Committee representation

This standard was prepared by the P8100 Committee. The membership of the committee was approved by the New Zealand Standards Approval Board and appointed by the New Zealand Standards Executive under the Standards and Accreditation Act 2015.

The committee consisted of representatives of the following nominating organisations:

Beef+Lamb New Zealand

CRV Limited

DairyNZ Limited

Datamars Livestock

Federated Farmers of New Zealand

GEA Farm Technologies

Gribbles Veterinary

International Accreditation New Zealand

Landcorp Farming Limited (Pāmu)

LIC

Massey University Te Kunenga ki Pūrehuroa

Matriarch Genetics Limited

MilkTestNZ Limited

Ministry for Primary Industries

MSD Animal Health New Zealand

New Zealand Animal Evaluation Limited

New Zealand Holstein Friesian Association Inc.

NZ Dairy Breeds Federation

QCONZ Limited

Telarc Limited

AgriTech New Zealand

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DZ NZS 8100:2023

New Zealand Standard

Dairy herd testing

Superseding NZS 8100:2015

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Referenced documents

Reference is made in this document to the following:

New Zealand standard

NZS 8100:2015	Dairy herd testing

Joint Australian/New Zealand standard

AS/NZS ISO 9001:2015	Quality management systems – Requirements

International standards

ISO 707:2008 | IDF 50:2008	Milk and milk products — Guidance on sampling
ISO 9622:2013 | IDF 141:2013	Milk and liquid milk products – Guidelines for the application of mid-infrared spectrometry
IDF/ISO/AOAC Official Method 989.05	Fat in milk modified Mojonnier. ether extraction method first action 1989 final action 1992
AOAC Official Method 991.20	Nitrogen (total) in milk Kjeldahl methods first action 1991 final action 1994
ISO 8968-1:2014 | IDF 20-1:2014	Milk and milk products — Determination of nitrogen content — Part 1: Kjeldahl principle and crude protein calculation
ISO 8968-3:2004 | IDF 20-3:2004	Milk — Determination of nitrogen content — Part 3: Block-digestion method (Semi-micro rapid routine method)
ISO 23318:2022 | IDF 249:2022	Milk, dried milk products and cream — Determination of fat content — Gravimetric method
ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories
ISO/IEC 17034:2016	General requirements for the competence of reference-material producers

Other publications

NZAEL. *DIGAD CDP Interface Specifications for herd recorders.*

ICAR. *Procedure 2 of Section 2 of ICAR guidelines – computing of accumulated lactation yield*. January 2020.

ICAR. *Procedure 4 of Section 11: Testing of Traditional Milk Recording and Sampling Devices. Version.* March 2023.

ICAR. *Procedure 12 of Section 11: Guidelines – Procedure for Test-Day Practices for Obtaining Milk Samples on Individual Animals from Sampling Devices.* March 2023.

ICAR. *Section 12 – Guidelines for milk analysis*. April 2020.

ICAR *Section 13 – Guidelines for on-farm milk analysis*. October 2017,

Jago, J G, and Burke, J K. *Estimating 24-hour milk, fat, and protein yields and somatic cell count for automatically milked cows in pastoral production systems. Proceedings of the New Zealand Society of Animal Production, 73*, 29–32, 2013.

New Zealand legislation

Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations 2001, or its successor.

Ministry for Primary Industries Operational Code NZCP1: Design and operation of farm dairies. 19 May 2017.

NZ government gazette notice (https://gazette.govt.nz/notice/id/2015-gs6422).

Websites

www.dairynz.co.nz/animal/animal-evaluation/animal-database/data-standards

www.ianz.govt.nz

www.icar.org/index.php/icar-recording-guidelines

https://www.icar.org/index.php/certifications/icar-certifications-for-milk-meters-for-cow-sheep-goats/automatic-milking-systems-and-sampling-shuttles-and-trays/

www.legislation.govt.nz

www.mpi.govt.nz/resources-and-forms/registers-and-lists/certification-bodies-and-certified-herd-testers

www.ospri.co.nz/farmers-and-livestock-owners/tagging-and-registering-animals/tagging-your-animals/buying-tags

Latest revisions

Users of this standard should ensure that they have copies of the latest versions of the New Zealand standards listed here. These, and any amendments to them, can be found on www.standards.govt.nz.

Review of standards

We welcome your suggestions for improving this standard. Please send them to the National Manager, Standards New Zealand, PO Box 1473, Wellington 6140.

Foreword

The Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations 2001 (the Regulations) define the minimum data that shall be collected and supplied to the manager of the core database, which is part of the Dairy Industry Good Animal Database (DIGAD). NZS 8100 *Dairy herd testing*, which is incorporated by reference into the Regulations, sets out what is required of a certified herd tester (CHT), from collecting data and milk samples on the farm to supplying data to the core database.

The data collected by certified herd testers (CHTs) is used for various activities, including farm management, animal evaluation, and industry statistics. The core data specified in the Regulations is only a subset of the data needed for animal evaluation, which gives information that enables genetic gain.

Previous versions of NZS 8100 (these were published in 2001, 2007, and 2015) focused on enabling as many farmers as possible to conduct herd tests (HTs) under twice-a-day (TAD) or once-a-day (OAD) milking regimes. However, over the last two decades, farmers have increased their herd sizes and now use a broader range of herd-management practices. Milking regimes have evolved and many farmers run multiple herds on the same property. Previous versions of NZS 8100 had no method for identifying herd-management groups or accounting for variable milking regimes. The New Zealand dairy industry has realised it needs additional information to identify which data are reliable for ranking male and females in its dairy cattle population. It also needs to consider how new technology will affect data-collection methods in the future.

NZS 8100:2023 supersedes NZS 8100:2015. It defines the standards needed to meet the objectives of the Regulations. It recognises that using a subset of high-quality data are better than using a large volume of data that includes inaccurate metadata. It also enables farmers to choose to identify herd-management groups, so they can account for preferential treatments and accurately record milking regimes. In future, only animals with high-quality metadata and records will be eligible to be included in animal evaluation of sires.

Outcome statement

This standard will enhance the ongoing contribution that high-quality data and metadata make to the dairy industry's core database. By applying this standard, CHTs will enable farmers to record herd-management groups and alternative milking regimes. This standard also enables metadata to be generated that is critical for animal evaluation and improving dairy farm productivity and profitability through genetic gain.

Dairy herd testing

1 General

1.1 Context

This standard relates to a subset of data that is needed to reliably rank animals across breeds, herds, and age groups. Reliable animal evaluation is the foundation for achieving best-practice genetic gain. The data referred to in this standard are submitted to the core database, which is part of the Dairy Industry Good Animal Database (DIGAD).

1.2 Scope

This standard sets out the requirements for certified herd testers (CHTs) who provide regulated herd-testing services under the Regulations, or their successor. The Regulations are administered by the Ministry for Primary Industries (MPI).

The scope includes the 'end-to-end' processes from the collection of data and milk samples on farm, to the supply of core data to the core database. It includes animal recording and herd testing data.

1.2.1 *Inclusions*

This standard covers the end-to-end process of collecting data and milk samples on a farm through to supplying data to the core database. The data that shall be collected and supplied to the core database are covered in the Regulations, Schedule 2; this includes data on animal recording and herd testing. To ensure data integrity, CHTs shall enable additional information to be sourced to account for differential treatments described in this standard.

1.2.2 *Exclusions*

This standard excludes additional data needed to accurately rank cows' genetic potential for the New Zealand dairy industry using animal evaluation and genetic gain. Those data, and the standards associated with it, are covered by DIGAD data standards.

1.3 Objectives

This standard is intended to be used by a CHT The standard has four objectives:

(a) To define the standards needed to meet the Regulations;
(b) To enhance the quality of data used for animal evaluation, by identifying herd-management groups and alternative milking regimes, thereby ensuring the collective national value of genetic gain;
(c) To define the 'end-to-end' process of collecting data from farms through to supplying it to the core database, so that the compliance of CHTs with the standard can be audited; and
(d) To ensure the standard enables interoperability of databases, to validate data, and use of new and emerging technologies that will benefit the dairy industry.

1.4 Transition requirements

Changes introduced in NZS 8100:2023 are valid from the time it is published. CHTs shall be compliant with the standard – in its entirety – within three years of the publication date.

1.5 Interpretation

For the purposes of this standard, the word 'shall' refers to requirements that are essential for compliance with the standard, while the word 'should' refers to practices that are advised or recommended.

The terms 'normative' and 'informative' appendix have been used in this standard to define how the appendix is applied. A 'normative' appendix is an integral part of the standard while an 'informative' appendix is for information and guidance only. However, where an informative appendix specifies a prescribed test procedure, the word 'shall' means that if users elect to conduct this test, it shall be undertaken exactly as set out in the appendix.

1.6 Definitions

For the purposes of this standard, the following definitions shall apply:

24-hour equivalent value	The calculation of HT (herd test) milk volume or the HT milk components to represent a 24-hour period
AM milking	A milking event that starts between midnight and noon
Animal	Male or female dairy cattle of any age
Animal evaluation (AE)	The process of fitting a model which describes the systematic and non-systematic factors and effects that influence observed performance. The model is fitted to performance records such as those from herd testing. The outcomes from AE include estimates of the effects and the likely nature of prediction errors. From a selection viewpoint, it is the estimates of the breeding values, and their associated reliabilities which are a function of prediction errors, that are of paramount importance. In addition to performance records such as from herd testing, modern animal evaluation typically makes use of pedigree information, genomic information and prior information from other sources. In its widest context, animal evaluation includes the process of combining across all traits in the national breeding objective, the estimates of breeding values with their economic values to produce an overall estimate of Breeding Worth (BW)
AE model	The model used to calculate an animal's genetic performance. It includes a description of the nature and scope of factors and effects to include when analysing a particular trait for genetic performance. The model's description includes its equation, location parameters, dispersion parameters, and – in some cases – the distributional properties of its effects. The AE models that New Zealand Animal Evaluation Limited (NZAEL) uses are documented by NZAEL
Automated-milking system (AMS)	A system that records milk volume and either takes milk samples or analyses milk without human supervision or interference
AMS and automatic milk sampler/tray combinations	An AMS combined with a specific automatic milk sampler or tray, where the combination has been certified by the International Committee for Animal Recording (ICAR) and listed on the ICAR website under Automatic Milking Systems and Automatic Milk Sampler/Trays. In this standard, an ICAR-certified combination can also be interpreted as a milk meter
Automatic milk sampler/tray	An automatic sampler or tray that is installed or attached to an AMS and used to collect a milk sample for off-farm analysis of milk components. The milk sample collected shall represent the milking of the whole udder of an individual cow
Batch milking	Milking a group of cows at regular intervals that are prescribed by the farmer
Breed societies	Members of the NZ Dairy Breeds Federation that contribute data to DIGAD
Breeding Worth (BW)	The index used to rank cows and bulls on their expected ability to breed profitable, efficient replacements
Certification body	A person or body that is approved by the chief executive of the Ministry for Primary Industries under Schedule 1 of the Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations 2001
Certified data provider (CDP)	A person who is certified to provide data to DIGAD under DIGAD data standards

Certified herd tester (CHT)	A person who is certified as a herd tester under Schedule 1 of the Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations 2001
Combined herd	For the purposes of herd testing, two or more herds combined and recorded as a single herd at one farm location (see 3.6)
Composite sample	A sample formed from two or more milk subsamples where the subsamples forming the composite sample are proportional, based on the milk volume from which they were collected relative to the total milk volume for all the milk samples collected in the herd test period. For example, if a herd test period includes two milkings in 24-hours, with morning and afternoon milk volumes being 20 L and 10 L, the composite sample preparation includes two units of milk from the morning milking for every one unit from the subsample for the evening milking
Contemporary group	A set of animals that have an equal opportunity to perform. Animals will be assigned to the same contemporary group for herd testing where: (a) Animals are at the same farm location and share the same environment (this includes the same geographic location, temperature, rainfall, and grass growth); and (b) Animals are in the same herd and share the same farm-management practices (this includes but it not limited to the stocking rate, supplement and feed regimes, walking distances, and calves running with lactating animals); and (c) Animals are tested on the same day, and have the same milking regime (that is, OAD milking, TAD milking or variable milking); and (d) Animals are tested on the same day, using the same herd-test-sampling regime (pm/am, pm only or am only); and (e) Animals belong to the same age group (that is two-year-olds, three-year-olds, four-year-olds or five- to seven-year-olds); and (f) Animals share the same calving season; and (g) Animals are herd tested using the same milk sampling regime
Conventional herd testing	Installing milk meters or using permanently installed milk meters or AMS and automatic milk sampler/tray combinations, to collect on-farm samples for analysis at an HT laboratory. Herd testing is carried out by CHTs
Core-data	The data in or required by the Herd Testing Regulations to be contributed to the Core Database and any additional data pursuant to any amendment to the Act or the Herd Testing Regulations
Core database	As per the Dairy Industry Restructuring Act 2001, means the core database that comprises: (a) Information provided to the manager of the core database under the Herd Testing Regulations 1958 or under the terms and conditions of any license issued under those Regulations; and (b) Information provided to the manager of the core database under any Regulations made under this Act
Cow (milk cow)	A female animal that has had at least one calf and is used for dairy production
Dairy cattle	Male or female animals of any age that are used for dairy production
Dairy Industry Good Animal Database (DIGAD)	A database containing ancestry and performance data for every recorded dairy cow in New Zealand. This database is intended to contain all the data required for AE. DIGAD contains the core database and other data fields
DIGAD data providers	Individuals and organisations that submit data to DIGAD, including CHTs, herd-record providers (HRPs), and certified data providers (CDPs). See 2.5

DIGAD data standards	Standards defining the data requirements and data provider requirements used to approve CDPs to submit data to DIGAD
Derived	A data element calculated from raw data elements using a mathematical, logical, or other type of transformation (such as an arithmetic formula or aggregation), using an agreed and documented process
Distributed milking system (DMS)	A system where individual cows in a herd select their milking time and are milked at variable times and frequencies using automated or robotic machinery (see Appendix A) NOTE – In 2015, the Herd Test Standard Committee rejected the terms AMS and robotic milking as terms for cows that select their milking time (this is also known as voluntary milking times), as original equipment manufacturers predicted that automated and robotic systems would be included in herringbone and rotary sheds in the future. They recommended describing, rather than implying, the actual milking system, to avoid confusion and futureproof the herd test standard. Since then, the standard has used the terms batch milking and DMS
Event data	The information to be supplied to the manager of the core database as listed in Schedule 2 of the Regulations and defined in 8.4, Table 2 and listed in Appendix B
Farmer	A person or entity who contracts a CHT to undertake an HT. The farmer may opt to take responsibility for collecting the HT milk samples and supplying herd records associated with the HT to the CHT (see Appendix C)
Ground-truth	The measurement data that are expected to be true, which are used to evaluate the measurements of technology being assessed
Herd records	Core and non-core data that is needed for AE
Herd-record provider (HRP)	An organisation contracted by a farmer to submit herd records to the manager of the core database
Herd-management group	A group of cows within a single farm location, that has the same farm-management practices (such as supplements, feed regimes, and walking distances) Herd-management groups are required if accurate contemporary groups are to be formed for AE. A herd management group enables an individual cow's performance to be compared with herd mates under the same farm-management conditions (see 3.5) NOTE – Farmers may refer to a herd-management group as a 'mob', 'sub-herd', or 'herd'.
Herd test (HT)	An event that involves determining the milk volume and analysing the milk components of milk from a cow
Herd-test (HT) laboratory	An accredited laboratory that accepts representative subsamples of HT samples, to analyse the milk fat and milk protein content, and somatic cell counts (SCC). The herd test laboratory shall be accredited to form the composite sample where forming composite samples is required before analysis of milk fat and milk protein content, and SCC
Herd-test (HT) period	The time from attaching the milking apparatus ('cups on') to the first cow that a milk sample is collected from, to the time the milking apparatus is detached ('cups off') from the last cow that a milk sample is collected from the last consecutive HT event

Herd-test (HT) sample	A representative milk sample or measurement taken from a cow's entire milking, to determine the cow's milk volume and components
Herd-testing procedures	The procedures and processes that CHTs follow when they collect milk volume data and representative milk samples or measurements for milk components from herds, to provide data to the manager of the core database
Key data	The information to be supplied to the manager of the core database as listed in Schedule 2 of the Regulations and defined in 8.4, Table 2 and listed in Appendix B
Lead organisation	A person or organisation who oversees approval procedures for on-farm milk analyser (OMA) systems (see Appendix D), and the verification requirements for milk meters (see Appendix E) on behalf of the verification body.
Manager of the core database	The entity responsible for operating the core database, which is defined in section 5 of the Dairy Industry Restructuring Act 2001
Milk	A secretion from dairy cows that supplies their young with nutrition and immunological protection. The primary components of milk are water, lipids (milk fat), carbohydrates, proteins, and salts
Milk components	For the purposes of this standard, milk components are milk fat and protein, and somatic cells
Milk fat	The estimated lipid content of milk correlated with the milk fat content of milk determined by chemical analysis (the analysis is done using international reference methods: ISO 1211 | IDF 1 or IDF/ISO/AOAC Official Method 989.05)
Milk meter	A milk recording device that has the function to: (a) Measure the milk yield per individual milking of a cow for the whole udder; and (b) Provide a representative sample of this milk, for milk component analysis off-farm. without significantly affecting the normal milking procedure and the quality of the harvested milk
Milk protein	The estimated crude or total protein content of milk correlated with the milk protein content of milk determined by chemical analysis (the analysis is done using international reference methods: ISO 8968-1:2014 | IDF 20-1:2014 Part 1; ISO 8968-3:2004 | IDF 20-3:2004 Part 3; or AOAC 991:20 -23)
Milk volume	The amount of milk (litres) produced by a cow during milking at an HT. Where the milk volume is determined by weighing the milk the weight is converted to volume by dividing it by 1.03
Milking interval	The interval between one milking event and the subsequent milking event of the same herd or cowl
Milking regime	Milking intervals prescribed by a farmer for cows in a herd or herd-management group. Intervals can be OAD, TAD, variable or distributed
National Breeding Objective (NBO)	Determines which traits and information are most important to farmers to enable improvements in genetic gain in the national dairy herd. New traits and changes in data are established through the NBO and reflected in NZAEL's Breeding Worth index and other industry animal evaluation indexes

Non-core data	The data supplied to DIGAD not defined as core-data and agreed to be provided to DIGAD under a data supply agreement with the NZAEL database manager
Once-a-day (OAD) milking	A cow milked once per day with a consistent milking interval of approximately 24 hours. The average number of milkings is exactly one per day
On-farm milk analyser (OMA)	Equipment installed on a farm that collectively measures the volume, components, and characteristics of milk for individual cows
OMA reporting date	The date associated with each submitted 24-hour equivalent value for OMA measurements
Production data	The information to be supplied to the manager of the core database as listed in Schedule 2 of the Regulations and defined in 8.4, Table 2 and listed in Appendix B
PM milking	A milking event that starts between noon and midnight
Regulations	Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations 2001, or its successor
Regulated herd testing	As per the Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations 2001, means the operation of testing the milk of milk cows in any two or more herds that are the property of different persons, for the purpose of recording the production of individual cows within those herds in respect of milk or components of milk
Representative sample	A sample that is intended to reflect the characteristics of the milk from which it was taken
Single-sample herd test (HT)	An HT sample taken, at the AM or PM milking, from a cow that is milked more than once in 24 hours (that is TAD or variable milking)
Somatic cell count (SCC)	The estimated number of somatic cells, in thousands, per millilitre of milk
Static data	The information to be supplied to the manager of the core database as listed in Schedule 2 of the Regulations and defined in 8.4, Table 2 and listed in Appendix B
Subsample	A sample of a larger sample. The subsample is intended to accurately reflect the characteristics of the larger sample
Test-day AE model	A statistical model that directly uses records from every day that a herd is herd tested. This contrasts with the approach used in previous years that pooled test-day records to predict whole lactation performance and fitted only the prediction into the AE model
Twice-a-day (TAD) milking	A cow milked twice every day during a 24-hour period, with each milking time being about the same for each 24-hour period and not on a variable milking regime. The average number of milkings is exactly two per day
TAD milking, two-sample testing	An HT sample taken at consecutive milkings, from a cow that is milked TAD. Typically, a PM sample is taken first, followed by an AM sample
Variable milking	Any milking sequence where a cow is not repeatedly milked OAD or TAD. For example, variable milking could be three milkings in two days (3in2) or ten milkings in seven days (10in7)
Verification body	The Scientific Advisory Committee (SAC), or its successors, and the NZAEL Board. The SAC makes recommendations to the NZAEL Board

Warrant of fitness (WOF)	An annual check following the documented procedure approved by the Verification Body as part of the OMA approval procedures for OMA systems

1.7 Abbreviations

The following abbreviations are used in this standard.

3AD	Thrice-a-day milking
3in2	Three milkings in two days
10in7	Ten milkings in seven days
AE	Animal evaluation
AMS	Automated-milking system
BW	Breeding Worth index
CDP	Certified data provider
CHT	Certified herd tester
CSB	Cow-specific bias
DIGAD	Dairy Industry Good Animal Database
DMS	Distributed milking system
HRP	Herd-record provider
HT	Herd test
HTP	Herd-test (HT) period
IANZ	International Accreditation New Zealand
ICAR	International Committee for Animal Recording
IDF	International Dairy Federation
MPI	Ministry for Primary Industries
NA	Not applicable
NAIT	National Animal Identification and Tracing programme
NZAEL	New Zealand Animal Evaluation Limited
OAD	Once-a-day milking
OMA	On-farm milk analyser
RFID	Radio-frequency identification
SAC	Scientific Advisory Committee
SCS	Log (base 2) of the SCC

SCC	Somatic cell count
TAD	Twice-a-day milking
WOF	Warrant of fitness

2 Herd testing and animal recording

2.1 Introduction

The National Breeding Objective's aim is to breed dairy cows that can more efficiently convert feed into profit. Animal evaluation (AE) is underpinned by the National Breeding Objective; it involves ranking the performance of an individual animal relative to its contemporaries, using contemporary groups.

The National Breeding Objective defines breeding worth (BW) as the value of traits that account for factors like feeding levels, replacement rates, reproductive interventions, health costs, and beef and milk revenues. The long-term efficiency of the dairy industry depends on selecting superior parents. Herd testing is not simply a way to assess milk production at a fixed point in time, it also contributes to generating data and metadata that enable cows and bulls to be ranked for their suitability as parents of the next generation.

Herd testing involves recording data about an animal's parentage, contemporaries (this includes herd-management groups and contemporary groups), milking regimes, and environmental influences determined by the cow's age and stage of lactation at each herd test. Combined with milk measurements, these data make up the core data that CHTs shall provide the manager of the core database.

Herd improvement is a long-term activity that relies on decades of information used for AE. Database facilities and documented standards are critical to providing useful information, and interpreting that information, over these extended periods.

2.2 About herd testing

Herd testing involves sampling or analysing milk, or both, from each cow in a herd, to estimate the milk yield and milk components. This can be done once, twice, or more during a 24-hour period, or a longer period, depending on the milking regime and the requirements of the AE model being used.

The milk component results from each milk sample collected during a herd-testing period and its associated milk volume measurement are used to estimate the equivalent yield in a 24-hour period (24-hour equivalent value). The more accurate the 24-hour milking-yield-equivalent estimate is for the milking regime, and the more frequently herd testing is done over the entire course of the lactation, the more accurate the total lactation yields and genetic-merit estimates for the season will be.

2.3 Reasons for herd testing

Farmers use herd testing for multiple reasons, including managing the somatic cell count (SCC), and making decisions for culling, breeding and other farm management purposes.

Herd testing results are information about an individual cow's milk production and milk components, and that of her contemporaries using contemporary groups. When that information is combined with other animal recording data in an AE model, the lactation performance of individual cows, and their sires, can be compared, and the lactational performance of their future offspring can be predicted.

For an AE model to take account of performance differences resulting from different breeds, herd locations, cow ages, stages of lactation, herd-management practices, and milking regimes, animal and HT data must be accurately recorded. Herd test (HT) data contribute to evaluating lactation traits that explain approximately 50% of the differences in economic merit defined by the National Breeding Objective. The traits that are not covered by this herd test standard reflect differences in economic merit explained by differences in reproductive performance, survival, and efficiency.

Selecting above-average animals based on their BW is the basis for improving subsequent generations and this practice dictates the annual rate of genetic gain. The collective national value of genetic gain is the primary motivation for regulating herd testing.

2.4 Benefits of herd testing

Dairy farmers who opt to use semen from bulls evaluated under AE directly benefit from the collective activities of farmers who herd test and supply high-quality data used in AE. Dairy livestock managers enjoy access to genetically superior animals as a result of their predecessors' cooperative activities. Farmers who herd test also benefit by having information to make on-farm decisions, at important times during the dairy season.

Artificial-breeding companies benefit from herd testing because it is the basis for identifying elite cows and bulls that can contribute to genetic gain by providing sons. Herd testing provides the means to rank young sires on the productivity of their progeny test daughters, or from genomic information collected about the young animals that has been characterised from previous generations of herd testing.

Herd-record providers (HRPs) receive HT data for their customers' herds and use it to support their services to farmers, which has commercial benefits for them.

Breed societies receive HT data to enable them to provide animal and herd testing performance records to their members.

Increasing the productivity of the national dairy herd contributes to New Zealand's economic performance, which benefits all New Zealanders.

Processors and marketers benefit from using HT information to predict national timing and composition of milk flows. This is valuable for planning milk processing and marketing of milk products.

2.5 Relationships between DIGAD and the core database and DIGAD data providers and certified herd testers

Figure 1 shows the relationship between DIGAD and the core database and DIGAD data providers. DIGAD contains ancestry and performance data for every recorded dairy cow in New Zealand. This database is intended to contain all the data required for animal evaluation (AE). DIGAD contains the core database, which contains the data supplied under the Regulations. DIGAD comprises:

(a) The core database, which contains the data supplied under the Regulations by a CHT, and which are subject to this herd test standard; and
(b) All other data fields required for AE which are not covered by the Regulations or by this herd test standard. These other data are submitted to DIGAD by the HRP or CDPs on a voluntary basis as agreed between the HRP or CHT with the Manager of DIGAD.

It is the combination of the data in 'a' and 'b' above that enables AE to be completed.

The HRP is normally contracted by the farmer to enrol their animals with DIGAD and to maintain and submit animal records to DIGAD. The HRP normally provides the outputs from animal evaluation to the farmer. There is only one contracted HRP for each participant.

The CHT is contracted by the farmer to undertake regulated herd testing. The CHT is required to submit the data described in 1.2.1 to the core database, which is a subset of DIGAD. The CHT may submit the data directly, or indirectly via an HRP. An organisation may be contracted to a farmer as an HRP or CHT or CDP.

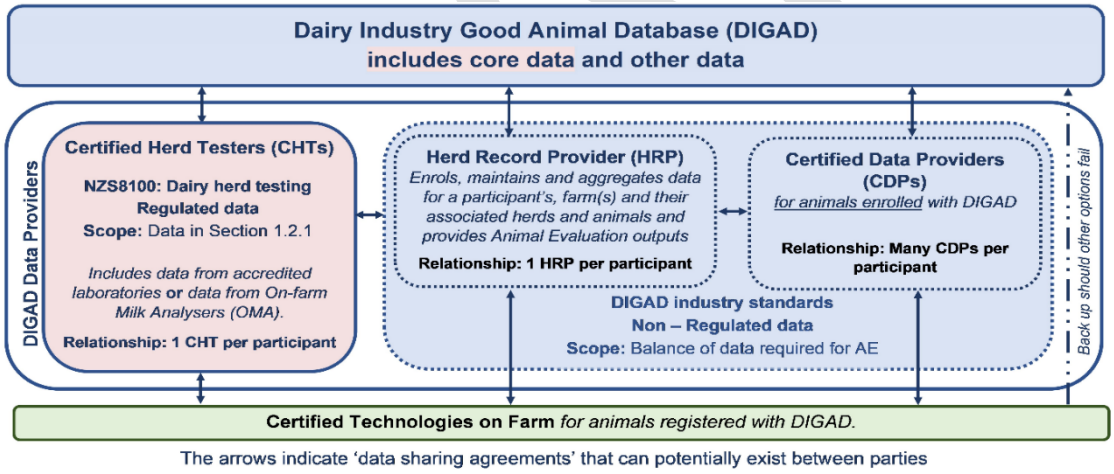


Figure 1 – Relationships between the Dairy Industry Good Animal Database and data providers

2.6 Regulations and the certified herd tester

2.6.1 *Regulated herd testing*

Regulated herd testing services are undertaken by CHTs who will collect and submit the data to the core database and are also required to collect and supply the data identified in Section 1.2.1 and comply with this Standard except for the sections identified as informative.

The CHT shall ensure the data identified in Section 1.2.1 has been collected and supplied directly, or through other DIGAD Data providers (Figure 1) to enable the ranking of cows and bulls in accordance with the National Breeding Objective.

The requirement to submit data to the core database does not apply to testing activities for the purpose of determining only the somatic cell count (and nothing else).

A person who undertakes herd testing for the purpose of research only, on a herd that the person does not own, is not required to be a CHT or provide data to the manager of the core database. However, that person

must ensure that the herd is tested by a CHT in the same season as the season in which the testing for research is done.

The regulation of herd testing is one component of a framework that is intended to ensure the maintenance of a comprehensive database of information on New Zealand dairy cows and allow for competition in the provision of herd testing services.

2.6.2 *Access to data collected by certified herd testers*

The New Zealand Dairy Core Database Access Panel must grant applications for access to data in the core database if it is satisfied that to do so is likely to be of benefit to the New Zealand dairy industry. The access panel requirements are detailed in Part 2: Access to data in the core database, under the Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations 2001, or its successor. The application process is detailed in the NZ government gazette notice (https://gazette.govt.nz/notice/id/2015-gs6422).

2.6.3 *Certification of herd testers*

A person can only offer regulated herd testing services in New Zealand if they are a CHT. They must be certified by a certification body approved by the chief executive of MPI under Schedule 1 of the Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations 2001, and their successor.

The certification body must be satisfied that the person or body applying for certification as a herd tester has the necessary competencies, capacity, and capability to undertake regulated herd testing in compliance with the dairy herd testing standard.

The CHT will be listed on the MPI website https://www.mpi.govt.nz/resources-and-forms/registers-and-lists/certification-bodies-and-certified-herd-testers/ and the NZAEL website (https://www.dairynz.co.nz/animal/animal-evaluation/animal-database/data-standards).

2.6.4 *Approval of certification bodies*

The chief executive of MPI may, on application, approve a person or body as a certification body. Joint Accreditation System of Australia and New Zealand (JASANZ) provides assurance to the chief executive about the competence of the applicant prior to their approval by MPI as a certification body. An approved certification body must:

(a) assess applications from persons who want to become CHTs against the requirements of the dairy herd testing standard.
(b) ensure that all herd testers certified by it comply with the requirements for certification.
(c) implement a programme of auditing certified herd testers certified by it to ensure that they continue to comply with the requirements for certification.

2.6.5 *Compliance with this standard*

Each CHT shall be certified as compliant with AS/NZS ISO 9001 and NZS 8100, except for sections identified as informative.

2.6.6 *Non-compliance with this standard*

Failure to comply with Regulations 5(1), 6(1), 7(1) to (3) is an offence, which can result, on conviction, in a fine of up to $20,000 (see Regulation 32). A herd tester's certification may also be revoked if the certification body or chief executive of MPI is satisfied that the CHT is failing or has failed to comply with the standard or Regulations.

2.6.7 *External audit requirements*

The certification body shall implement a programme of auditing CHTs as required under 2.6.4(c).

The audit shall include herd testing and animal recording procedures. All core fields (Table 2) shall be audited at least once in a three-year audit cycle.

The audit shall include verification for a subset of animals that the core data for the core data fields (Table 2) have been submitted to the manager of the core database.

3 Concepts that govern a herd-testing service

3.1 Advising herd owners

The CHT shall communicate the importance of these matters to the herd owner:

(a) Identification of the management group;
(b) Relative accuracy of data resulting from the HT, when the HT sample regime does not match the milking regime (see note 1);
(c) This standard's herd recording requirements (see note 2); and
(d) Test-day responsibilities (see Appendix C).

NOTE –

(1) NZAEL provides information about the accuracy of data when HT sample regime does not match the milking regime.

(2) These requirements include recording abnormal codes, calving dates, animal identification, query resolution, combined herds, and how herd-management groups are identified.

3.2 Testing and accounting for cows

To avoid unintended consequences and reduce the opportunity for manipulating the herd testing outcomes, all lactating cows shall be tested or a valid reason shall be given for their exclusion (as per the core database abnormal test codes) when the cows:

(a) are at the same farm location, or in a single shed in the case of a combined herd; and
(b) have the same participant code; and
(c) are in the same calving season.

Exceptions to this requirement are the following age groups which may be tested separately from all cows in the herd:

(d) two-year-old cows; or
(e) three-year-old cows; or
(f) two- and three-year-old cows.

To be eligible for testing as a permitted age group, all cows in the age group shall be managed as a herd-management group (see Note 1 and 3.5).

NOTE –

(1) Herd-testing groups should not include other mixed-age cows when testing two-year-old or three-year-old cows covered by the exceptions.

(2) When not every lactating cow is tested, tagging and calving thresholds still apply for the entire farm location.

3.3 Testing animals under different milking and sampling regimes

During an HT, some cows may be tested under different milking or sampling regimes or both. In these situations, the milking or sampling regime or both shall be recorded for each individual cow.

NOTE – The DIGAD CDP Interface Specifications for herd recorders defines valid types of sampling and milking regimes. An agreement exists between CHTs and the manager of the core database.

3.4 Recording differential in-shed feeding

In some farming practices, it is possible that individual cows have different access to feed compared with others in their herd or herd-management group. As this can influence AE, CHTs shall ask these questions about in-shed feeding before the first HT of the season, and shall advise the manager of the core database of herds practicing differential feeding in the milking parlour.

(a) Do you use in-shed feeding?
(b) If yes, when you use in-shed feeding throughout the season, do you allocate cows an equal amount of feed at milking?

3.5 Recording different herd-management groups

New Zealand farmers often divide their herd into subunits, such as mobs. This standard refers to these subunits as herd-management groups.

For AE, it is important to know if animals are treated differently. For example, if they have different walking distances, access to feed, types of feed, or stocking rates. When different herd-management groups under the same milking regime are tested on the same day, the CHT shall enable the herd-management group for each animal to be recorded.

3.6 Recording combined herds

For the purposes of herd testing and interoperability with the National Animal Identification and Tracing programme (NAIT), when two or more herds are farmed at different locations that have a contiguous boundary, or are within a 10 km radius, they can be defined as a single herd at a single farm location.

To undertake herd testing as a combined herd using more than one shed, at least one of these conditions shall be met:

(a) Different sheds are tested on different days; or
(b) Different sheds are tested as different milking regimes; or
(c) Cows milked through different sheds have different calving seasons; or
(d) Cows milked through different sheds shall be identified as different herd-management groups.

Combined herds shall meet the requirements of 3.2.

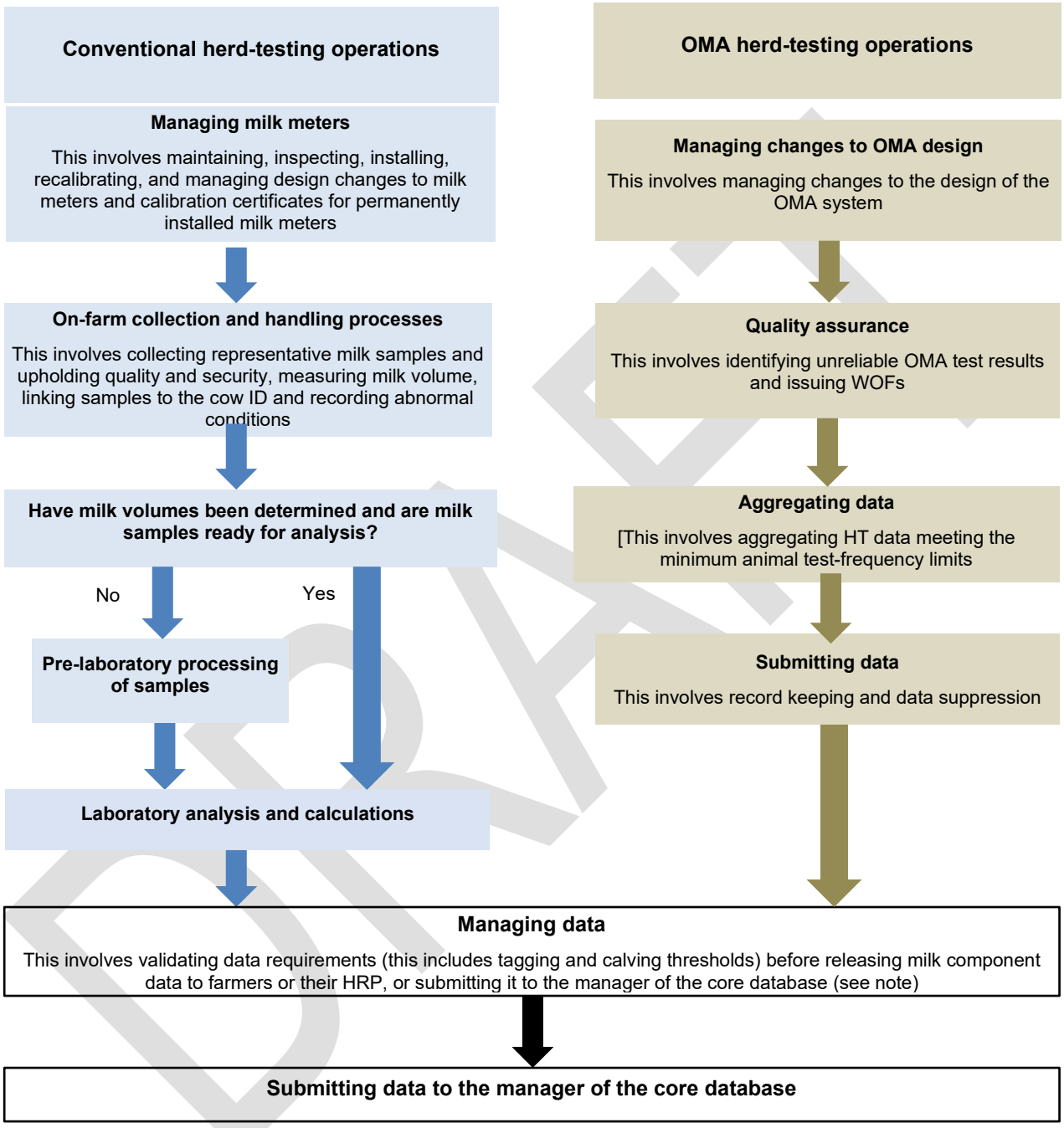
NOTE – When not every lactating cow is tested, tagging and calving thresholds still apply for the entire farm location.

3.7 Deciding test number, type and frequency

The farmer decides the number, type, and frequency of HTs to conduct during a season or lactation period.

4 Herd-testing operations

Herd testing is operated using a conventional herd-testing approach (see section 5) or an on-farm milk analyser (OMA) system (see section 6). The processes for these operations are shown in Figure 2. The same processes are used for managing data (see section 7) and submitting data to the manager of the core database (see section 8).



NOTE – Farmers with OMA technology will have access to milk-related data for managing individual cows.

Figure 2 – Processes for conventional herd testing and herd testing using OMA

5 Conventional herd testing

5.1 Managing milk meters

5.1.1 *Checking the suitability of milk meters*

To be used for herd testing, milk meters shall meet one of these conditions:

(a) They are certified by the International Committee for Animal Recording (ICAR); or
(b) They are verified for use by the verification body in accordance with the approval procedures (see Appendix E) and listed on the NZAEL website; or
(c) They are a Tru-Test FC Meter, Tru-Test WB AutoSampler Meter or Waikato Speedsampler Meter that have been verified by the verification body.

The manager of the core database shall maintain a register of approved milk meters, their model numbers and specifications for devices approved by the verification body.

If the manager of the core database has any concerns about the performance of a CHT's milk meter (this includes milk meters certified by ICAR), NZAEL reserves the right to refer the milk meter to the verification body. The verification body at its sole discretion can request that the milk meter is tested and validated, and it will set the terms of reference for the validation. If this shows that the milk meter does not achieve the required performance, or if the validation is not completed within the required time, the verification body may withdraw the milk meter from use.

5.1.2 *Changing the design of existing milk meters*

When a design change occurs to a previously approved milk meter, the device shall be re-approved by ICAR or the verification body before it is used for herd testing

5.1.3 *Maintaining and recalibrating milk meters*

Milk meters shall be inspected and serviced annually, to check for damage, faults, and general wear and tear, and to check if any parts need replacing.

Milk meters shall be maintained by trained staff, to ensure they operate to the manufacturers' specifications. Some maintenance procedures may require the accuracy of the meter or measuring equipment to be tested.

Milk meters shall be recalibrated at least once a year, and more often if necessary, by the manufacturer or their authorised representative.

Each milk meter shall be uniquely identified. A record shall be kept of its current calibration status, which shows it is fit for purpose and accurate. CHTs, milk-meter manufacturers, and those responsible for servicing and calibrating milk meters shall have clearly documented procedures for their calibration, testing and validation processes.

When a CHT uses a permanently installed milk meter, they shall obtain a copy of its calibration certificate. This certificate shall be less than 13 months old.

5.1.4 *Inspecting milk meters*

CHTs shall inspect milk meters and associated equipment before they use them, to check for damage, faults, or general wear and tear, and to see if any parts need replacing. If they identify that a milk meter or associated equipment is unusable, they shall clearly identify it and remove it from service until it is restored to full working order and tested to validate its accuracy.

NOTE – Farmers, or their representatives, should ensure that all permanently installed milk meters they use for herd testing are not faulty, and that they rectify and recalibrate any faulty equipment before they use it.

5.1.5 *Installing milk meters*

A milk meter shall be installed in accordance with the manufacturer's instructions and the farm's dairy type, to ensure it accurately collects samples and measures milk volume, when it is used for HT.

Before and during installation, milk meters and associated equipment shall be inspected for cleanliness and foreign matter, to minimise the risk of them contaminating milk.

5.1.6 *Checking the suitability of milk-sample containers*

Milk-sample containers (flasks or vials) that come into contact with milk, and wash water or chemicals shall be made of materials that conform to IDF Standard 50C and the Animal Products (Dairy Processing Specifications) Notice.

5.2 On-farm collection and handling processes

5.2.1 *Upholding the quality and security of milk samples*

CHTs shall maintain systems that uphold the quality and security of milk samples while they are collected, stored and transported. This ensures that, when applicable, refrigeration, preservation, agitation, timeliness, and hazards are addressed to safeguard and preserve sample integrity.

5.2.2 *Representative sample*

Milk samples shall be collected in accordance with this standard, using a device that is approved for sampling and using procedures that ensure milk subsamples represent the whole milkings from which they were collected.

5.2.3 *Recording abnormalities*

CHTs shall provide a system that records any abnormalities that occur during an HT event and communicate this system to persons undertaking HT (see 8.4, Table 2, Production data, abnormal test code).

5.2.4 *Checking on-farm personnel are competent to conduct herd testing*

When the CHT is not present while herd testing equipment is set up or sampling occurs, they shall ensure the on-farm personnel carrying out the HT have access to adequate training and have instructions on how to operate the milk meter, and follow the sampling and data-collection processes.

NOTE – See Appendix C for details of farmers' responsibilities.

5.2.5 *Labelling milk-sample containers*

Milk-sample containers shall be clearly labelled using legible, adhesive labels that are not compromised when samples are collected, transported, or tested in the laboratory.

5.2.6 *Linking samples to their corresponding cows*

CHTs shall maintain a system that enables each sample to be linked to the corresponding cow's unique animal identifier.

When cows are identified electronically, checks should be made to ensure that each sample is linked to the corresponding cow.

See ICAR's *Procedure 12 of Section 11: Guidelines – Procedure for Test-Day Practices for Obtaining Milk Samples on Individual Animals from Sampling Devices.* March 2023 for examples of recording systems and practices for test days.

NOTE – See Appendix C for details of farmers' responsibilities.

5.2.7 *Recording milk volume on the farm*

When milk volume is recorded on the farm, the CHT shall follow a documented process using suitably certified or approved equipment. The milk volume shall be recorded for each cow. Milk volume is recorded to the nearest tenth of a litre; it represents the volume of milk the cow produces during the milking.

A trained CHT assistant shall record the milk volume produced by each cow being tested, by visually assessing the flask of the approved and calibrated milk meter. These data are matched to the cow being tested, before being submitted to the processing laboratory for full HT analysis.

NOTE – See 5.3.4.2 for details of determining milk volume off the farm.

5.3 Laboratory analysis and calculations

All laboratories should test to the same standard, to ensure that similar results will be generated for any sample, or representative sample or subsample tested, regardless of where it is analysed.

5.3.1 *Meeting laboratory accreditation standards*

When a laboratory is accredited to ISO/IEC 17025 by International Accreditation New Zealand (IANZ) or an alternate recognised accreditation body, it indicates that the laboratory meets a relevant international standard for laboratories. The ISO/IEC 17025 and the relevant International Dairy Federation (IDF) standards include methods for calibration, equipment validation, limits, subsampling, and proportional sampling.

Laboratories completing subsampling and proportional sampling shall be accredited to ISO 707:2008 | IDF 50:2008.

When milk samples are analysed for dairy herd testing, this shall be conducted according to documented analysing and calibration procedures. consistent with 5.3.2 and shall demonstrate they are competent to carry

out the required tests, by being accredited to ISO/IEC 17025 by IANZ or an alternate recognised accreditation body.

A laboratory that wants to start analysing HT samples has six months from the date of completing its application to a recognised accreditation body to demonstrate accreditation to ISO/IEC 17025.

5.3.2 *Calibrating equipment used to analyse milk components*

Test methods shall be carried out using ICAR's *Section 12 – Guidelines for milk analysis*, including appendices 1 and 2.

When calibrating equipment used to test milk components, laboratory personnel shall use reference results for representative samples from a reference-material producer that has been accredited to ISO/IEC 17034 for all relevant components by IANZ or an alternate recognised accreditation body.

In accordance with ISO9622 | IDF 141:2013 section 7.4, the reference samples used to check slope and intercept for the equipment used in testing milk components shall be from a reference-material producer that has been accredited to ISO/IEC 17034. The reference samples shall be representative of the total sample population tested by the instrument, and whose milk component values are varied regularly, covering the entire range of values of each component being measured.

5.3.3 *Processing laboratory samples*

Testing of preserved samples shall be completed within seven days of the last milking for the HT.

Weighing or creating composite milk samples, or both, shall be completed within 48 hours of the samples being collected from the farm dairy, unless the delay is outside the CHT's control.

Testing of unpreserved samples shall be completed within 72 hours of the last milking for the HT. Laboratories shall test for milk components within 24 hours of receiving the unpreserved samples.

5.3.4 *Processing samples before analysis*

5.3.4.1 *Identifying subsamples*

A system shall be maintained to enable each subsample to be linked to the correct cow ID and herd.

5.3.4.2 *Weighing samples to determine milk volume*

When milk volume is determined by weighing the sample, conversion of weight to volume shall be calculated using 1.03 kg/L as the milk density. Weighing should be done in an impartial manner using suitably certified, calibrated measuring equipment.

5.3.4.3 *Subsampling for analysing milk components*

When laboratory analysis needs subsamples of the sample collected on the farm, subsampling shall be done in a way that avoids introducing significant errors into determining the milk components. Replicate samples shall be prepared from the original samples, to assess the end-to-end process of preparing a proportionate composite sample.

5.3.4.4 *Preparing a composite sample*

Samples and milk weights are taken at each milking during the HT. Each sample is proportionate to the relative milk volume of each milking from which it was collected. These samples are pooled to form a composite sample, using a pipette or a specially designed tool that ensures proportional sampling creates one mixed sample that is representative of the entire HT.

5.3.4.5 *Meeting accuracy limits for composite samples*

The total error associated with the end-to-end procedure (see 5.3.4.3 and 5.3.4.4) (this includes equipment) used to process samples – after collecting them from the farm and before analysing them in the laboratory – shall meet the accuracy limits in Table 1. The replicate samples shall be representative of the total population of the milk component concentrations collected on farm.

Table 1 – Accuracy limits requirements for the total error for replicate composite samples formed by the proportional sampling procedures and equipment. The replicate samples shall be representative of the total population of the milk component concentrations collected on farm.

Table 1 – Accuracy limits for assessing composite samples

		Accuracy limits	
Component	**Range (g/100 ml)**	**Standard deviation of the individual errors**	**Mean bias**
Milk fat	2–8%	0.10%	±0.05%
Milk fat	>8% and <10%	0.25%	±0.10%

5.3.4.6 *Recording anomalies when processing HT samples*

There shall be a procedure to record anomalies identified when samples are processed (see 8.4 Table 2, Production Data, Abnormal test code).

5.4 Calculating a 24-hour equivalent

Excluding data from a OAD milk cow, a 24-hour equivalent value is calculated for the milk component results if;

(a) composite milk component results for a herd test for two-sample testing for a TAD milking cow is not submitted to the manager of the core database; or
(b) the AM milk volume and its milk component results and the PM milk volume and its milk component results for each HT sample collected during the HT period are not supplied as raw data to the core data base manager (i.e., the composite milk component results are calculated by the CHT); or
(c) when the sampling regime does not record the true production during 24 hours, an estimated 24-hour equivalent value is calculated in accordance with 5.4.1 and 5.4.2.

5.4.1 *Batch milkings*

5.4.1.1 *Twice-a-day milking single sample herd test*

In the case of a single sample herd test taken for a twice-a-day (TAD) milking regime, the raw results of the collected sample shall be submitted. The manager of the core database, CHT, or HRP shall derive the missing sample, directly or indirectly, using an approved calculation. The details of this calculations shall be based on the test-day AE model. They are documented in the DIGAD CDP Interface Specifications for herd recorders.

5.4.1.2 *Thrice-a-day milking, three milkings in two days and ten milkings in seven days*

In the case of thrice-a-day (3AD) milking, three milkings in two days (3in2) and ten milkings in seven days (10in7), when raw data are not transmitted the 24-hour equivalent shall be calculated. The volume shall be submitted as half from the PM milking field and half from the AM milking field. Alternatively, the data shall be submitted as raw-milk component results, as collected on the farm (see Appendix A).

5.4.2 *Distributed milking*

In the case of distributed milking, the 24-hour equivalent shall be calculated, submitting the volume as half from the PM milk volume and half from the AM milk volume for each cow (see A4 in Appendix A).

5.4.3 *OMA milking*

For submission of production data for milking and sampling regimes of OMA system see 6.5.

6 On-farm milk analyser herd-testing operations

6.1 On-farm milk analyser (OMA) systems

OMA systems may be used for herd testing if they are verified for use by the verification body (see Appendix D).

6.2 Managing changes to OMA design

CHTs shall ensure that the OMA equipment provider keeps a record of any change made to the design of an approved OMA system (this includes changes to hardware and software). The records shall include this information:

(a) The date the change was released for sale;
(b) A description of the change;
(c) Details of whether the change may be deployed to existing systems, or only new ones;
(d) An assessment of the potential impact of the change on the quality of submitted data; and
(e) A record of the evidence of the impact on submitted data.

CHTs shall notify the manager of the core database about each change before they submit data from herds collected by the new system. The manager of the core database shall maintain a register that links the version numbers of OMA system components with the version number of the overarching system.

Appendix F gives examples of design changes, their potential impact on submitted data, and the process required to prove that the potential impact has not occurred.

NOTE – ICAR may manage the approval of design changes to parts of an OMA system that are ICAR certified. In these cases, ICAR re-certification may satisfy some, or all, of the requirements in 6.2. Any requirements that are not met as part of ICAR re-certifying the OMA system shall be completed in addition to ICAR re-certification.

6.3 Quality assurance

A manufacturer's documented procedures for installing, calibrating, and maintaining an OMA system shall be followed.

CHTs shall keep a record of which OMAs are installed in a milking shed and where they are located on the milking platform (for example, recording the bail numbers).

6.3.1 *Identifying unreliable OMA test results*

An OMA system shall have these functions to identify unreliable test results before data are submitted:

(a) An automated process to detect unreliable devices;
(b) An automated process to detect unreliable test results;
(c) A means to manually identify that test results are unreliable; and
(d) A means for farmers to record abnormal test codes (see Table 2, Production Data, Abnormal test code).

Unreliable test results shall be coded 'unreliable OMA data' when they are submitted. They shall not be used to calculate the 24-hour equivalent values that are submitted. A record of unreliable data shall be available to the person assessing the OMA system for a WOF (see 6.3.2).

6.3.2 *Issuing warrants of fitness*

Each shed's OMA system shall be reviewed every 12 months and its warrant of fitness (WOF) shall be no more than 13 months old. The review shall be completed by trained and competent personnel who follow a documented procedure that is approved as part of the OMA system. This procedure shall include checking the health of the system and its components, installation commissioning certification, maintenance records, and calibration status and reviewing the statistics collected under section 6.3.1. The review may be done remotely by analysing data from the system. If the CHT finds the system is compliant, they shall record a WOF for it.

Data from systems that do not have a current WOF shall not be submitted.

6.4 Aggregating data

If the OMA system does not include analysers at every milking point, a process is needed to determine 24-hour equivalent values for the OMA reporting dates.

6.4.1 *Cow test-frequency limits for OMA*

The minimum frequency for testing individual cows shall be defined when the OMA system is approved (see Appendix D). When the test frequency for a cow does not meet the approved limit for the system, its 24-hour equivalent value shall be submitted with the abnormal test code 'unreliable OMA data'.

NOTE – An OMA system may not have an installed analyser at every milking point. This reduces the frequency that cows in the herd are tested, compared with systems that have installed analysers at every milking point. The frequency that cows are tested may also be less if the frequency of milking is reduced, electronic identification tags are missing, or milking equipment or parts of the OMA system experience faults.

6.5 Submitting data

CHTs shall submit the following data from OMA systems directly to the manager of the core database, or indirectly through the HRP.

(a) Individual test results. These shall be submitted within one month of the test date; and
(b) 24-hour equivalent values, calculated for each cow at regular intervals, if the OMA system does not have an analyser at every milking point. These values shall be submitted within one month of the OMA reporting date. The manager of the core database and the CHT should agree on the length of the intervals.

NOTE – When OMA data are submitted, non-core fields should also be submitted, as this enables OMA data to be used effectively in AE (see Appendix H).

6.5.1 *Record keeping and supressing data*

There shall be a system for recording and checking for compliance with key elements of equipment provider's guidelines and preventing the submission of data where there is non-compliance, whether for whole system or individual devices.

This system shall record dates of installation, calibration, maintenance, and WOFs.

7 Managing data

7.1 Creating an animal's record in the core database

There are two ways that HRPs can create an animal's record (with its unique animal identifier) in the core database.

(a) The farmer provides details of the calving event for the dam of the animal, and the animal's details, to the Herd Record Provider, which is then provided to the core database or
(b) The farmer providing core-data fields related to the calving, and the CHT submitting these data directly to the manager of the core database or indirectly via an HRP, results in the core database automatically creating the animal's record with these fields:
    (i) A unique animal identifier is created for the animal;
    (ii) The animal's date of birth (the dam's calving date);
    (iii) The animal's sex;
    (iv) The genetic dam;
    (v) The sire;
    (vi) The breed;
    (vii) Breed 16ths;
    (viii) The farm location; and
    (ix) The date the animal entered the herd.

A unique animal identifier can be created using details of an animal that was previously not recorded on the core database, or an animal that was recorded with an animal management number only. In these situations, a check should be carried out for to make sure that the unique animal identifiers have not been duplicated.

7.2 Notifying the manager of the core database about herd testing

Before they submit data to the manager of the core database, the CHT shall advise them of the herds they are testing.

7.3 Supplying core data

7.3.1 *Introduction*

The quality of any information generated from the data stored in the core database is limited by the accuracy of the data supplied to it, by organisations that provide herd-testing record services and people and organisations who undertake HTs on contracted herds.

Given there are on-farm limitations to collecting data that is 100% complete and accurate, this standard balances the practicalities of operating a farm with the core database's need for timely data.

When this section states that a CHT is responsible for collecting and supplying data, this means they may supply the data directly to the core database, or indirectly via the HRP.

7.3.2 *Core data*

Schedule 2 of Regulations requires CHTs to collect data (see Appendix B) and supply it to the manager of the core database.

Section 8 of this standard gives the details of that data.

In accordance with the Regulations, core data shall be supplied to the manager of the core database no later than 15 working days after it is collected by the CHT.

When data that are under query (see 7.3.3.10) are corrected, they shall be supplied to the manager of the core database within 15 working days of being corrected.

7.3.3 *Herd testing*

7.3.3.1 *Developing data-management requirements*

For any herd-testing regimes that are not defined in the standard, a CHT shall develop data-management requirements (this includes data descriptions, formats and data transfer messages) and agree these with the manager of the core database before they implement them.

NOTE – The manager of the core database maintains the DIGAD CDP Interface Specifications for herd recorders, which all CHTs can refer to.

7.3.3.2 *Completeness of core data*

When a percentage is specified (such as 7.3.3.6 or 7.3.3.7), to achieve the minimum recording standard, the CHT shall apply these percentages for the entire farm location, even when not every lactating cow is tested (see 3.2) or it is a combined herd (see 3.6)

7.3.3.3 *Providing core data to CHTs*

In accordance with the Regulations, a CHT may request key and static data from the core database at any time. In these cases, the CHT shall ensure that the manager of the core database has the authority to provide them with core data.

7.3.3.4 *Managing key and static data*

CHTs shall verify that key and static data reflects, as far as is practicable, an animal's current situation on the property. They shall ensure these data are complete before they supply the production data to the core database.

If key or static data are changed, the CHT shall advise the manager of the core database within 15 working days.

7.3.3.5 *Submitting data to the core database*

When they supply core data about an animal in a herd to the manager of the core database, a CHT shall adhere with the relevant section of the current DIGAD CDP Interface Specifications for herd recorders. They shall supply the data within 15 working days of receiving it directly to the manager of the core database or indirectly via the HRP.

NOTE – The manager of the core database maintains the DIGAD CDP Interface Specifications for herd recorders, which all CHTs can refer to.

7.3.3.6 *Identifying animals at a farm location*

HT data for an individual cow in a herd is recorded against that cow's unique animal identifier.

Even under ideal conditions, not every animal may be tagged or recorded. This means that it may not be possible to identify 100% of animals at any one time, especially at the start of the season. Recognising this reality, these measures have been developed:

(a) CHTs shall ensure that at least 95% of cows at the farm location (see 3.2 and 3.6) that are currently lactating, and are expected to supply a milk sample, are identified on the core database before they submit data from the HT event; and
(b) CHTs shall ensure that data are linked to individual animals using the unique animal identifier core data field Table 2).

CHTs shall ensure they comply with these measures within 15 working days of receiving the information from 'a' and 'b'.

These requirements apply to all HTs throughout the season.

7.3.3.7 *Supplying calving data*

Calving dates are essential information for HT recording.

Even under ideal conditions, not every cow may have a calving recorded that can be supplied to the core database. This means that it may not be possible to fully complete a herd's calving records at any one time, especially at the start of the season. Recognising this reality, these measures have been developed:

(a) CHTs shall ensure that at least 85% of cows that are currently lactating, and are expected to supply a milk sample (see 3.2 and 3.6), have their latest calving date recorded at the HT event;
(b) CHTs shall include the calf's identification, sex, and other details in the core data they upload; and
(c) CHTs shall supply to the core database any relevant information they obtain or generate within 15 working days of receiving it.

CHTs shall ensure they comply with measures (a) to (c) within the stated time frame (see 7.3.3.10).

7.3.3.8 *Checking and updating key data*

Before the HT season, CHTs shall review key data (participant code, farm location, and herd number) to ensure they are still current. They shall update the data with any changes before supplying new HT data.

7.3.3.9 *Recording and updating mating data*

All known mating records shall be correctly recorded for the individual cow in a herd within eight months of the mating. CHTs shall supply to the core database any mating data they receive, or mating data generated on the farm, within 15 working days of receiving it.

A parentage record can be updated to change a mating record, eight months post-insemination. This record can be updated only after DNA testing is done to verify parentage (dam, sire, or both parents).

7.3.3.10 *Resolving data validation queries and anomalies*

When a percentage is specified for tagging or calving, it shall apply to the farm location (see 3.2 and 3.6).

CHTs shall engage with farmers to resolve any query or anomaly resulting from data validation as soon as possible, and within no more than 150 days of the query being raised.

When a farmer does not meet the requirements of 7.3.3.6 (a) and 7.3.3.7 (a), only SCC results will be published. If the compliance thresholds stated in these clauses *are not* met within 150 days, the results for all cows tested at that HT event will be permanently suppressed. If the compliance thresholds stated in these clauses *are* met for some but not all cows, after 150 days the remaining cows, and any others on query, will have their HT result from that HT event permanently suppressed.

CHTs shall supply corrected data to the core database within 15 working days of it being generated or receiving it. (CHTs shall have systems in place to monitor that HT events comply with 7.3.3.6 (a) and 7.3.3.7 (a) and 7.3.3.10.

NOTE – When a CHT has received OMA data, only the SCC data will be available on the CHT database. The farmer retains all data as part of the OMA system.

7.3.3.11 *Submitting data for every HT*

CHTs shall comply with these measures (see 7.3.3.6 and 7.3.3.7):

(a) Check that key data and static data for every cow on the property that will be herd tested are complete, up to date, and accurate before they supply them to the manager of the core database;
(b) Send the manager of the core database any changes to key and static data within 15 working days of the HT and before submitting production data;
(c) Submit production data generated by the HT to the manager of the core database with the herd-management groups if identified with the HT;
(d) Resolve any queries or anomalies with the farmer (see 7.3.3.10); and
(e) Record agreed production data (see Appendix B).

NOTE – Farmers may refer to herd-management groups as mobs, sub-herds, or herds.

8 Submitting data to the manager of the core database

8.1 Submitting compatible data

CHTs are required to provide data in a format that is compatible with the manager of the core database's data-entry systems. They shall use formats stated in Table 2 and the relevant sections of the current DIGAD CDP Interface Specifications for herd recorders.

8.2 Resolving data queries and anomalies

CHTs shall take reasonable steps to ensure the integrity of data supplied to the manager of the core database. When the manager of the core database is concerned about data integrity, and considers that a disproportionate amount of core data they have received from a CHT has anomalies, they shall raise this concern with the CHT. If they consider that the CHT has made insufficient effort to remedy the concerns, they may advise MPI or the CHT's certification body to investigate the matter further.

8.3 Alternative arrangements

Every CHT must collect and supply to the manager of the core database all of the herd testing data specified in Schedule 2 relating to its herd testing activities in accordance with the requirements for data set out in the dairy herd testing standard. This requirement may however be modified by agreement between the CHT, the manager of the core database, and the owner of the dairy herd, if that agreement provides for the manager of the core database to be supplied with some or all of the data by another means.

NOTE – Refer to clause 7 of the Regulations for further details.

8.4 Explaining terms used in the data fields

CHTs typically source core data directly or indirectly from the farmer, or a service provider for farmers, and then supply the data directly to the manager of the core database, or indirectly via the HRP.

Table 2 describes the requirements for the core-data fields (see Appendix B). The core data fields are prescribed in Schedule 2 of the Regulations and include animal recording and herd testing data. These descriptions are designed to help CHTs understand and fulfil their responsibilities for providing core data to the manager of the core database.

To ensure data integrity, CHTs shall source additional information from the manager of the core database on how to meet the requirements of the core database.

Table 2 – Details of the requirements for each core data field listed in Appendix B

NOTE

(1) Description – A short explanation of the data field.

(2) Creation – When the detail or record for this data field is created, and the preferred or most common approach for creating the record.

(3) Sequence – When the data for this data field is be supplied to the manager of the core database.

(4) Format – Numeric alpha or alpha-numeric plus the number of characters required.

(5) Valid values – Permitted values and ranges as listed or as documented in the DIGAD CDP Interface Specifications for herd recorders, which is available from DIGAD or CHTs. The manager of the core database, CHTs, HRPs, and other relevant stakeholders shall agree the process for changing or adding valid values. Valid values listed in this table or documented in the DIGAD CDP Interface Specifications for herd recorders, **for the core data fields (Appendix B),** are of equal importance for audit and compliance purposes.

(6) Verification, validation, and associated rules– Systematic checks to ensure that the data element is applicable and accurate (such as when, how, and who), and any other requirements for this data field, including logical data checks.

(7) Level of compliance– Data-compliance requirements for the data field.

(8) Notes – Additional information that will help CHTs, HRPs, and farmers maintain data integrity and understand the complex data links in the core database.

NOTE – All requirements are normative for each core field, except the description(#1) and the notes(#8).

	8.4.1 Key data			**8.4.2 Static data**
	8.4.1.1 Farm location	**8.4.1.2 Herd number**	**8.4.1.3 Participant code**	**8.4.2.1 Unique animal identifier**
Description	Unique number, allocated to approximately identify the farm location in New Zealand	Sequence number of a herd at a farm location, assigned by the HRP May change when a herd moves farm location, or the herd owner changes An animal may belong to only one herd at a time	Code issued to the herd owner by the manager of the core database, via the HRP	Industry animal identifiers
Creation	Before the first herd records at the farm location	Before the first herd records at the farm location	Before the first herd records	Before the first herd records for the animal
Sequence	In relevant communications about the farm location of an animal or herd	In relevant communications about the farm location of an animal or herd	In relevant communications about the farm location of an animal or herd	Once it is in the core database and linked to the herd management number, if appropriate
Format	Alphanumeric – 10 characters and digits	Numeric – up to 3 digits	Alpha – 3 to 5 characters excluding vowels, ‘s’ and ‘z’	See Appendix G
Valid values	Provided by the HRP, or manager of the core database, who shall ensure the value is unique and associated with the farm’s physical location	Provided by the HRP	Refer to the DIGAD CDP interface Specification for herd recorders	Any one of the following: artificial breeding code (AB code), birth identification, international ID, NAIT radio-frequency identification (RFID) number, or NAIT visual identifier
Verification, validation and associated rules	By the CHT At the start of each new herd-testing contract Links to where the animals are physically located and recorded	By the CHT At the start of each new herd-testing contract The herd number at each farm location shall increase by one when a change is triggered (see notes) The first herd at a new farm location will be herd number 1	Must be a valid participant code	Each animal shall have a unique animal identifier, which may be linked to an animal management number If an animal has more than one recorded unique animal identifier, the link shall be provided to the core database A NAIT RFID shall be linked to one visual identification code on the NAIT device and submitted to the core database If a NAIT RFID is replaced, the replacement shall be linked to a duplicate visual identifier originally used for the animal, or a NAIT (visual) replacement tag, and the manager of the core database shall be notified
Level of compliance	Mandatory when herd number is used	Mandatory when the farm location is used	Must be a valid participant code	The animal identification recorded on the animal’s NAIT tag, and the animal identification recorded on the core database shall be the same for the animal
Notes	Farm location is one of the key data fields used to identify a herd and its approximate location in the country	Herd number, in conjunction with farm location, is one of the key data fields used to identify information specific to a group of animal records	Most farmers know what their participant code is, and often use it when they communicate with HRPs and CHTs. It is interoperable with industry data	The animal identifier is typically created when the calving event is recorded A non-recorded animal may need an animal record created before its herd record can be assigned. This may arise when a non-

	When created, it is the map reference of the farm entrance from the New Zealand map series; contains the map sheet number and east and north grid references, rounded to the nearest 100 yards Alternate arrangements have been agreed (see 8.3) for CHTs to provide data enabling an accurate farm location as reliable at the farm entrance to be recorded. This agreement enables CHTs to continue to use the New Zealand map series and format as a herd identifier. Herd number, in conjunction with farm location, is one of the key data fields used to identify information specific to a group of animal records Farm location and the herd number shall be submitted together, as per the DIGAD CDP Interface Specification for herd recorders	Farm location and the herd number shall be submitted together, as per the DIGAD CDP Interface Specification for herd recorders The most common reasons to trigger an increment in the herd number are a new herd starting at an existing farm location, or an existing herd moving to an existing farm location	When herd testing at a specific time, it is linked to the farm location and herd number to form a unique combination	recorded animal is purchased, or when international animals are added to the pedigree of an existing recorded animal The herd management number is normally used to record herd-testing information Wherever possible, checks are done to ensure that an animal is uniquely identified and accurately linked to its data
	8.4.2.2 Sire official indicator	**8.4.2.3 Sire**	**8.4.2.4 Genetic dam**	**8.4.2.5 Sex**
Description	Code showing the extent to which the sire of the animal has been confirmed	Unique animal identifier of the father of the animal	Unique animal identifier of the genetic mother of the animal	Code indicating the animal's sex
Creation	Via the system that processes data on the database, directly from the CHT, indirectly via the HRP, or manually when an animal's record is updated	Derived from mating records when the dam's birth event was recorded, or submitted by the CHT – directly or indirectly via an HRP – when new animal record is created before a HT	When the dam's birth event is recorded, or when the CHT creates a new animal record before a HT and provides satisfactory evidence to the manager of the core database (such as a previous record or a DNA test)	When the animal record is created via the dam's birth event, or when the CHT creates a new animal record before a HT
Sequence	When sire identification is added to an animal's record, or the record is updated, if more information becomes available	When an animal is first recorded, or when parentage is verified by DNA	When an animal is first recorded, or when parentage is verified by DNA	When an animal is first recorded
Format	Numeric – 2 digits	One of the defined unique animal identifier types, depending on which is used when the animal is born	One of the defined unique animal identifier types, depending on which is used when the animal is born	Alpha – 1 character
Valid values	0 = No mating records recorded 3 = DNA results in negative parentage test 5 = Not verified, uncertain, may be two or more sires, birth date does not meet the recommended range in the DairyNZ Sire Determination Methodology 7 = DNA results indicate that parent is probable 9 = Mating indicates that parent is possible as per the DairyNZ Sire Determination Methodology 10 = For international animals where overseas evidence indicates that parent is possible 11 = Approved genomic profile is 50K SNP or more 12 = Parentage profile is minimum of ICAR standard and less than 50K SNP 13 = NZAEL trio (calf, sire and dam) verified parentage Codes 1, 2, 4, 6 and 8 were deprecated in 2023	Unique animal identifier	Unique animal identifier	M = male F = female
Verification, validation and associated rules	DairyNZ Sire determination methodology	Identification of the sire shall already be recorded on the core database	Identification of the dam shall already be recorded on the core database	A valid value
Level of compliance	Mandatory for every sire identifier recorded for an animal	Shall be supplied if it is known	Shall be supplied if it is known	Mandatory the first time that static animal data are submitted

Notes	The data source is derived from pre-existing mating information for the dam or a manual intervention based on DNA evidence This indicator is set automatically by the database processing system when a calf record is processed, in line with the DairyNZ Sire Determination Methodology. The system determines the sire of the animal record being created and assigns an official indicator according to preset rules. Alternatively, the indicator is created by when the CHT manually updates the animal's record directly, or indirectly via an HRP. Note – The Sire Determination Methodology is a document agreed between the HRPs and the manager of the core database	The data source is derived from mating data or from verifying the parentage by DNA Standard recording of calving information, which includes identifying a calf, automatically creates an animal record with a unique animal identifier. This includes a record of the sire, provided that the dam's mating information has been recorded and the calf's details are recorded at the same time as the dam's calving date Sires will be deemed official and used for AE only if they are consistent with pre-existing mating data on the core database. Unverified sires will be recorded for information only These data do not need to be re-supplied each time records are updated for the animal	The data source is derived from verifying the parentage by DNA Standard recording of calving information, which includes identifying a calf, automatically creates an animal record with a unique animal identifier. This includes a record of the genetic dam, provided that the calf's details are recorded at the same time as the dam's calving date Embryo transfer recording also requires the recipient or birth dam to be recorded These data do not need to be re-supplied each time records are updated for the animal	Standard recording of calving information, which includes identifying a calf, automatically creates an animal record with a unique animal identifier. This includes a record of the animal's sex, provided that the calf's details are recorded at the same time as the dam's calving date These data do not need to be re-supplied each time records are updated for the animal
	8.4.2.6 Date of birth	**8.4.2.7 Date of birth confidence indicator**	**8.4.2.8 Breed**	**8.4.2.9 Breed 16ths**
Description	Date when the animal was born, or near estimate or null if actual date is unknown	Indicator of confidence that the recorded date of birth is accurate	Breed code of this portion of the animal's breed	Number of 16ths of the breed(s) in the breed data field which contributes to the makeup of the animal
Creation	When the animal record is created	When the animal record is created via the dam's birth event, or when the farmer updates records before the first HT and simultaneously records the date of birth	When the animal record is created, parentage is derived from recording the animal's sire and dam; or if a farmer needs to update their records	When the animal record is created, parentage is derived from recording the animal's sire and dam; or if a farmer needs to update their records
Sequence	Before first herd records are submitted	Before first herd records are submitted	When an animal is first recorded	When an animal is first recorded
Format	Date – YYYY-MM-DD, or NULL, if the date is unknown	Numeric – 1 digit	Alpha – 1 or 3 characters, or NULL if the breed is unknown	Numeric – 1 or 2 digits, NULL if the breed 16ths are unknown
Valid values	Valid date	1 = actual date reported by the farmer 2 = estimated by the farmer, or the HRP on their behalf	See breed type code list in the DIGAD CDP interface Specification for herd recorders	Numeric – 1 to 16
Verification, validation and associated rules	Data should be validated by checking, for example, that the animals date of birth is the same as the dam's calving date The manager of the core database may verify against other records and may provide information on data quality to HRPs and CHTs	A valid indicator shall be supplied	Recorded on the core database before the first HT	Breeds shall reflect the parents' breeds The sum of the 16ths contributions shall not exceed 16/16ths Recorded on the core database before the first HT
Level of compliance	Animal shall be recorded in the core database	Mandatory the first time that static animal data are submitted	Mandatory for every animal unless it is unknown	Mandatory for every animal unless it is unknown
Notes	The process of creating an animal record in the core database is described in 5.2.2.8 If an animal has no date of birth, their data cannot be used for AE The HRP can update the date of birth in the rare situation that they receive improved data from the farmer The HRP may need to estimate the date of birth when a non-recorded animal is purchased into a recording herd International animals may need a date of birth that is not generated by a calving event in New Zealand	These data do not need to be re-supplied each time records are updated for the animal, unless the data changes	When the calf's birth is recorded, its breed is derived from its parentage This data field may be repeated up to four times in conjunction with breed 16ths. Up to four breeds may be recorded to define the animal's breed fractions These data do not need to be re-supplied each time records are updated for the animal, unless the details change when parentage is verified or discovered	These data do not need to be re-supplied each time records are updated for the animal, unless the details change when parentage is verified or discovered

	If the date of birth changes, it shall be re-submitted to the manager of the core database			

	8.4.3 Event data			
	8.4.3.1 Herd management number (also known as 'animal management number')	**8.4.3.2 Herd management number start date**	**8.4.3.3 Herd management number end date**	**8.4.3.4 Date animal entered herd**
Description	Number that identifies the animal to its herd management group at the time of the event. Number is unique to the herd Allocated by the farmer for management purposes Provided if the animal has been allocated a number. Participants may choose to not allocate the number until the animal joins a milking herd	Date that a farmer allocates the herd management number to the animal	Date that a farmer stops allocating the herd management number to the animal	Date the animal arrives at the farm location or joins the herd
Creation	Before supplying event data	When the herd management number is allocated to the animal	When the herd management number stops being allocated to the animal	When a dam's calving information is processed, when stock (or equivalent) are purchased, or when an animal record is created for the farm location or herd number
Sequence	Every time data are transmitted without the unique animal identifier	The first time the herd management number is submitted for the animal	When the animal is removed from the herd or the herd management number is allocated to another animal	Before sending additional event data to the core database
Format	Numeric – up to 5 digits	Date – YYYY-MM-DD	Date – YYYY-MM-DD	Date – YYYY-MM-DD
Valid values	1 to 99999	Valid date	Valid date	Valid date
Verification, validation and associated rules	The CHT shall record on farm The HRP shall ensure the herd management number is unique before they transmit event data Herd management number can be resolved within the farm to the unique animal identifier At any point in time, there shall be a one-to-one relationship between an animal and a herd management number	The start date shall be linked to the animal's herd management number The date shall be consistent with the animal having only one herd management number at any one time	The herd management number is no longer allocated to the animal The end date shall be linked to the animal's herd management number The date shall be consistent with the animal having only one herd management number at any one time	This data field shall be recorded on the core database before the first HT The date shall be sequentially logical (the date the animal enters a herd shall not be earlier than when it left the previous herd) The date should be verified by a HRP and the manager of the core database
Level of compliance	Mandatory to provide the link to the animal's unique animal identifier	Mandatory when a herd management number is used	Mandatory when the herd management number is no longer allocated to the animal	Mandatory for every animal when it is recorded at a new farm location
Notes	The herd management number shall be associated with a location and herd number, to identify which herd the number is used for When this number no longer relates to an animal, an end date shall be recorded Animal management number start and end dates ensure that an animal is assigned only one number at any one time	These data do not need to be re-supplied each time records are updated for the animal, unless the herd management number changes	These data do not need to be re-supplied each time records are updated for the animal, unless the herd management number changes	This data field reflects an animal's physical movement An animal can join a herd on the same date that it leaves another herd This data does not need to be re-supplied each time records are updated for the animal
	8.4.3.5 Date animal exits herd	**8.4.3.6 Animal fate**	**8.4.3.7 Cause of fate**	**8.4.3.8 Calving date**
Description	Date the animal leaves the farm location or herd	Code for an animal's fate or destiny when it leaves the farm location or herd (for example, sold, moved, or terminated)	One or more reasons for the cause(s) of the animal's fate	Date when the dam calved, initiating lactation
Creation	When animal fate is recorded, or the animal is moved to a new farm location or herd	When the date animal exits herd is recorded	When animal fate is recorded	When the birth event occurs

Sequence	When animal fate is submitted, as soon as practicable after the event occurs and before records of an HT event are submitted that do not include the animal	When date animal exits herd is submitted, as soon as practicable after the event occurs and before records of an HT event are submitted that do not include the animal	When animal fate is submitted, as soon as practicable after the event occurs and before records of an HT event are submitted that do not include the animal	Once per lactation after the dam calves and before HT results are submitted
Format	Date – YYYY-MM-DD	Alpha – 1 character	Alpha – 2 characters	Date – YYYY-MM-DD
Valid values	Valid date	See the DIGAD CDP interface Specification for herd recorders	See the DIGAD CDP interface Specification for herd recorders	Valid date
Verification, validation and associated rules	If the animal is not on the farm when herd records are submitted, this data field shall be recorded with the fate event and cause of fate The date shall be no earlier than the date of an HT or other event for the animal at the current farm location or in the current herd, and no earlier than the date the animal joined the herd	A valid code	A valid code Up to three codes shall be submitted – one code for the primary reason and up to two codes for secondary reasons	Shall be after the dam's last calving date A new lactation record shall be created only if the calving date is more than 200 days since a previous recorded calving date
Level of compliance	Mandatory when an animal dies or leaves a herd	Mandatory when an animal dies or leaves a herd	Mandatory when the farmer gives the data to the CHT	The latest calving date shall be recorded for at least 85% of cows that are currently lactating and are expected to supply a milk sample at the HT event (see 3.2, 7.3.3.7, and 7.3.3.10)
Notes	This data field reflects an animal's physical movement These data do not need to be re-supplied each time records are updated for the animal, unless the animal leaves the herd	These data do not need to be re-supplied each time records are updated for the animal, unless the animal leaves the herd	These data do not need to be re-supplied each time records are updated for the animal, unless the remedial changes are required for the cause of fate	The calving date is important for making good use of HT data If the calving date is 200 days or less since a previous calving date recorded on the core database for the animal, the system will not create a new lactation record. It will assume that the new calving date represents an abortion, and that the animal's lactation will not be noticeably different These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted NOTE – A cow that calves in less than 200 days cannot physiologically initiate a new lactation These data do not need to be re-supplied each time records are updated for the animal
	8.4.3.9 Abnormal calving circumstances	**8.4.3.10 Calving assistance**	**8.4.3.11 Calf number within parturition**	**8.4.3.12 Fate of calf**
Description	Code for abnormal circumstances at calving	Code for assistance given to dam at calving	The birth sequence number for this calf	Code for the calf's fate
Creation	When the calving date is recorded, and if the calving is deemed abnormal	When the calving date is recorded, and if the dam has needed assistance	When the calving date is recorded, if the dam has had at least one calf	When the calving date is recorded
Sequence	When the calving date is recorded, and if the calving is deemed abnormal	When the calving date is recorded, and if the dam has needed assistance	When the calving date is recorded, if the dam has had at least one calf	When the calf number within parturition is recorded
Format	Alpha – 1 character	Numeric – 1 digit	Numeric – 1 digit	Alpha – 1 character
Valid values	A = aborted I = induced P = premature	0 = not reported 1 = reported no assistance 2 = assistance given 3 = major assistance	1 = singleton and first-born calf 2 = second-born calf 3 = third-born calf (and so on)	R = reared (retained on farm) S = sold (assumed to be used in the livestock industry) D = died (natural causes) B = bobbied or processed for pet food
Verification, validation and associated rules	A valid value	A valid value	Shall be supplied for each calving, if information about a calf or calves is submitted	A record shall be supplied for each calf born
Level of compliance	Mandatory if calving is abnormal	Mandatory when the farmer gives the data to the CHT	Mandatory when the farmer gives the data to the CHT	Mandatory when the farmer gives the data to the CHT, or indirectly via the HRP

Notes	These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted	These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted	These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted	These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted

	8.4.3.13 Comment code (fate of calf)	**8.4.3.14 Date of mating**	**8.4.3.15 Mating type (code)**	**8.4.3.16 Mating sire**
Description	Code for observations during the calf's first four weeks of life	Date when mating occurs, or period when cows were run with bulls	Code for the type of mating	Unique animal identifier for the sire used for mating, if the sire is known
Creation	When the calving date is recorded	When the mating event occurred or the dates that the run with bulls started and ended	When the mating event is recorded	When the mating event is recorded
Sequence	When the calving date is recorded	Within eight months of the event Multiple mating events can be recorded	When the date of mating is recorded	When the date of mating is recorded
Format	Alpha – 2 characters	Date – YYYY-MM-DD	Numeric – 1 digit	Unique animal identifier
Valid values	See the DIGAD CDP interface Specification for herd recorders	Valid date	4 = artificial insemination 5 = natural mating 6 = start date of run with bull period 7 = finish date of run with bull period 8 = artificial insemination with sexed semen	Unique animal identifier
Verification, validation and associated rules	A record shall be supplied for each calf born	Shall be recorded with each mating type for the animal at the farm location or in the herd	Shall be recorded with the mating date for the animal at the farm location or in the herd Code 7 date shall be after code 6 date	Shall be a pre-existing unique animal identifier
Level of compliance	Mandatory when the farmer gives the data to the CHT, or indirectly via the HRP	Mandatory when the farmer gives the data to the CHT, or indirectly via the HRP	Mandatory when the farmer gives the data to the CHT, or indirectly via the HRP	Mandatory when the farmer gives the data to the CHT, or indirectly via the HRP
Notes	These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted	Each mating for an animal shall be recorded (i.e., not just the last mating) A separate record is created for each date of mating and mating type, with or without a mating sire If an animal is not mated, no mating record will be created An animal may have one or more mating types during a given period In addition to recording mating dates for individual animals, it is normal practice – particularly for yearlings – to record the period they are run with a bull. Record mating type 6 (start date of run with bull period) and mating type 7 (finish date of run with bull period) These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted	These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted	These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted
	8.4.3.17 Embryo implant serial number	**8.4.3.18 Embryo implant date**	**8.4.3.19 Embryo donor**	**8.4.3.20 Embryo sire**
Description	Unique serial number of the embryo recovery and transfer certificate, which is often referred to as an ET certificate	Date the embryo is implanted	Unique animal identifier of the genetic dam	Unique animal identifier of the sire used to create the embryo from the genetic dam
Creation	When an embryo recovery and implant event is recorded	When an embryo recovery and implant event is recorded	When an embryo recovery and implant event is recorded	When an embryo recovery and implant event is recorded
Sequence	Within eight months of the event	When an embryo serial number is recorded	When an embryo serial number is recorded	When an embryo serial number is recorded

Format	Date – YYYY-MM-DD	Date –YYYY-MM-DD	Unique animal identifier	Unique animal identifier
Valid values	Valid unique serial number	Valid date	Unique animal identifier	Unique animal identifier
Verification, validation and associated rules	Embryo implant serial number, embryo implant date, embryo donor, embryo sire, and embryo recipient shall be submitted at the same time An embryo implant serial number can be associated with only one embryo donor, but it may include multiple embryo sires and embryo recipients	Embryo implant serial number, embryo implant date, embryo donor, embryo sire, and embryo recipient shall be submitted at the same time	Shall be a pre-existing unique animal identifier The birth date of the embryo progeny shall be later than the birth date of the embryo donor Embryo implant serial number, embryo implant date, embryo donor, embryo sire, and embryo recipient shall be submitted at the same time	Shall be a pre-existing unique animal identifier Embryo implant serial number, embryo implant date, embryo donor, embryo sire, and embryo recipient shall be submitted at the same time
Level of compliance	Mandatory for each embryo recovery and transfer certificate	Mandatory for each embryo recovery and transfer certificate	Mandatory for each embryo recovery and transfer certificate	Mandatory for each embryo recovery and transfer certificate
Notes	The data may be a record from a veterinarian or embryo transfer service provider. These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted	The data may be a record from a veterinarian or embryo transfer service provider These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted	The data may be a record from a veterinarian or embryo transfer service provider. These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted If the embryo donor is not alive when the embryo progeny is born, the embryo donor shall still be recorded	The data may be a record from a veterinarian or embryo transfer service provider. These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted There may be multiple embryo sires recorded against one embryo recovery and transfer certificate
	8.4.3.21 Embryo recipient	**8.4.3.22 Drying-off date**	**8.4.3.23 Drying-off reason**	**8.4.4.1 Herd test date**
Description	Unique animal Identifier of recipient dam	The date when a cow was last milked at an interval of at least every 24 hours	One or more reasons why a cow has finished lactating	The date of the HT visit (this is the first day of sampling, if the HT straddles more than one day), or the OMA reporting date
Creation	When an embryo recovery and implant event is recorded	When drying off occurs	When drying off occurs	At each HT
Sequence	When an embryo serial number is recorded	When the core database is updated with a drying-off date	When the core database is updated with a drying-off date	When the core database is updated with HT results
Format	Unique animal identifier	Date – YYYY-MM-DD	Alpha – 3 characters	Date – YYYY-MM-DD
Valid values	Unique animal identifier	Valid date	BCS = body condition score EC = eczema EL = end lactation IN = injured (other than lameness) FM = farm management LM = lameness MA = mastitis OC = other causes OD = other diseases SI = sick	Valid date
Verification, validation and associated rules	Shall be a pre-existing unique animal identifier Embryo implant serial number, embryo implant date, embryo donor, embryo sire, and embryo recipient shall be submitted at the same time	The date shall be after the latest calving date for the current lactation, after the cow's last HT for the current lactation, and before the calving date for the next lactation	A valid code Up to three codes shall be submitted – one code for the primary reason and up to two codes for secondary reasons	Shall be recorded on the core database each time HT data are transmitted
Level of compliance	Mandatory for each embryo recovery and transfer certificate	Shall be supplied by the CHT within 15 working days of receiving the data, or by the HRP on their behalf	Shall be supplied by the CHT within 15 working days of receiving the data, or by the HRP on their behalf	Mandatory for each herd test data transmission
Notes	The data may be a record from a veterinarian or embryo transfer service provider.			OMA data shall be submitted within 15 working days of calculating 24-hour equivalent values, which should be no more than 30 days from the OMA reporting date

	These data do not need to be re-supplied each time records are updated for the animal. If the data changes, it shall be re-submitted There may be multiple recipients recorded against one embryo recovery and transfer certificate			
	8.4.4.2 Abnormal test code	**8.4.4.3 Average number of milkings**	**8.4.4.4 Pre-test milking date stamp**	**8.4.4.5 Test 1 date stamp**
Description	A code that indicates HT results are sufficiently irregular to preclude them being included in AE There are five main reasons for this: (a) The biological status of the cow (such as sick, in season, or held milk); (b) Farm-management issues that preclude the cow being included (such as being run with calves); (c) Processing errors on the farm or by the HT agency; (d) Sample quality (such as contamination detected); or (e) OMA data that is deemed unreliable (such as it contains insufficient data points for the animal)	The average number of times that a cow is milked in 24 hours during the HT, or the OMA reporting date	For batch milking, the date and time of the milking immediately before the first HT sample milking for the herd For distributed milking, the date and time of the milking immediately before the first HT sample milking for each cow For OMA individual results, the date–time stamp of the cow's last milking before their submitted result For OMA 24-hour-equivalent data, the date–time stamp of the cow's last milking before the OMA reporting date	The date and time of the first HT sample milking. When available, this date–time stamp is recorded for each cow For distributed milking, the data for each cow shall be downloaded from the herd-management system to obtain cow's latest milking before their submitted result For OMA individual results, this is the date–time stamp of the cow's latest milking before their submitted result For OMA 24-hour-equivalent data, this is the date–time stamp of the cow's milking on the OMA reporting date
Creation	At each HT, if a sample is deemed incomplete or abnormal, by the farmer or CHT	At each HT sample milking	At each HT	At the first HT sample milking
Sequence	When the core database is updated with HT results	When the core database is updated with HT results	When the core database is updated with HT results	When the core database is updated with HT results
Format	Numeric – 2 digits	Numeric – 3 digits	Date and time – YYYY-MM-DDT-HH:MM:SS	Date and time – YYYY-MM-DDT-HH:MM:SS
Valid values	01 = insufficient sample (sample volume is not enough for laboratory tests) 02 = Farm anomaly (issues, errors, or events that occur on the farm and prevent a sample being obtained or analysed. For example, accidentally mixing two samples; losing or spilling a sample; not obtaining a sample from a cow because they missed a milking; or incomplete milkings for distributed milking herds) 03 = animal in season 04 = animal held milk 05 = herd tester processing anomaly 07 = animal running with calves 08 = animal sick (as determined by the farmer) 09 = contaminated (herd tester determines that the sample contains blood, sand, foreign bodies, or curdled milk when they process or analyse it) 13 = unreliable OMA data	Numeric – 3 digits where the animal-level date–time stamps are not provided	Date–time stamp	Date–time stamp
Verification, validation and associated rules	Shall be recorded on the core database each time HT data are transmitted, if appropriate	The CHT shall verify that they have calculated the average number of times the cow is milked in 24 hours during the HT sample milking	If the animal's date–time stamps are not available, the CHT shall verify that they have the date and time for the last herd milking before the first HT sample milking For batch milking, milking start time is the time that the first cow has cups on For distributed milking, the data for each cow shall be downloaded from the herd-management system to obtain	If the animal's date stamps are not available, the CHT shall verify that they have the date and time for the last herd milking before the first HT sample milking For batch milking, milking start time is the time that the first cow has cups on For distributed milking, the data for each cow shall be downloaded from the herd-management system to obtain the date and time that each cow was milked

			the date and time for the last milking before the first HT sample milking for each cow	
Level of compliance	Required if a sample is abnormal or incomplete	Mandatory for each HT	Mandatory for each HT before the Test 1 date stamp	Mandatory for each HT sample milking
Notes	Although this data field is called abnormal test code, it covers samples that are different to those normally received or expected Determine why a cow missed its test or was deemed not fit for testing, and then allocate the appropriate abnormal code When an abnormal test code is recorded, the data are not used for AE	See Appendix A for the conversion table See 1.6 for definitions of the HT period and HT sample milking	See 1.6 for definitions of the HT period and HT sample milking	See 1.6 for definitions of the HT period and HT sample milking
	8.4.4.6 Test 2 date stamp	**8.4.4.7 PM milk volume**	**8.4.4.8 AM milk volume**	**8.4.4.9 Fat percentage**
Description	The date and time of the second HT sample milking. When available, this date–time stamp is recorded for each cow For distributed milking, the data for each cow shall be downloaded from the herd-management system to obtain the date and time that each cow was milked For OMA 24-hour-equivalent data, this is the date stamp of the cow's second milking on the OMA reporting date, or NULL if submitting an individual result	The amount of milk produced by the cow at the PM milking during the HT For OMA individual results, this is the test volume, if the milking started at midday or later, or NULL if the milking started before midday	The amount of milk produced by the cow at the AM milking during the HT For OMA individual results, this is the test volume, if the milking started before midday, or NULL if the milking started at midday or later	The percentage of milk fat (g/100 ml) recorded for the milk sample or calculated for the 24-hour equivalent period For OMA, this is the 24-hour equivalent fat percentage on the OMA reporting date, or the fat percentage for each cow
Creation	At the second HT sample milking	At each HT	At each HT	At each HT
Sequence	When the core database is updated with HT results	When the core database is updated with HT results	When the core database is updated with HT results	When the core database is updated with HT results
Format	Date and time – YYYY-MM-DDT-HH:MM:SS	Numeric value in litres, recorded to one decimal place	Numeric value in litres, recorded to one decimal place	Percentage, recorded to two decimal places
Valid values	Date–time stamp	Numeric	Numeric	Numeric
Verification, validation and associated rules	If the animal's date stamps are not available, the CHT shall verify that they have the date and time for the last herd milking before the second HT sample milking For batch milking, milking start time is the time that the first cow has cups on For distributed milking, the data for each cow shall be downloaded from the herd-management system to obtain the date and time that each cow was milked	The CHT shall verify that they have a normal PM sample for each cow, or an abnormal sample plus an abnormal code When a cow is expected to provide a sample but does not, record an abnormal code Record the volume to the nearest tenth of a litre	The CHT shall verify that they have a normal AM sample for each cow, or an abnormal sample plus an abnormal code When a cow is expected to provide a sample but does not, record an abnormal code Record the volume to the nearest tenth of a litre	The CHT shall verify that they have a normal fat percentage result If an abnormal fat percentage result is obtained, an abnormal test code shall be recorded If no fat percentage result is obtained, an abnormal test code shall be recorded Record an abnormal indicator unless the volume, fat percentage, protein percentage, and SCC are all recorded for the milk sample
Level of compliance	Mandatory if there is a second HT sample milking	Mandatory only when samples are collected at the PM HT sample milking, or a 24-hour equivalent is calculated	Mandatory only when samples are collected at the AM HT sample milking, or a 24-hour equivalent is calculated	Mandatory for each cow present at each HT
Notes	See 1.6 for definitions of the HT period and HT sample milking	If a 24-hour equivalent is calculated, see Appendix A See the DIGAD CDP Interface Specification for herd recorders for minimum and maximum values	If a 24-hour equivalent is calculated, see Appendix A See the DIGAD CDP Interface Specification for herd recorders for minimum and maximum values	Fat percentage, protein percentage, and somatic cell count shall be submitted with a corresponding milk volume A milk volume cannot be submitted without milk component data unless an abnormal code is submitted with the data If a 24-hour equivalent is calculated, see Appendix A

	8.4.4.10 Protein percentage	8.4.4.11 Somatic cell count
Description	The percentage of milk protein (g/100 ml) recorded for the milk sample or calculated for the 24-hour equivalent period For OMA, this is the 24-hour equivalent protein percentage on the OMA reporting date, or the protein percentage for each cow	The SCC recorded for the milk sample or calculated for the 24-hour equivalent period. The SCC is recorded as thousands of cells per millilitre of milk For OMA, this is the 24-hour equivalent SCC on the OMA reporting date, or the SCC for each cow
Creation	At each HT	At each HT
Sequence	When the core database is updated with HT results	When the core database is updated with HT results
Format	Percentage, recorded to two decimal places	Numeric – 5 digits
Valid values	Numeric	Actual cell count divided by 1000
Verification, validation and associated rules	The CHT shall verify that they have a normal protein percentage result If an abnormal protein percentage result is obtained, an abnormal test code shall be recorded If no protein percentage result is obtained, an abnormal test code shall be recorded Record an abnormal indicator unless the volume, fat percentage, protein percentage, and SCC are all recorded for the milk sample	NA
Level of compliance	Mandatory for each cow present at each HT	Mandatory for each cow present at each HT
Notes	Fat percentage, protein percentage, and somatic cell count shall be submitted with a corresponding milk volume A milk volume cannot be submitted without milk component data unless an abnormal code is submitted with the data If a 24-hour equivalent is calculated, see Appendix A	Fat percentage, protein percentage, and somatic cell count shall be submitted with a corresponding milk volume A milk volume cannot be submitted without milk component data unless an abnormal code is submitted with the data If a herd is sampled only to determine SCC it does not constitute regulated herd testing and the CHT is not required to submit the data to the manager of core database

8.5 Auditing data provided

The approved certification body shall confirm that core data are being submitted.

APPENDIX A – CALCULATING VOLUMES FOR TESTS OTHER THAN TWICE-A-DAY TWO SAMPLES OR A ONCE-A-DAY SAMPLE

(Normative)

A1 Calculating a 24-hour equivalent for batch milkings

A1.1 Single sample herd test from TAD milking regime

The raw results of the collected sample shall be submitted to the manager of the core database. The manager of the core database, CHT, or HRP shall derive the missing sample, directly or indirectly, by, using equations in the DIGAD CDP Interface Specifications for herd recorders.

A1.2 Missing samples from 3in2, 10in7, and 3AD milking regimes

When raw data are not transmitted, calculate the 24-hour equivalent and submit the volume as half in the PM field and half in the AM field.

A2 Calculating HT milk volume to represent a 24-hour equivalent for cows on 3in2 and 10in7 milking regimes

Calculate the volume to represent a 24-hour period:

Total measured milk volume/cycle production time x 24 hr

Cycle production time = time in hours, from pre-test milking date stamp to Test 1 or Test 2 date stamp, as applicable.

Example: Single sample herd test

Previous milking cups on at 3pm; sample milking cups on at 9am

Pre-test date stamp 3pm; Test 1 date stamp 9am; Test 2 date stamp NA

Therefore, cycle production time = 18 hours

Volume of sample = 10 L

24-hour volume = 10 L / 18 hours x 24 = 13.3 L

Example: Two sample

Previous milking cups on at 3pm; first sample milking cups on at 9am; second sample milking cups on at 5am

Pre-test date stamp 3pm; Test 1 date stamp 9am; Test 2 date stamp 5am

Therefore, cycle production time = 38 hours

Volume of sample 1 = 10 L; volume of sample 2 = 8 L

24-hour volume = (10 L + 8 L) / 38 hours x 24 hours = 11.4 L

If actual milk volumes are not submitted, transmit the data as half in the PM milk volume field and half in the AM milk volume field

Example: Three samples collected in 24hours

Agree calculations and data-submission format with the manager of the core database and recorded in the DIGAD CDP Interface Specifications for herd recorders.

A3 Calculating milk volume for OMA data

When the sampling regime does not record the true 24-hour production for AM and PM milk volume, calculate a 24-hour equivalent value and record the data as half in the PM milk volume field and half in the AM milk volume field.

A4 Herd-testing procedures for distributed milking herds

A4.1 Introduction

Herd testing for distributed milking herds is completed using ICAR-approved automated-milking systems (AMS) and automatic milk sampler/tray combinations. For the duration of the HT period, this involves collecting representative subsamples from each cow at each milking and linking each subsample to the milk volume for the milking that the sample was collected from. Subsamples are then submitted to the herd-testing laboratory for analysis.

The on-farm herd-testing procedures – up to and including submitting milk samples to an HT laboratory – are the CHT's intellectual property. The CHT shall document and comply with all their HT procedures and processes, for distributed milking herds, and have their documentation available for audit purposes. However, to convert milk volume, milk components, and SCC to a 24-hour equivalent period, all CHTs shall use the same procedure (see A4.2). CHTs shall use only equipment that is approved for herd testing and comply with calibration requirements.

All data submitted to the manager of the core database shall meet this standard's requirements. All production data for eligible animals shall be recorded and submitted to the manager of the core database.

A4.2 Converting milk volume and milk components to a 24-hour equivalent

A4.2.1 Estimating 24-hour milk volume and milk component values

The procedure for estimating 24-hour milk volume and milk component values from herd testing in distributed milking systems is based on Jago and Burke's description.

For distributed milking herds, the herd-testing procedure requires a milk sample to be collected from each cow at each milking that occurs during the HT period. The HT period for distributed milking herds is 36 hours, or a minimum of 16 hours depending on the average number of milkings over 24 hours for each cow in the herd. This average is calculated using the average number of milkings for each cow milked over a 48 period in the 10 days before the HT period:

(a) If the average is less than or equal to two milkings per 24-hour period, use a 36-hour herd-test period(HTP); or
(b) If the average is more than two milkings per 24-hour period, use a minimum 16-hour HTP.

During the 16- or 36-hour HTP, at each milking the milk volume is recorded by the herd-management system, and a milk sample is collected for each cow. All milk samples shall be submitted to the laboratory to analyse their milk components and SCC. For each milking, the fat and protein percentages and SCC counts are multiplied by the milk volume to obtain the fat and protein yields and SCC load for the milking. The yields and loads for every milking in the 16- or 36-hour HTP are summed to calculate the total yield and load.

For each cow, the time of the last milking before the HT, and the times of every milking during the 16- or 36-hour HTP, are downloaded from the herd-management system software that records the milking information. These data are used to calculate the total milking interval for the HTP (the total milking interval is the time of the last milking during the HTP minus the time of the last milking before the HTD) and the milking intervals during the HTD.

The hourly standardised milk yield, fat and protein yields, and SCC load are calculated by dividing the total yields and total load by the total milking interval. These hourly standardised yields and loads are multiplied by 24 to obtain a standardised estimates of the 24-hour yields and SCC load. Standardised fat and protein percentages and SCC count are calculated by dividing the standardised estimates of 24-hour fat and protein yield and SCC load by the standardised estimate of 24-hour milk volume.

Results are submitted to the manager of the core database as two volumes (half the total volume is recorded as PM volume and the other half as AM volume) and two standardised fat and protein percentages and SCC counts (the same value is recorded for PM and AM).

Milk volume is recorded in litres (L); SCC count is recorded as the actual count per millilitre of milk divided by 1000; fat and protein concentrations are recorded as percentages (g/100 ml).

The calculations described in A4.2.1 are demonstrated in Table A1 (16-hour HTP) and Table A2 (36-hour HTP).

A4.2.2 Managing missing milk component results

The following procedures for dealing with missing milk component results are consistent with those for batch-milking systems. The procedures apply regardless of how many times a cow is milked during the HTP.

(a) If there are no milk samples available to analyse the milk components, apply an abnormal test code; or
(b) If only one milk sample is available for a 36-hour HTP, apply an abnormal test code, but calculate and submit standardised 24-hour milk component values based on the milk volume when the sample was collected, the available sample, and the time interval since the previous milking; or

If two or more milk samples are available, calculate and submit standardised 24-hour milk component values based on the milk volume from which it was taken, the available samples, and their time intervals since the previous milking (this applies regardless of whether there is a milk component result for the previous milking).

Table A3 demonstrates how to calculate results for a 36-hour HTP with four milkings and two missing milk samples.

A4.3 Managing results for incomplete milk samples

A milk sample is considered incomplete if the recorded milk volume is less than 80% of the expected milk volume. The expected milk volume is calculated from the cow's average hourly milk-production rate (L/h) during the 16 or 36 hours before the first milking of the HTP, and the number of hours since her last successful milking.

If milk component results are available for the incomplete milking *and* the subsequent milking during the HTP, estimate and present 24-hour equivalents (see A4.2.1, Table A1 and Table A2). Table A4 demonstrates how to calculate 24-hour milk volume and milk component values for a 16-hour HTP with one incomplete milking but milk component results for every milking.

If milk component results are unavailable for *either* the incomplete milking *or* the subsequent milking during the HTP, treat milk component results as missing for both milkings and follow the procedures for missing results (see A4.2.2 and Table A3).

Table A5 demonstrates how to calculate 24-hour milk volume and milk component values for a 36-hour HTP with one incomplete milking with milk component results followed by a complete milking with no milk component results.

Note – Tables A1 to A5 are copies of data provided to the verification body to approve distributed milking systems (DMS) data to be collected by a CHT as part of regulated herd testing and included in the NZS 8100: 2015 Dairy herd testing standard, and its successors.

Table A1 – Sample calculations to estimate 24-hour milk volume and milk component values for cow 1003 on a 16-hour HTP

Results recorded from 7.00am on 1 Jan 2016 to 11.00pm on 1 Jan 2016

Cow ID	Milking	HMS[1] Date Time	Calculated Time interval	DMS Milk volume (L)	Laboratory report Fat (%) [3]	Laboratory report SCC (10^3 cells/ml)	Calculated Fat yield (kg) [3]	Calculated SCC (10^3 cells/ml)
1003	Last before HTD	01/01/16 03:24	–	–	–	–	–	–
1003	1st during HTD	01/01/16 13:56	10 h 32 min 10.53 h	16.8	4.37	25	16.8 L x 4.37% = 0.734	16.8 L x 25 = 420.0
1003	2nd during HTD	01/01/16 22:08	8 h 12 min 8.20 h	8.4	4.98	103	8.4 L x 4.98% = 0.418	8.4 L x 103 = 865.2
Total milk volume, yield, or time (calculated)			18 h 44 min 18.73 h	25.2	–	–	1.152	1285.2
Standardised hourly (calculated)				25.2 L / 18.73 h = 1.345	–	–	1.152 / 18.73 h = 0.062	1285.2 / 18.73 h = 68.62

Standardised 24 hours (calculated)	1.345 L x 24 h = 32.28	1.476 kg 32.28 L = 4.57	1646.8 32.28 L = 51	0.062 x 24 h = 1.476	68.62 x 24 h = 1646.8

NOTE –

(1) HMS is the herd management system software the records the milking information.

(2) Milk protein percentage and yield is calculated in the same way as milk fat percentage and yield.

Table A2 – Sample calculations to estimate 24-hour milk volume and milk component values for cow 2003 on a 36-hour HTP

Results recorded from 7.00am on 1 Jan 2016 to 7.00pm on 2 Jan 2016

Cow ID	Milking	HMS(1)	Calculated	DMS	Laboratory report		Calculated	
		Date Time	Time interval	Milk volume (L)	Fat (%) (2)	SCC (10^3 cells/ml)	Fat yield (kg) (2)	SCC (10^3 cells/ml)
2003	Last before HTD	01/01/16 03:24	–	–	–	–	–	–
2003	1st during HTD	01/01/16 16:56	13 h 32 min 13.53 h	12.8	4.24	19	12.8 L x 4.24% = 0.543	12.8 L x 19 = 243.2
2003	2nd during HTD	02/01/16 04:06	11 h 10 min 11.17 h	9.3	3.98	74	9.3 L x 3.98% = 0.370	9.3 L x 74 = 688.2
2003	3rd during HTD	02/01/16 18:18	14 h 12 min 14.20 h	11.7	4.05	23	11.7 L x 4.05% = 0.474	11.7 L x 23 = 269.1
Total milk volume, yield, or time (calculated)			38 h 54 min 38.90 h	33.8	–	–	1.387	1200.5
Standardised hourly (calculated)				33.8 L 38.9 h = 0.869	–	–	1.387 38.9 h = 0.036	1200.5 38.9 h = 30.86
Standardised 24 hours (calculated)				0.869 L x 24 h = 20.85	0.856 kg 20.85 L = 4.10	740.6 20.85 L) = 36	0.36 x 24 h = 0.856	30.86 x 24 h = 740.6

NOTE –

(1) HMS is the herd management system software the records the milking information.

(2) Milk protein percentage and yield is calculated in the same way as milk fat percentage and yield.

Table A3 – Sample calculations to estimate 24-hour milk volume and milk component values for cow 2004 on a 36-hour HTP with four milkings and two missing samples

Results recorded from 7.00am on 1 Jan 2016 to 7.00pm on 2 Jan 2016

Cow ID	Milking	HMS(1)	Calculated	DMS	Laboratory report		Calculated	
		Date Time	Time interval	Milk volume (L)	Fat (%) (2)	SCC (10^3 cells/ml)	Fat yield (kg) (2)	SCC (10^3 cells/ml)
2004	Last before HTD	01/01/16 03:24	–	–	–	–	–	–
2004	1st during HTD	01/01/16 13:56	10 h 32 min 10.53 h	12.8	4.24	19	12.8 L x 4.24% = 0.543	12.8 L x 19 = 243.2

2004	2nd during HTD	01/01/16 23:06	9 h 10 min 9.17 h	10.5	missing	missing	missing	missing
2004	3rd during HTD	02/01/16 08:06	9 h 0 min 9.00 h	9.3	3.98	74	9.3 L x 3.98% = 0.370	9.3 L x 74 688.2
2004	4th during HTD	02/01/16 18:18	10 h 12 min 10.20 h	11.7	missing	missing	missing	missing
Total milk volume, yield, or time (calculated)			38 h 54 min 38.90 h	44.3	–	–	–	–
Total milk volume, yield or time excl. milkings with missing milk component data			19 h 32 min 19.53 h	22.1	–	–	0.913	931.4
Standardised hourly (calculated) excl. milkings with missing milk component data				22.1 L / 19.53 h = 1.132	–	–	0.913 / 19.53 h = 0.047	931.4 / 19.53 h) = 47.69
Standardised 24 hours (calculated)				1.132 L x 24 h = 27.17	1.128 kg / 27.17 L = 4.15	1144.6 / 27.17 L = 42	0.047 x 24 h = 1.128	47.69 x 24 h = 1144.6

NOTE –

(1) HMS is the herd-management system software the records the milking information.

(2) Milk protein percentage and yield is calculated in the same way as milk fat percentage and yield.

Table A4 – Sample calculations to estimate 24-hour milk volume and milk component values for cow 1004 on a 16-hour HTP with one incomplete milking but complete milk component results

Results recorded from 7.00am on 1 Jan 2016 to 11.00pm on 11 Jan 2016

Cow ID	Milking	HMS[1] Date Time	Calculated Time interval	DMS Milk volume (L)	Laboratory report Fat (%) [2]	Laboratory report SCC (10^3 cells/ml)	Calculated Fat yield (kg) [2]	Calculated SCC (10^3 cells/ml)
1004	Last before HTD	01/01/16 06:24	–	–	–	–	–	–
1004	1st during HTD	01/01/16 18:56	12h 32 min (12.53 h)	8.6[3]	4.37	25	8.6 L x 4.37% = 0.376	8.6 L x 25 = 215.0
1004	2nd during HTD	02/01/16 22:08	3h 12 min (3.20 h)	10.3	4.98	103	10.3 L x 4.98% = 0.513	10.3 L x 103 = 1060.9
Total milk volume, yield, or time (calculated)			15h 44 min (15.73 h)	18.9	–	–	0.889	1275.9
Standardised hourly (calculated)				18.9 L / 15.73 h = 1.202	–	–	0.889 / 15.73 h = 0.057	1276 / 15.73 h = 81.11
Standardised 24 hours (calculated)				1.202 L x 24 h = 28.84	1.368 kg / 28.84 L = 4.74	1946.6 / 28.84 L = 67	0.057 x 24 h = 1.368	81.11 x 24 h = 1946.6

NOTE –

(1) HMS is the herd-management system software the records the milking information.

(2) Milk protein percentage and yield is calculated in the same way as milk fat percentage and yield.

(3) Milking is incomplete; 8.6 L is 57% of the expected milk volume. The expected milk volume is 15.0 L, or 12.53 h @ 1.2 L/h according to the HMS).

Table A5 – Sample calculations to estimate 24-hour milk volume and milk component values for cow 2005 on a 36-hour HTP with three complete and one incomplete milking, and one missing milk sample

Results recorded from 7.00am on 1 Jan 2016 to 7.00pm on 2 Jan 2016

Cow ID	Milking	HMS(1) Date Time	Calculated Time interval	DMS Milk volume (L)	Laboratory report Fat (%) (2)	Laboratory report SCC (10^3 cells/ml)	Calculated Fat yield (kg) (2)	Calculated SCC (10^3 cells/ml)
2005	Last before HTD	01/01/16 03:24	–	–	–	–	–	–
2005	1st during HTD	01/01/16 13:56	10 h 32 min 10.53 h	8.6(3)	4.24 as if missing	19 as if missing	not calculated	not calculated
2005	2nd during HTD	01/01/16 16:06	2 h 10 min 2.17 h	6.3	missing	missing	missing	missing
2005	3rd during HTD	02/01/16 06:06	14 h 0 min 14.00	16.8	3.98	74	16.8 L x 3.98% = 0.669	16.8 L x 74 = 1243.2
2005	4th during HTD	02/01/16 18:18	12 h 12 min 12.20 h	12.7	4.06	22	12.7 L x 4.06% = 0.516	12.7 L x 22 = 279.4
Total milk volume, yield, or time (calculated)			38 h 54 min 38.90 h	44.4	–	–	–	–
Total milk volume, yield, or time excl. milkings with missing milk component data			26 h 12 min 26.20 h	29.5	–	–	1.185	1522.6
Standardised hourly (calculated) excl. milkings with missing milk component data				$\frac{29.5\ L}{26.20\ h} = 1.126$	–	–	$\frac{1.185}{26.20\ h} = 0.045$	$\frac{1522}{26.20\ h} = 58.09$
Standardised 24 hours (calculated)				1.126 L x 24 h = 27.02	$\frac{1.080\ kg}{27.02\ L} = 4.00$	$\frac{1394.2}{27.02\ L} = 52$	0.045 x 24 h = 1.080	58.09 x 24 h = 1394.2

NOTE –

(1) HMS is the herd-management system software the records the milking information.

(2) Milk protein percentage and yield is calculated in the same way as milk fat percentage and yield.

(3) Milking is incomplete; 8.6 L is 74% of the expected milk volume. The expected milk volume is 11.6 L, or 10.53 h @ 1.1 L/h apccording to the HMS).

APPENDIX B – INFORMATION TO SUPPLY TO THE MANAGER OF THE CORE DATABASE

(Normative)

CHTs shall collect and supply the data fields in Schedule 2 of the Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations, or its successor. The data fields are listed in Table B1.

This information is correct at the time that this standard is published. To determine their reporting obligations at a particular time, users should check the relevant law, by accessing the Regulations at www.legislation.govt.nz.

Table B1 – Data fields in Schedule 2 of the Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations 2001

Key data

Farm location

Herd number

Participant code

Static data

Unique animal identifier

Sire official indicator

Sire

Genetic dam

Sex

Date of birth

Date of birth confidence indicator

Breed

Breed 16ths

Production data

Herd test date

Abnormal test code

Average number of milkings

Pre-test milking date stamp

Test 1 date stamp

Test 2 date stamp

PM milk volume

AM milk volume

Fat percentage

Protein percentage

Somatic cell count

Event data

Herd management number

Herd management number start date

Herd management number end date

Date animal entered herd

Date animal exits herd

Animal fate

Cause of fate

Calving date

Abnormal calving circumstances

Calving assistance

Calf number within parturition

Fate of calf

Comment code (fate of calf)

Date of mating

Mating type (code)

Mating sire

Embryo implant serial number

Embryo implant date

Embryo donor

Embryo sire

Embryo recipient

Drying-off date

Drying-off reason

APPENDIX C – FARMERS' RESPONSIBILITIES AND BENEFITS

(Informative)

C1 Introduction

This standard's definition of 'farmer' can include the farm owner, herd owner, contract milker, or farm employees. The farmer will vary from case to case, depending on who is responsible for engaging services, supplying herd data, resolving queries, and completing herd-testing procedures on the farm.

Herd testing for farmers has been available since the early 1900s. Data from the New Zealand Pedigree Breed Societies form the New Zealand Pedigree Breeds Federation and the New Zealand Dairy Board's Farm Production division, and establishing the Dairy Industry (Herd Testing and New Zealand Dairy Core Database) Regulations and standards, have led the industry to set up an animal database under the New Zealand Dairy Board. Farmers have added data to the database, by using herd-testing services and providing herd records. In 2001, the NZS8100 herd test standard for formed. DIGAD was established in 2014.

Herd testing gives farmers essential information about each of their cow's production, SCC, and herd ranking. It also enables breeding indexes to be calculated, to assess future breeding potential. With regular herd testing and accurate record keeping, this information can be used to make breeding and culling decisions to improve the quality of the herd.

Quality data from herd testing is used to benefit the dairy industry, by calculating performance of individual sires, and enabling dairy farmers to select bulls that will give them maximum genetic gain for their herd.

Current and future farmers should continue regular herd testing and providing accurate and timely data, as per this standard, to protect DIGAD and enable the dairy industry to continue benefitting from genetic gain.

C2 Engaging HT services

Farmers engage a CHT and HRP for herd testing and herd recording.

Each season, the frequency, timing and type of herd testing is decided by the farmer. CHTs advise farmers on how accurate different types of herd testing are. For example, they explain differences in the milking and sampling regimes, and whether the HT data will be eligible to be included in AE. NZAEL provides industry support material that CHTs can refer to when they communicate with farmers.

When a farmer has more than one herd, the CHT will explain how they can easily identify each herd-management group during herd testing. Herd-management groups are essential for producing accurate AE outputs, for the farmer who is herd testing and other farmers whose herds have similar genetics.

C3 Conducting an HT

C3.1 Before an HT

Before herd testing, farmers have these responsibilities:

(a) Check that all lactating cows are physically tagged with a unique herd management number and accurately recorded with the HRP;
(b) Record calving dates, calves' details, for lactating cows and record dry off dates;
(c) Ensure they understand how to record herd-management groups, if this applies to them; and
(d) If they have permanently installed milk meters (see 5.1.3) or OMA equipment (see 6.3.2) that they use to collect HT data, provide the annual certificate or WOF to the CHT (the certificate shall be less than 13 months old).

C3.2 During an HT

During herd testing, farmers have these responsibilities:

(a) Ensure that the people carrying out the HT are trained and competent to use the processes;
(b) Ensure that the vacuum level of the milking plant is set at the CHT-recommended level, where possible. This will improve the accuracy of the HT results;
(c) Ensure that the milking plant is operating properly and has had an annual check, as per dairy processors' requirements;

(d) Ensure that all cows are accurately recorded against their samples;
(e) Identify cows that require an abnormal code, and record these in the CHT system (see Table 2, abnormal test code);
(f) Follow the CHT's procedures to maintain the integrity of the samples;
(g) Ensure that all lactating cows on the farm are tested at each HT event, except when only the two- or three-year-olds are tested (see 3.2);
(h) Record herd-management groups, when cows on the farm are managed as more than one herd or as multiple mobs (see 3.5 and 3.6); and
(i) Comply with these requirements if the farm has permanently installed milk meters or OMA equipment:
    (i) Monitor the equipment is working properly and is attached to the milking equipment (this includes checking for damage, faults, and general wear and tear, and replacing any necessary parts), and engage an appropriate supplier to resolve any problems
    (ii) Give the CHT the calibration certificate for the permanently installed milk meters (see 5.1.3) or the WOF for the OMA equipment (see 6.3.2)
    (iii) Record abnormal codes (see Table 2, abnormal test code).

C3.3 Meeting data requirements

To meet data requirements, farmers have these responsibilities:

(a) Annually inform their CHT if they are differentially feeding individual cows using an in-shed feeding system (such as a system where cows are electronically fed to milk yield);
(b) Accurately maintain herd records of their animals via their HRP. This includes recording tagging, calving, replacement identifications or NAIT tags, mating, removals, and drying off;
(c) Ensure if recording multiple cows in bulk for fate, drying off and comment code comply with 'b'; and
(d) Resolving queries about individual animals within 150 days of the HT event.

APPENDIX D – APPROVAL PROCEDURES FOR OMA SYSTEMS

(Informative)

D1 OMA errors

D1.1 Types of error

HT measurements of animal performance are used for animal management and selection purposes. ‘Measurement error’ is the difference between an ‘observed’ value measured by a measuring instrument and the ‘true’ value being measured. An instrument is ‘unbiased’ if the average of repeated measurement errors is zero. Conversely, if the average is not zero, the measurement exhibits bias. Measurement errors are considered to be ‘independent’ if a positive measurement error on one occasion is equally likely to be associated with a positive or negative measurement error on another occasion. The usefulness or accuracy of an instrument with independent errors can be improved by using repeated measurements. Cow-specific bias (CSB) occurs when the average of repeated measurement errors varies between cows.

D1.2 Repeated HT measurements

OMA typically obtain many more observations per cow than conventional herd testing. With enough repeated measurements, an instrument with larger magnitude of measurement errors could easily outperform conventional herd testing, even if there is a small amount of CSB. While independent measurement errors reduce as multiple measurements are averaged, repeated measurement will not reduce CSB. When CSB is present, it affects the accuracy of comparisons between cows. So, characterising the nature and extent of CSB is critical for validating OMA systems that can be used with confidence in AE and for other management purposes.

D1.3 270-day evaluation

270-day lactation values are calculated from many observations during a lactation. Therefore, the error in 270-day values is an estimate of CSB. The performance of an OMA system can be evaluated by its ability to predict 270-day lactation values against a performance benchmark based on the current ‘gold-standard’ three PM/AM conventional HTs per lactation.

D2 Scope of evaluation

Evaluation is used to determine how accurately an OMA system measures 270-day lactation total volume, fat yield, and protein yield; and average somatic cell score (SCS). SCS is the log (base 2) of the SCC, in thousands of cells per millilitre.

The evaluation covers the hardware, software, and procedures used to perform these functions:

(a) Install, calibrate, and maintain the OMA system;
(b) Produce OMA results for individual milkings;
(c) Associate individual cows with their OMA results;
(d) Detect faulty devices for which data will be recorded as unreliable;
(e) Detect and record unreliable test results;
(f) Compute 24-hour equivalent values from individual milking measurements (the aggregation method); and
(g) Detect and record unreliable 24-hour equivalent values (for example, due to insufficient data), including specifying limits for the frequency of testing for individual cows.

If an OMA system has an analyser at every milking point, 24-hour equivalent values do not need to be submitted. In this case, functions (f) and (g) do not need to be evaluated.

The primary measure of OMA system performance shall be the accuracy of 270-day lactation values predicted from the first 270 days of OMA data for each cow. The accuracy of 270-day lactation values predicted from the first 90 days of OMA data for each cow shall also be determined to test the usefulness of data from OMA systems for making animal evaluations in early lactation.

D3 ICAR-certified OMAs and systems

This standard recognises ICAR-certified OMAs and systems. When this standard was published, ICAR certification of OMA includes evaluating individual total test error. The total test error includes random and

systematic errors, such as CSB. Given OMAs test milk highly frequently, there is a risk that random error is only a small proportion of total error, and a heritable systematic error (such as CSB) predominates.

ICAR certification and ICAR certification reports can be used as evidence that an OMA system produces sufficiently accurate 270-day lactation values. The ICAR certification report includes the OMA device's test error, which should be interpreted to understand its potential implications for the accuracy of 270-day lactation totals. Evidence obtained from ICAR certification should be considered when OMA evaluation trials are designed, and OMA systems are approved, based on ICAR-certified OMAs.

When OMA systems are approved for CHTs to use, consider all elements of the scope of evaluation (see D2). If ICAR certification does not cover every element, the missing elements shall be evaluated through additional tests.

D4 Lead organisation for OMAs and systems

The lead organisation is appointed by, and reports to, the verification body. They are a person or organisation that oversees OMA approval procedures, trial execution, and final trial report on behalf of the verification body.

The lead organisation should have knowledge in the following areas, although they may also outsource expertise:

(a) New Zealand herd testing;
(b) Dairy automation technology;
(c) Milk metering and milk analysis;
(d) Data analysis and statistics;
(e) Evaluation of analytical systems; and
(f) New Zealand dairy farming.

The lead organisation has these roles:

(g) Review the OMA system's design, documentation, and measuring principle (confidentially, if necessary) and identify which elements need to be included in the design of an evaluation trial to test the impact that common New Zealand farm-management practices have on the OMA system's accuracy;
(h) Review an applicant's proposed design for an evaluation trial, work with them on developing and finalising the trial design, and formally approve the trial design;
(i) Monitor the execution of the trial(s), to verify the integrity of the dataset(s) produced by the trial design;
(j) Review and audit the data processing used to produce 270-day lactation totals and independently verify trial results; and
(k) Submit a formal report and recommendation to the verification body on how the OMA system performs against these OMA approval procedures.

D5 Evaluation trials

Evaluation trials shall be used to determine the accuracy of 270-day lactation values derived from the outputs of an OMA system.

This standard does not intend to constrain innovative evaluation-trial design and data-analysis methods, so it does not specify which evaluation-trial procedure to use. The lead organisation shall review and approve evaluation-trial procedures before a trial, to verify that the trial will fully and fairly evaluate the OMA system.

Here are some points to consider regarding the design for an evaluation trial:

(a) **ICAR certification** – consider evidence obtained as part of the ICAR certification of the OMA system, or parts of the OMA system ICAR Section 13 – *Guidelines for on-farm milk analysis*. October 2017;
(b) **Research methods** – consider which combination of methods (such as a literature review, laboratory tests, small-scale farm trials, and full-lactation trials) to use to demonstrate how the technology manages potential interfering factors (these factors include herd size, milk-production range, breed distribution, genetic variability, calving season, feed-production system levels, feed types, milking frequency, farm location and climate, and milking shed characteristics);
(c) **Herd selection** – consider which two or more herds are best suited to demonstrating how well the technology manages potential interfering factors, considering any specific risks or unknown factors related to the technology;
(d) **Conventional herd testing** – consider how many HTs to use to generate ground-truth 270-day lactation values (the more HTs, the more accurate the ground-truth 270-day lactation values). PM–AM HTs should

be conducted at least monthly. While conventional PM–AM herd testing pools both samples to analyse the milk components, in OMA evaluation trials the milk components of PM and AM samples should be determined separately and the equipment calibrated for the milk component ranges being tested;

(e) **Methods to detect unreliable ground-truth HT data** – these methods should be part of the approved evaluation-trial design. Ground-truth data that is found to be unreliable should be excluded from analysis;

(f) **Paired or unpaired analysis** – either method can be used to evaluate OMA. Paired analysis uses filtered data, which excludes records from cows that have only conventional HTs or OMA data. Unpaired analysis uses all valid OMA and ground-truth data to determine lactation values;

(g) **Bail coverage** – OMAs installed at every milking point for evaluation trials increases the number of paired tests per cow and results in more accurate measurements of OMA performance. This means the evaluation requires fewer HTs per cow. When a specific percentage of bail coverage is being evaluated, the bails should be selected and documented before data are collected;

(h) **OMA devices** – specify how many OMAs will be evaluated in the evaluation-trial design. The production lot from which OMAs are obtained should be at least 50 units, if production scale makes this feasible. Select OMAs randomly before collecting data, rather than selecting them based on prior performance;

(i) **Sample size** – consider sample-size limitations in the evaluation-trial design. Use statistical methods that account for sample size, to get the best possible estimate of true performance;

(j) **Example datasets**– Consider using example datasets to validate data smoothing, interpolation, and other data processing methods for 24-hour equivalent data that are submitted to DIGAD; and

(k) **Aggregation methods**

(i) Aggregation methods that are part of the OMA system being approved shall be evaluated as part of that system

(ii) Aggregation method(s) used to analyse evaluation-trial data shall produce values for 270-day lactation volume, fat yield, protein yield, and average SCS for individual cows, from the OMA data and ground-truth data

(iii) The aggregation method(s) used to analyse evaluation-trial data should be specified and approved as part of the evaluation-trial design

(iv) Aggregation methods are described in ICAR's *Procedure 2 of Section 2 of ICAR guidelines – computing of accumulated lactation yield* (January 2020) and could be adapted for use in the evaluation. Other methods, or combinations of methods, may be used if they provide a more accurate estimate of an OMA system's performance.

D6 Human processes during evaluation trials

OMA systems shall be installed, calibrated, and maintained according to the equipment provider's guidelines. These guidelines shall comply with this standard's requirements for submitting data. During the evaluation trial, tools used to monitor faults with the OMA system should be the same as those routinely used.

D7 Transparency of evaluation trials

The following steps should be taken to maintain the integrity of the evaluation trial:

(a) The technology provider shall support the lead organisation to review any aspect of the trial or data processing;

(b) The applicant should automatically send copies of unprocessed OMA data to the lead organisation as they are collected;

(c) The HT laboratory should send copies of unprocessed ground-truth data directly to the lead organisation;

(d) The applicant should provide the lead organisation with cleaned OMA and ground-truth data that are used for calculating lactation production, with a register of removed or amended records that contains the reasons for removing or amending them;

(e) The applicant should provide the lead organisation with OMA and ground-truth lactation-production values and calculated performance statistics;

(f) The applicant should provide the lead organisation with the source code used to estimate lactation production and calculate performance statistics; and

(g) The lead organisation should audit a subset of cows and data points to verify the integrity of the analysis.

D8 Accuracy limits for 270-day lactation values

This standard does not define accuracy limits for 270-day lactation values, because HT benchmarking results were not available when it was published.

The verification body shall specify tolerance limits for volume, fat yield, protein yield, and SCS before the OMA approval process starts. These limits should be equivalent to the accuracy achieved by three PM–AM HTs.

The verification body may specify more lenient tolerance limits for SCS, or limits that apply to a defined SCC range. It may also allow 'bounding', which is when SCC values below or above a threshold are set to a predetermined value before performance metrics are calculated.

NOTE **–**

The purpose of relaxing tolerance limits for SCS is to encourage OMA data to be submitted. OMA systems that can report all four required milk-measurement core fields are uncommon. If an OMA system can provide volume, fat, and protein data that is at least as accurate as three conventional HTs, and SCC data that is less accurate than three conventional HTs, the benefit of collecting the data outweighs the negative effects of collecting less accurate SCC data. It is hypothesised that frequent SCC data across the lactation may provide more useful information about mastitis than infrequent HT SCC data, even if the data are not equivalent to that collected by laboratory HTs.

The design of an OMA system may change after it is approved. These design changes shall be managed by considering their potential impact on the quality of data. See 6.2 and Appendix F for the expected process to manage design changes.

D9 Hygiene requirements for OMA

Hygiene standards shall be met for any surfaces that encounter milk.

The surfaces of an OMA device that encounter milk and wash water or chemicals shall be materials that conform with farm dairy requirements, such as the latest version of MPI's Operational Code NZCP1: Design and operation of farm dairies.

The device's materials shall be capable of repeatedly sustaining a temperature of 95°C for three minutes, without it affecting the device's accuracy during subsequent milkings or causing its materials to visibly deteriorate.

D10 Verification of the OMA systems

The SAC of the verification body shall independently review the report from the trial and shall recommend whether the OMA system is fit for herd testing in New Zealand. The verification body may need additional information, depending on the milk meter's design and functionality.

The SAC shall refer the recommendation to the NZAEL Board, which shall verify the OMA system and any conditions for its use. Alternatively, it may decline to verify the OMA system.

NOTE –

The NZAEL Board would only reject the SAC's recommendations if it omitted important information.

APPENDIX E – REQUIREMENTS FOR VERIFYING MILK METERS FOR HERD TESTING IN NEW ZEALAND

(Informative)

E1 Introduction

Appendix E describes the procedures to test milk meters that are not certified by ICAR, for when an applicant wants the verification body to verify that a milk meter is fit for herd testing in New Zealand.

E2 Milk-meter requirements

A milk meter is required to perform either or both functions described in 1.6. When more than one device is needed to provide all milk measurements for herd testing, the devices shall be evaluated concurrently using the validation procedures.

A milk meter should be capable of measuring and sampling at least 40 kg of milk volume.

The sampling volume should be sufficient to analyse the milk components in a single representative sample.

Table E2 and Table E3 set out the accuracy requirements of a milk meter.

E3 Procedure for evaluating milk meters

This is the outline of the evaluation procedure:

(a) The applicant shall make a formal request to the manager of the core database, who will refer the request to the verification body;
(b) The verification body will assess the proposed evaluation protocol, and agree the protocol or recommend an alternative protocol is submitted;
(c) The verification body will appoint a lead organisation to oversee the evaluation and appoint any additional expertise needed for the evaluation protocol;
(d) The applicant and the lead organisation will complete the agreed evaluation protocol and provide the results to the verification body;
(e) The SAC of the verification body shall independently review results from the evaluation protocol and shall recommend whether the milk meter is fit for herd testing in New Zealand. The verification body may need additional information, depending on the milk meter's design and functionality; and
(f) The SAC] shall refer the recommendation to the NZAEL Board, which shall verify the milk meter and any conditions for its use. Alternatively, it may decline to verify the milk meter.

NOTE –

The NZAEL Board would only reject the SAC's recommendations if it omitted important information.

E3.1 Information needed in an applicant's formal request

Applicants should include this information in their formal request:

(a) The applicant's name, addresses, and contact numbers;
(b) The name and model number of the milk meter to be tested;
(c) The types of milking parlours where the milk meter will be used:
  (i) Conventional high- and low-line milking platform
  (ii) Swing arm systems
  (iii) Distributed miking systems;
(d) Photos and drawings of the milk meter, a clear description of its technical characteristics, and any other relevant information;
(e) A technical manual that outlines the milk meter's functions, and its sampling processes and principles;
(f) The operator manual, including installation and calibration procedures; and
(g) A proposed evaluation protocol based on the requirements of this standard, which includes statistical analysis and the milk meter's intended use. The applicant may also suggest organisations that have the required skillset to complete the evaluation.

The applicant shall ensure that they have addressed all confidentiality requirements before they submit their formal request and associated information.

In the formal request, the applicant will warrant that they have not violated any copyrights, patents, or trademarks, indemnify the verification body and NZAEL from all liability, and will enter into a contract with NZAEL that includes these conditions before the evaluation starts.

NOTE –

The costs of evaluating milking equipment are typically the applicant's responsibility.

E4 Approved organisations for testing and evaluating a milk meter

The process of evaluating a milk meter shall be conducted by an organisation appointed by the verification body. It may include the applicant or their nominee, provided that the verification body is satisfied that the independence of the evaluation will not be compromised.

E5 Selection of milk meters

The milk meters selected for testing shall be selected from a production run, once they have been developed.

When an applicant submits a milk meter for testing, they shall provide the lead organisation with a list of 50 milk meters that are uniquely identified (i.e., using serial numbers). In accordance with Table E1, the lead organisation randomly selects milk meters for testing, and reserve milk meters. When the milk meters are permanently installed in a milking parlour, each of the four selected devices shall be installed on the identified farms.

E6 Installation of milk meters

The manufacturer or test applicant is responsible for correctly installing the milk meters on the farms.

E7 Milk-meter accuracy requirements

E7.1.1 Tilt and performance characteristics

The milk meter's performance is tested when it has a tilt of 5° in forward, back, left, and right directions and is operating at the lower and upper vacuum levels of 45 and 50 kPa. This test shall be conducted over the range of milk volumes and milk component concentrations in Table E1. The testing of tilt and vacuum may be conducted in a laboratory or in the milking parlour. The test design shall be included in the proposed evaluation protocol submitted with the formal request.

The milk meter is expected to perform and be maintained in accordance with Table E2 and Table E3.

NOTE –

The 45 to 50 kPa range is a guideline, based on these four factors:

(1) ICAR is expected to remove laboratory testing from its certification in June 2023, and move to using manufacturers recommendations instead.

(2) The proposed test is part of the field test, so it is a more realistic assessment than laboratory tests that use a rig and a test solution.

(3) Representative sampling is more accurate if the vacuum is in the 45 to 50 kPa range.

(4) The standard should not encourage a perception that using vacuum kPa lower than that recommended by the manufacturer would produce data of the same accuracy as using the range recommended by the manufacturer.

E7.1.2 Field tests

Field tests are carried out to assess the milk meter's performance under field conditions. These tests shall be carried out under normal milking conditions, on a farm that has a representative breed(s) for New Zealand, a representative production level, and a normal distribution of milk quantity, flow rates, and fat percentages (see Table E1).

Field tests shall use a milking machine that has a test certificate that is less than 13 months old.

Table E1 summarises the minimum testing requirements for milk meters. This includes the number of milk meters tested, the milking system and herd information, the milk volume, and the milk component ranges.

Table E1 – Minimum test requirements for milk meters used in herd testing

Device information	High-line and low-line milking platform	Permanently installed milk meters	AMS and automatic milk sampler/tray combinations)
Number of devices used for herd testing	Many	Many	Few
Number of cows per device during herd testing	Typically < 20	Typically < 20	Typically about 90
Test requirements			
Production lot from which milk meters are selected for testing	≥ 50	NA	NA
Number of units selected for testing	8 milk meters	8 milk meters	≥ 4 milking units and 4 sampling devices for the combination
Number of units selected as reserve	2 milk meters[1]	2 milk meters[1]	2'AMS and automatic milk sampler/tray combinations[1]
Herd requirements			
Stages of lactation	2 stages: mid- and late-lactation		
Number of herds used for each stage of lactation	2[2]	2[2]	2 (≤ 2 and > 2 milkings per 24 hours)
Number of samples collected over the 2 stages of lactation	≥ 320 About 40 per milk meter	≥ 320	≥ 160 About 40 per combination
Minimum ranges of milk volume and milk component concentrations for testing the devices			
Milk volume by weight[3]	2–40 kg for a single sample		
Milk fat	2.0–9.0 g/100 ml		
Milk protein	2.5–5.0 g/100ml		
SCC	Low level Medium level High level	0–100 103 cells/ml 100–1000 103 cells/ml >1,000 103 cells/ml	

NOTE –

(1) The applicant may install the additional milk meters, or identify the reserve permanently installed milk meters, using a unique identifier, and may include them in the testing.

(2) The applicant shall state in the proposed evaluation protocol if the herds will be on the same or different farms for the stages of lactation.

(3) The limits for assessing accuracy are based on ICAR guidelines, and ICAR records yield as kg. However, the New Zealand convention is to report milk yield (in other words, milk volume) in litres.

These requirements shall be met at each sampling during the field test:

(a) All data derived from milk meters shall be traceable to the milk meter it was collected from during the evaluation;
(b) Information shall be provided on the most recent calibration of the milk meters; and
(c) Milk component results from the laboratory shall be reported to the lead organisation and applicant simultaneously.

E7.1.2.2 The field test procedure

The field test procedure requires:

(a) The predicted total milk volume derived using the milk meter ('milk meter volume') to be compared with the whole amount of milk produced when a given cow is milked ('reference volume'); and

(b) The milk fat concentrations of the representative subsample collected using the milk meter ('milk meter sample') with the milk fat concentration for the total milk volume collected in a test bucket ('reference sample').

The reference volume is the milk volume assessed by manual weighing of test buckets, using a scale with an accuracy of ± 0.02 kg corrected for the volume in kilograms, of the subsample of milk collected in the milk meter.

For the test procedure, the milk volume is expressed in kilograms. However, if the milk meter is approved, when data are submitted to the core database the milk volume is expressed in litres.

The reference sample is prepared by gently mixing the test bucket sample until it is homogenous and manually collecting two or more subsamples (replicate 'reference samples').

The milk meter sample(s) are prepared by mixing the subsample until it is homogenous and manually collecting a subsample for analysis. If possible, duplicate samples should also be taken from the milk meter sample. When a duplicate sample is unavailable, the sample from the milk meter shall be analysed twice, if possible, and the results shall be treated as a single sample with duplicate analysis and noted in the report.

The reference samples and milk meter samples are submitted to an HT laboratory. The laboratory shall ensure its milk-analysis equipment is calibrated for the milk component range in Table E1.

E7.1.2.3 Faulty device during the field test

If a milk meter fails because it is poorly calibrated or has a technical defect, the lead organisation may choose one of these options:

(a) Use the data from reserve milk meters, if they were installed or identified as part of the evaluation;
(b) Replace the faulty device with the reserve device, and install and test it; or
(c) Ask the manufacturer to repair or calibrate the device or both, and then retest it.

The report to the verification body shall state which milk meter, if any, has been replaced or retested and explain the reasons.

E7.1.2.4 Handling and operating problems during the field test

If a relevant handling or operational problem occurs during the first field test, the applicant shall be notified and allowed to solve the problem before the evaluation procedure resumes.

Any remarks about handling and operating the milk meter in the field, by the people involved in the test (this includes farmers) shall be noted in the report. Details of problems solved during the test period shall also be recorded.

E7.1.3 Calibration procedure test

The applicant's calibration method, or method of testing the calibration, shall be tested on two milk meters, when appropriate, and evaluated to check it is fit for purpose. This evaluation shall be by someone authorised by the applicant or manufacturer.

E7.1.4 Milk-meter hygiene and cleaning test

Hygiene standards shall be met for any surfaces that encounter milk.

The surfaces of a milk meter that encounter milk and wash water or/chemicals shall be materials that conform with farm dairy requirements, such as the latest version of MPI's Operational Code NZCP1: Design and operation of farm dairies.

At the end of the field trial, routine cleaning and washing of milk meters on the farm shall be tested to check they are effectively cleaning and disinfecting the devices.

Every milk meter used in the field test shall be visually inspected by a person who is proficient in assessing milking equipment. If no residues are found on the milk, surfaces in contact with the milk meters are accepted as clean. Where residues are found, a swab shall be taken using the adenosine triphosphate assay. Swabs shall be taken from parts of the milk meter where cleaning and disinfecting could be ineffective, or less effective than expected (such as the top of the meter, or the chambers, samplers, or tubes). The milk meter passes the test if the adenosine triphosphate results are 'fit for purpose'. The test results shall be reported to the verification body as part of the evaluation.

E8 Accuracy requirements for a device using a single measurement

To provide an accurate assessment of milk volume or milk components that is representative for a cow's entire milking event, accuracy limits for milk meters using a single measurement are used. The limits for milk yield are stated in Table E2 and the limits for milk fat are stated in Table E3.

Table E2 – Accuracy limits for milk volume measured by a milk meter

(Source: ICAR guidelines, section 11, procedure 4)

Component	Units	Range	Accuracy limits	
			Standard deviation of the individual errors	Mean bias
Milk volume by weight[(2)]	kg	2–10 kg	0.5 kg	± 0.2 kg
		>10 kg	5.0%	± 2.0%

NOTE –

(1) The accuracy limits are based on the difference between the estimated volume (kg) for the milk meter, and the milk volume (kg) measured by the reference method.

(2) The limits for assessing accuracy are based on ICAR guidelines, and ICAR records yield as kg. However, the New Zealand convention is to report milk yield in litres.

Table E3 – Accuracy limits for milk fat measured by a milk meter

(Source: ICAR guidelines, section 11, procedure 4)

Component	Units (g/100 ml)	Accuracy limits	
		Standard deviation of the individual errors	Mean bias
Milk fat	2–8%	0.10%	± 0.05%
	> 8% and < 10%	0.25%	± 0.10%

E9 Data statistical analysis

E9.1 Introduction

This section summarises statistical analysis from ICAR *guidelines for milk meters (Procedure 4 of Section 11 – Testing of Traditional Milk Recording and Sampling Devices - Subsection 3.4*. Version March 2023. This section has been included to make applicants aware of the ICAR guidelines for analysing the accuracy of milk meters. The verification body will consider the ICAR guidelines when it assesses whether HT equipment used by CHTs is 'fit for purpose'.

E9.2 ICAR guidance

All milk meters being tested, excluding any reserve milk meters not identified to replace a milk meter, shall fulfil the accuracy limits for standard deviation and mean bias for milk yield (see Table E2) and milk fat (see Table E3). Data from reference samples and associated milk meter shall be excluded from analysis if the milk fat concentration for the reference sample is less than two percent or ten per cent or greater.

Milk fat values from duplicate samples shall be omitted if they differ by more than 0.10%.

The average of duplicate values from the reference samples and milk meter samples is calculated and used in the analysis.

The differences between the milk volume and milk fat concentrations from the reference samples and milk meter samples are calculated and compared with the reference value. Any extreme differences should be used in calculations, unless there is a reason to assume there has been an error or the milk meter is broken. The final report to the verification body shall contain an appendix with all test data (uncensored).

The milk meter shall have at least 35 readings left for milk yield and milk fat; otherwise, it shall be retested.

Statistical tests are used to determine if the remaining dataset contains any outlier data, and how the outlier data may modify the assessment of bias of the milk meter. The standards for bias should be fulfilled both with and without outlier data. The standards for reproducibility should be fulfilled with all data.

Bias and reproducibility are also tested for homoscedasticity (the assumption of equal or similar variance in different groups being compared), which occurs if the residuals of regressing the differences in yield between the milk-meter sample and reference sample are identically and independently distributed. Homoscedasticity is tested by a X2 test (Chi-squared test). This test compares the matrix of variance covariance of the estimators of the coefficients of regression obtained under the assumption of heteroscedasticity (circumstance in which the variability of a variable is unequal across the range of values of a second variable that predicts it), with the same matrix obtained under the assumption of homoscedasticity.

Homoscedasticity of the residuals of the regression is tested first. If homoscedasticity of the residuals exists, the rules about calculating the standard deviation of reproducibility and the acceptability conditions for a milk meter are maintained for milk yield (see E9.1.1) and milk (see E9.1.2).

If homoscedasticity is not proven by the X^2 test, then heteroscedasticity exists and more testing is needed. For details of this testing, see ICAR *guidelines for milk meters (Procedure 4, subsection 3.4 of Section 11 – Testing of Traditional Milk Recording and Sampling Devices – Subsection 3.4*. Version March 2023*)*.

APPENDIX F – EXAMPLES OF DESIGN CHANGES TO AN OMA SYSTEM

(Informative)

Table F1 gives examples of how the software or hardware design of an OMA system may change.

Table F1 – Examples of design changes to an OMA system

Design change	Potential impact of the design change	Required proof of the impact of the design change	Which HT equipment version code to submit
Change the layout of the milking screen	No effect on data submitted	None	Register new version(s) against the version number of the existing system
Replace obsolete OMA component	Could affect data submitted, but unlikely	Record evidence verifying there will be no effect on data, and submit the evidence to NZAEL	
Change data cleaning or smoothing algorithms	Likely to affect data submitted	Record evidence verifying that the performance will be no worse than the approved OMA system, and submit the evidence to NZAEL	Register new version(s) against a new version number for the system
Change a measuring principle	Will fundamentally change part of the system	Affected parts of the system shall be re-evaluated, and this process shall be overseen by a lead organisation	

APPENDIX G – INDUSTRY FORMATS FOR UNIQUE ANIMAL IDENTIFIER

(Normative)

G1 Objective

The unique animal identifier has two objectives:

(a) Ensure that an animal's data are linked to its unique animal identifier in the core database, with sufficient redundancy to ensure data integrity if the animal's tags are lost or damaged; and

(b) Enable interoperability of industry databases for validating data for AE and research.

G2 Industry identifiers and formats

G2.1 Animal breeding code (AB code)

AB code format	Numeric up to 6 digits	
The format is comprised of:		
Breed category	Numeric	1 digit
Year allocated	Numeric	2 digits
Number sequence	Numeric	3 digits
Example	122123	

G2.2 Birth identification

Birth identification format	Alphanumeric	8–13 digits and letters
The format is comprised of:		
Participant code	Alpha	3–5 letters
Year	Numeric	4 digits
Birth identification number	Numeric	1–4 digits
Examples	ABC-2015-1, or ABCDF-2015-1, or ABCDF-2015-1234	

NOTE –

(1) The birth identification tag used in an animal's ear has the year of birth truncated from four to two digits (for example, ABC-15-1, or ABCDF-15-1, or ABCDF-15-1234).

(2) The birth identification tag in the animal's ear has the same format as the NAIT visual identification (participant code – year – sequence).

(3) In this standard, birth identification and the NAIT visual identification are the same. Only one is required when submitting the animal identifier to the core database.

G2.3 International ID

International ID	Alphanumeric	19 letters and digits
The format is comprised of:		
Breed code	Alpha	3 letters
Country code	Numeric	3 digits
Gender code	Alpha	1 letter
Sequence	Numeric	12 digits
Examples	HOL840M003238259234	

G2.4 NAIT RFID number

NAIT RFID number	Numeric	16 characters
The format is comprised of:		

Manufacturer code issued by ICAR	Numeric	3 digits
Separator	Hyphen	1 hyphen
Sequence	Numeric	12 digits
Example	951-000123456789	

NOTE –

(1) The NAIT RFID is a unique number encoded in the transponder of each RFID tag.

(2) When it is submitted to the core database, the NAIT RFID number shall be linked to one of the formats for visual identification codes on NAIT devices (see G2.4.5).

G2.5 Formats for visual identification codes on NAIT devices

The visual identification code is printed on the outside of the tag in which the RFID number is encoded. Only one visual identification code may be printed on a device. The permitted formats for the codes are available on NAIT guidelines for approved animal identification devices, which are available at www.ospri.co.nz

G2.5.1 NAIT numbers

The NAIT number is a 2-to-6-digit number or an 8-digit NAIT location identifier. It is allocated by the NAIT organisation to a registered person in charge of animals. The number cannot be used at any other location.

There are two formats for NAIT numbers.

NAIT number–year–sequence number

NAIT number–year–sequence number	Numeric	Up to 18 characters
The format is comprised of:		
NAIT number	Numeric	2 to 6 digits or 8 digits
Separator	Hyphen	1 hyphen
Year	Numeric	2 digits
Separator	Hyphen	1 hyphen
Sequence number (animal number)	Numeric	Up to 6 digits
Examples	12345678-15-1 or 12345678-15-123456	

NAIT number–sequence number

NAIT number–sequence number	Numeric	Up to 15 characters
The format is comprised of:		
NAIT number	Numeric	2 to 6 digits or 8 digits
Separator	Hyphen	1 hyphen
Sequence number (animal number)	Numeric	Up to 6 digits
Examples	12345678-1 or 12345678-123456	

G2.5.2 NAIT birth tags and duplicate birth tags

New-born animals and animals that have not previously been tagged are given birth tags. The NAIT birth tag or duplicate tag may use the participant code instead of the NAIT number.

There are two formats for birth tags and duplicate birth tags:

Participant code–year–sequence number

Participant code–year–sequence number	Numeric	Up to 15 characters
The format is comprised of:		
Participant code	Alpha	3 to 5 letters (excludes vowels, 's' and 'z')

Separator	Hyphen	1 hyphen
Year	Numeric	2 digits
Separator	Hyphen	1 hyphen
Sequence number (animal number)	Numeric	Up to 6 digits
Examples	ABC-15-1, or ABCDF-15-123456	

Participant code–sequence number

Participant code–sequence number	Numeric	Up to 12 characters
The format is comprised of:		
Participant code	Alpha	3 to 5 letters (excludes vowels, 's' and 'z')
Separator	Hyphen	1 hyphen
Sequence number (animal number)	Numeric	Up to 6 digits
Examples	ABC-1, or ABCDF-123456	

NOTE –

(1) Farmers may order a duplicate birth tag if the original NAIT device placed in the animal has been lost or damaged. The duplicate tag is an RFID tag with the same visual identifier that was used to tag the animal at birth. HRPs and CHTs refer to duplicate tags as ‘replacement’ tags.

(2) A duplicate tag is unique, as it is linked to a new RFID number.

G2.5.3 NAIT replacement tags

There are two formats for replacement tags:

RFID number–NAIT number

RFID number–NAIT number	Numeric	Up to 25 characters
The format is comprised of:		
RFID number	Numeric	16 digits (see G.2.4)
Separator	Hyphen	1 hyphen
NAIT number	Numeric	2 to 6 digits or 8 digits
Example	951-000123456789-12345678	

RFID number–participant code

RFID number–participant code	Alphanumeric	Up to 22 letters and numbers
The format is comprised of:		
RFID number	Numeric	16 digits (see G.2.4)
Separator	Hyphen	1 hyphen
Participant code	Alpha	3 to 5 letters (excludes vowels, 's' and 'z')
Example	951-000123456789-ABCDF	

APPENDIX H – SUPPLEMENTARY DATA FROM OMA SYSTEMS

(Informative)

OMA herd-testing data are different to conventional herd-testing data. When submitting OMA data, submit data for the following non-core data fields as well as the core data fields. This additional data will enable OMA data to be used more effectively for AE:

(a) Milking regime (defined in Certified Data Provider Interface Specification for Herd Recorders);
(b) Sampling regime (defined in Certified Data Provider Interface Specification for Herd Recorders);
(c) Herd-test-equipment provider;
(d) Herd-test-equipment version;
(e) OMA milking session (AM, PM, or MD[1]), when submitting individual results; and
(f) OMA milking-point location (such as bail number), when submitting individual results.

[1] MD is the abbreviation for midday milking: the middle milking session of a 3AD milking regime or the only milking session on days with one milking session that are part of a milking regime using a multi-day pattern such as 3in2 and 10in7.