Technical Specification

ISO/TS 16710-1

First edition
2024-09

Ergonomics methods —

Part 1: Feedback method — A method to understand how end users perform their work with machines

Ergonomie —

Partie 1: Méthode de retour d'expérience — Méthode permettant de comprendre la manière dont les utilisateurs finaux effectuent leur travail au moyen de machines

Reference number
ISO/TS 16710-1:2024(en)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by the European Committee for Standardization (CEN) (as CEN/TR 16710-1:2015) and was adopted without modification other than those given below. It was assigned to Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 1, *General ergonomics principles*, and adopted under the "fast-track procedure".

— Source documents for 3.8, 3.18, 3.19 have been updated to ISO 6385:2016.

— Definition 3.16 has been supplemented by Note to Entry 1 to 3.

A list of all parts in the ISO 16710 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The importance of involving users in the design of machinery is recognized in most standards that deal with ergonomic design principles. In fact, i.e. EN 614-1 strongly recommends user involvement because it helps to identify measures and improvements for future design.

CEN Guide 414, ISO 6385, ISO 9241-210 and ISO 12100 also provide for feedback from the end-users of machinery, and affirm the need to continue monitoring the effect of the system in order to safeguard against long-term deterioration in the performance or health of the users.

Collecting users' experiences by reconstructing their activities, how they perform their work in different real-life operating conditions, will yield knowledge of the problems that emerge from common, everyday use and help to identify possible corrections and improvements to harmonized technical standards and machinery design and manufacture.

In the context of machinery safety, it is widely accepted that end-users possess extensive knowledge of the equipment they work with every day.[15] Collecting this information as feedback from end-users, mainly workers, provides a basis not just for improving machinery standards by incorporating ergonomics principles,[17] but also for putting standards to work and monitoring their quality over the years. Those who can benefit from such knowledge include:

— CEN and ISO and national standardization committees and working groups who can become aware of the problems relating to the real use of specific machine in different work contexts, and will thus be able to draw up new or to revise existing standards accordingly;

— designers (who are involved in the design or redesign) and manufacturers enabling them to produce better, more comfortable and safer machines and to provide precise, clear and exhaustive instructions for use;

— employers/buyers to help them choose the best available machinery on the market;

— the end users, employers, artisans and workers for training purposes and for defining appropriate work procedures;

— market surveillance, authorities to enhance their knowledge and improve the efficiency of their interventions;

— the machinery working group (MWG) chaired by the European Commission, whenever they need to collect further details on machinery design problems tabled during the MWG meetings.

Studies have shown that the "Feedback Method" described in this document has a high level of repeatability, as demonstrated by the results obtained in many different production contexts in seven different European member states from applying this method to five CE-marked machines manufactured in conformity with their specific C-standard (see Annex A).

The full participation and support of employees, employers, users and buyers of machinery, technicians and market surveillance personnel in putting the "Feedback Method" into practice is key to its successful application.

Within these studies, a detailed ergonomic analysis of the work with each machine, involving a number of work groups, yielded a large body of valuable information on the specific characteristics of machine use in different work contexts and socio-cultural, climatic and microclimatic environments.

Using the standardized method described in this document, that makes little demand on time and resources, multiple work groups can easily be set up to collect skilled users' experiences with a specific machine and to use this valuable information to:

a) identify failings in the appropriate technical standard or the design rather than in its use;

b) validate the results already obtained;

c) monitor improvements in the work activity and the efficacy of the ergonomic and safety solutions applied.

The outcomes of the method described in this document can also be used for evaluating and/or designing new machinery similar to the one under study.

EXAMPLE When dealing with the roll-over risk of any self-propelled machinery with a driver on board during use on uneven or lose ground.

The method can be used by workers' representatives or, more generally, representatives of consumers and users, to collect evidence for making improvements to various types of machinery, possibly after the occurrence of unwanted events during the use of a machine, so as to identify the causes and possible solutions.

Where appropriate, recommendations can then be forwarded to the appropriate ISO/IEC Technical Committees. For example, one important safety recommendation for any revision of ISO 21281 is to standardize the position of the main foot pedals to avoid the risk of confusion and accidents. Figure 1 shows the differences in pedal layout identified during the application of the "Feedback Method" to fork-lift trucks.

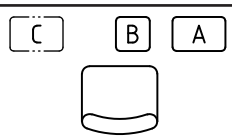
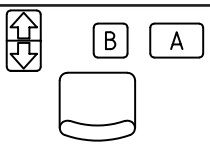
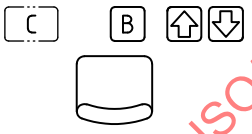
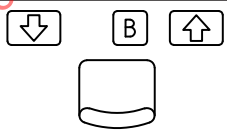
 Manual selector of direction. Right-foot-operated (car-like) accelerator.	 Left-foot-operated selector of direction. Right-foot-operated accelerator.	 Right-foot-operated selector of direction and right-foot-operated accelerator.	 Foot-operated selector of direction and accelerator (both left and right feet).
A = Accelerator **B** = Brake and/or approach at reduced speed **C** = Clutch coupling (if present) or approach at reduced speed			

Figure 1 — Illustration of the various foot pedal layouts identified in different fork-lift trucks

Ergonomics methods —

Part 1:
Feedback method — A method to understand how end users perform their work with machines

1 Scope

This document describes the “Feedback Method”, a method designed specifically to collect the contribution of machinery end-users by reconstructing and understanding how work is actually performed (i.e. the real work). This method can help to improve technical standards, as well as the design, manufacturing, and use of machinery.

By collecting the experiences of skilled users, this method can be used to reconstruct their actual work activities under different operating conditions and with any kind of machine. This helps to identify all the critical aspects having an impact on health and safety, or associated with ergonomic principles. Moreover, it makes it possible to identify some basic elements for defining the standards for machines and for their revision and improvement. It can also improve production efficiency and identify any need for additional study and research.

The method is designed to minimize the influence of the subjectivity of the facilitators and researchers in reconstructing and describing the reality of work, and to maximize the “objective” contribution of the skilled users of the machine.

The method combines a high level of reproducibility, sensitivity, and user-friendliness with low demands in term of resources, which makes it attractive to micro, small and medium-sized enterprises.

This document is addressed to standards writers, designers and manufacturers, employers-buyers, end users, craftsmen and workers, market surveillance and authorities.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
end-user feedback
information given back by end-users

3.2
expert
skilled end-user
person who has habitually used the machine under investigation for an extended period; normally he has received specific training in the use of the machine through professional courses or directly at the workplace by a tutor, often by the employer or expert co-worker; he is often in charge of training of co-workers in the use of the machine under investigation; he may be considered expert in the installation, use and maintenance of the machine

Note 1 to entry: In micro and small-sized enterprises the expert/skilled end-user is often the employer.

3.3
facilitator
person, who leads the "Feedback Method" Work Groups and collects the contributions of the skilled users of the machinery

Note 1 to entry: The facilitator is competent in leading groups, and in occupational health and safety and the ergonomics of machinery, or is supported by experts in such disciplines.

3.4
Feedback Method
specific method designed and applied to collect the contribution of machinery end-users by reconstructing and understanding the real work, in order to improve technical standards, together with the design, the manufacture and use of machinery

Note 1 to entry: See also [11].

3.5
Feedback Method sheet
document used by the facilitator to guide the discussions of the FMWG and to record the collected information

Note 1 to entry: See 5.6.2.

3.6
Feedback Method Work Group
FMWG
group composed of five to nine experts/skilled end users, coming from different enterprises, which, under the direction of a facilitator, provides the reconstruction and understanding of the real work with a specific machine by means of the "Feedback Method" sheet

3.7
final technical report
synthesis of the results of all the processes of the "Feedback Method" to a specific machine, written by the researcher from the reports of the FMWG meetings with the help, if needed, of other ergonomists/technicians/consultants

Note 1 to entry: The main contents are represented by the critical aspects identified, risks and disorders as well as by the possible solutions and or any need for further research.

3.8
job
organization and sequence in time and space of an individual's work tasks or the combination of all human performance by one worker within a work system

[SOURCE: ISO 6385:2016, 2.16]

3.9
machine dossier
collection of technical documentation and data on the machine, so as to be aware of the main safety issues (i. e. normal and abnormal use, residual risks) and ergonomic requirements as well as health effects and wellbeing of the end users

Note 1 to entry: Information on the productivity, efficiency and efficacy of the machine is also included.

3.10
real work
work as actually performed by workers

Note 1 to entry: Real as opposed to formal work reflects the difference between the formal/designed description of the activities and what is really performed at the workplace.

3.11
report of the FMWG meeting
"Feedback Method" sheets compiled by the facilitator/researcher during the FMWG meetings and validated by each participant

3.12
researcher
person competent in occupational health and safety and ergonomics of the machine, cooperating with others in the planning, execution and reporting of the "Feedback Method", including helping the facilitator to lead the FMWGs

Note 1 to entry: The researcher also contributes to the application of the outcomes to the standardization, design, manufacture and use of the machinery studied.

Note 2 to entry: Market surveillance bodies may also benefit from the outcomes.

3.13
safeguard clause
clause in Article 11 of Directive 2006/42/EC providing for a procedure whereby any measure taken by a Member State (on the grounds of non-compliance with the Essential Health and Safety Requirements, and where it is deemed that equipment is liable to endanger persons, animals or property) for the purpose of withdrawing from the market, prohibiting the placing on the market or restricting the free movement, of equipment accompanied by one of the means of attestation provided for in the Directive and therefore bearing the CE marking, must be immediately notified to the Commission by the Member State, which has taken it

Note 1 to entry: See also [10].

3.14
task
specific activity performed by one or more persons on, or in the vicinity of, the machine during its life cycle

3.15
technical action
elementary manual action required to complete the operations within the cycle

EXAMPLE Holding, turning pushing or cutting.

[SOURCE: ISO 11228-3:2007, 3.1.4]

3.16
user
person who interacts with a system, product or service

Note 1 to entry: Adapted from ISO 9241-110:2008, 3.8, and ISO 9241-11:1998, 3.7.

Note 2 to entry: The person who uses a service provided by a work system, such as a customer in a shop or passenger on a train, can be considered a user.

Note 3 to entry: A user who is using a system is not a component of that system. However, both the user and the system used can be considered as components of a higher-level system.

[SOURCE: ISO 26800:2011, 1, 2.10]

3.17
work phase
set of tasks required to achieve an intended part of the whole outcome of a work process

3.18
work process
sequence in time and space of the interaction of workers, work equipment, materials, energy and information within a work system

[SOURCE: ISO 6385:2016, 2.7]

3.19
work task
activity or set of activities required by the worker to achieve an intended outcome

[SOURCE: ISO 6385:2016, 2.17]

4 General principles

ISO 12100 requires risk assessments to be based on the experience of users of similar machines and, whenever practicable, an exchange of information with the potential users. It also provides a schematic representation of the risk-reduction process that includes a three-step iterative method. Each step concludes by asking whether the planned risk reduction is obtained.

This question is currently answered at the design stage, whereas a more exhaustive and practical answer could be provided by the collection of the experiences of actual users, not only of similar machines, as required in ISO 12100:2010, 5.2, but also of the same machines already in use.

This requires a structured and standardized method that can also be used by designers; and used systematically to add to their knowledge and provide a clear and unequivocal answer.

A number of standards provide for workers to be involved, both in risk assessment and in the design phase, through the use of prototypes, mock-ups, models and/or laboratory simulations. In simulations, operator feedback can be obtained in various ways including: group discussions, interviews, questionnaires, checklists, and observational studies, see EN 614-2.

Although in principle their value is uncontested, the question remains as to whether simulations can ever capture the complex reality of working with machinery in real life. Simulations with models and prototypes:

— are often confined to pre-defined environments which cannot reflect the real work environment with its multiple variables;

— are time-limited, whereas problems from prolonged actual use of machinery may only arise over longer timeframes;

— are limited to restricted circles of users that are not necessarily reliable and sufficiently heterogeneous samples of the population of real users;

— using machinery in a laboratory inevitably conditions the ways it is used and the worker's responsiveness, thereby rendering his impressions of the machinery unreliable;

— are unable to predict all the possible circumstances that may occur during real use in various production, social and economic contexts.

In contrast, the "Feedback Method" uses a different approach that aims at avoiding these shortcomings. In this approach, the reconstruction and knowledge of working practices is obtained by researchers and

facilitators through a detailed ergonomics analysis of end-user feedback, following a specific procedure with the participation of skilled end-users working in different companies.

Emphasis is placed on evaluating the working conditions through observation at the workplace and the need to plan studies to that end with the involvement of workers in the real environment of use. In reality, only the skilled and experienced end-user, the operator at the workplace, is able to provide relevant feedback on real work with a machine.

CEN Guide 414, for the drafting of safety standards, raises the question: "*Is there sufficient feedback on the use of the existing safety standard?*". The "Feedback Method" is appropriately designed to collect users' input in reply to this question.

The description of work activities identifies omissions or issues that are of high intrinsic value for depicting what actually happens in daily real work in different workplaces, as described by those most immediately concerned, skilled machine users. It is important to note that activity descriptions are not those of one individual skilled worker or even the aggregate of many individual skilled workers but the collective product of a group of skilled/expert workers interacting with one another, coordinated by a facilitator.

The work activity may be performed differently in other companies or in other production contexts. The best results are therefore obtained when the same machine and work activity are analysed by more than one work group, possibly in different geographical areas and socio-economic contexts. The description created will need to incorporate this diversity. This enables every user to compare the acquired knowledge against their specific reality and to update and expand the content in a way adapted to their working environment.

5 Feedback method

5.1 The "Feedback method" steps

The "Feedback Method" involves the following seven main steps:

— selection of the machine to be investigated;

— collection of documentation, and preparation of a machine dossier;

— identification of companies where the machine is regularly used;

— inspection of workplaces;

— work groups and work analysis with skilled users of the machine;

— written report of the FMWG results and their validation;

— project overview and final technical report.

5.2 Selection of the machine to be investigated

The "Feedback Method" may be applied whenever stakeholders identify a machine and a corresponding harmonized standard, which merits closer examination and analysis. The principal criteria for selecting the machine to study are:

— number and severity of accidents;

— lack of safety and ergonomic requirements;

— number and geographical dissemination of the machine;

— revision or definition of the machine's standard.

The interest and cooperation of the social partners, workers and employers, manufacturers, buyers and end-users are key requirements for the selection of the machine and the success of the study.

Having selected the type of machine to be studied, it is then necessary to identify the industrial sectors in which it is used and the type of production to be analysed. It is recommended to start with a single sector and production type before widening the scope of the study as appropriate.

5.3 Collection of documentation and preparation of a machine dossier

The next step of the "Feedback Method" is to collect any available technical documentation and data on the machine and its use, so as to be aware of the main safety features (i.e. normal and abnormal use, residual risks) and ergonomic requirements. In this preliminary phase researchers prepare a "machine dossier", that includes:

— relevant harmonized standards;

— safety guidelines elaborated by technical bodies or research organisations;

— accident statistics or records of undesired events associated with the machine (together with any specific accident investigations);

— any safeguard clauses relating to the machine or the related standard;

— market surveillance data;

— information provided by manufacturer about the territorial/geographical distribution of the machine and its different models and/or configurations;

— instruction handbooks accompanying the machine;

— other documentation (publications, journals, testimonies, etc.) and materials (films, photographs, miniature models of the machine, etc.).

The machine dossier may be implemented and updated with any further new information. It is the source and the reference for all the information presented and discussed in the FMWGs.

For transnational studies, the same dossier may be translated into the different languages. Then it may be used by each FMWG examining the same machine. In such a way all those participating will have the same background information and questions to answer.

5.4 Identification of companies where the machine is regularly used

After selecting the machine to be studied it is necessary to identify where this machine is used. It is recommended that machines used in one region are studied at first and then to widen the scope of the study to other regions and countries as appropriate. Trade unions and employers' associations can help to identify suitable companies willing to take part.

Attention should be paid to the size of companies using the machine. Micro and small-sized enterprises, where the traditional ergonomic, safety and hygiene approach is difficult to apply, should normally be included.

5.5 Inspection of work places

The active collaboration of all the stakeholders (employers, technicians/staff, company occupational physician, workers and their health and safety representatives) is essential for the best conduct of the study. Meetings with the stakeholders of each enterprise, in which the objectives of the study should be clearly explained and discussed, are appropriate both before and during the workplace inspections.

Workplace inspections are carried out with the cooperation of the stakeholders and include the observation of: the environment, the workplace and the work process, together with open discussions with workers engaged in the different jobs and activities performed in the company.

The more relevant phases of the work process are identified with the advice of the stakeholders, particularly skilled workers, and, if possible, by direct observation.

During the inspection, data and information are collected on forms containing the following items:

— general company data, sector, number of employees;

— description of the working environment (noise, vibration, dust, illumination, microclimate, chemicals, etc.) where the machine under investigation is used and of the relevant working methods and procedures;

— characteristics of the machines used in the company (manufacturer, model, year of manufacture, maintenance, safety devices);

— risk assessments relating to the machine;

— description (with the help of the workers or by direct observation) of the work process and of the job;

— identification of the main work phases and of the single activities/tasks. All the work phases should be considered, not only those directly observable, including the installation and preparation of the machine before its use, up to its storage at the end of the work shift, as well as planned and unplanned maintenance;

— information on near-misses and accidents which have occurred in the company relating to the use of the machine in question;

— information about the training provided for the workers assigned to operate the machine.

The inspection form should be designed to reflect the specific characteristics of the machine to be studied and, for multicentre studies, translated into the languages of the various participating countries. If needed, some items may be added to the "basic" form to collect regional differences in the use of the machine. Annex A shows an example of such a form, designed and used for collecting information during a specific study.

If possible, during the inspection, it is also appropriate to collect films, photographs, etc. of the machinery, the environment, the workplace and of the individual activities/tasks performed by the machine operator and coworkers. If needed, and if the available resources allow, further inspections or more detailed investigations may be conducted to collect more information through the use of suitable tools and methods selected from the relevant disciplines (e.g. ergonomics, occupational health and safety, cognitive psychology).

The information and documentation collected during the workplace inspection will be included in the machine dossier. It enables the researchers to understand better the context where the machinery operates and its functions. It also facilitates the ergonomics analysis of the work, the reconstruction of the real-work and activities, and the identification of the more critical aspects of the use of the machine.

Elaboration of the collected data will also enable the accurate description of the sample of companies involved and the machine studied.

5.6 Feedback Method Work Groups and work analysis with skilled users of the machine

5.6.1 Preparation for meetings

FMWGs are formed of five to nine users. The choice of users should be made from skilled users of the machine (workers, technicians, artisans or even employers of the micro and small sized enterprises). These should be those who use and/or maintain the machine. The number of participants in each group should be limited to facilitate the dialogue and the comparison, and to allow everyone to contribute actively. Participants in any one group should have experience of the same specific use of that machine. At least three different companies should be involved, in order to minimize the influence of working practices in any individual company. This selection should enable a job reconstruction to be formulated which is representative of the daily tasks involved in that use across different working contexts.

The facilitators of the FMWGs should be:

— those who have worked on the machine dossier and have performed the inspections in the companies;

— knowledgeable about relevant machine standards;

— competent in leading work groups.

For each type and use of machine analysed it is preferable to form more than one FMWG in order to compare the results and to strengthen their validity.

For a successful meeting it is necessary to:

— prepare the meeting place and equipment needed;

— collate documentation and other material (taken from the machine dossier) in order to supply the workers with the base information (existing technical standards, important residual risks indicated by the manufacturers, description of the most important accidents, etc.) and the necessary information for the development of the group job;

— identify the main work phases to be analysed by the groups – all the work phases to be analysed should be taken into account.

NOTE The identified work phases can change with the uses of the machine and can be defined from information collected during the inspections.

5.6.2 Work analysis with skilled end-users of the machine

The FMWG activity is based on two preliminary steps:

— The participants are provided with the collated documentation and other material.

— Each work phase is split into elementary operational tasks, from the set-up of the machine to the maintenance and cleaning operations.

NOTE Normally, no more than four hours are necessary for such a meeting.

Thereafter the facilitators introduce the job ergonomic analysis through which the group will reconstruct in detail the work activities and then carry out a systematic analysis of each work activity/phase.

For each work phase, the tasks/activities are identified, and for each of them the following elements are recorded:

— Operating Procedure;

— Competence required for the execution of the task;

— Critical aspects: hazards/risks; disorders/diseases/injuries;

— Solutions and suggestions for prevention and need of further research.

These are recorded using the FMWG sheet, as shown in Table 1. It is important to note that the facilitators leading the discussion should allow the workers to act as key players in evaluating their own working environment. Their role consists of supplying information, speeding up the participants' contribution to the reconstruction of the phases of the job and the activities associated with each phase, and guiding the end users' evaluations of the safety and health issues, any critical aspects of their work with the machine, and any possible preventive action. The description should be as detailed and unbiased as possible, paying particular attention to those operations which the documentation, experience and knowledge have clearly shown as hazardous.

The FMWG analysis is based on a detailed and meticulous description of each activity and their temporal and spatial sequence.

The facilitators should encourage the active participation of all the participants. They should ask the group to characterize and define the necessary competence for the execution of the single tasks, the current problems and risks and suggestions for practical improvements. The group should not just consider health and safety issues but also explore opportunities for improving the effective and efficient use of the machine.

Suggestions for improvement should be addressed primarily to the search for possible improvements to the machine itself (design, manufacture). However, attention should also be paid to the related aspects of organizational choices, of operating procedures and/or of the "correct" behaviour of the single workers. Opportunities for the promotion of health and wellbeing through better design of machinery and tasks should also be considered.

It will be necessary to guide the group to deepen the analysis of how they perform the single activities since the participants will tend to simplify the description because, although for them this may be well-known and banal information it may not be apparent to those without their level of knowledge and experience.

It will be useful, to facilitate the participation and the analysis, to describe the dynamics of any accidents or incidents which have occurred (these can be drawn from the experiences of the companies visited during the inspections, the FMWG participants, or their colleagues), or to show images or movies of other incidents or dangerous situations.

When descriptions of unexpected operating modalities or unforeseen hazardous situations emerge during the FMWG activity, they should be recorded in detail.

Table 1 — "Feedback Method" Work Group sheet

Sequence of tasks/ activities[a]	Operating Procedure	Competence	Critical aspects: hazards/ risks; disorders/diseases/injuries	Solutions, suggestions for prevention; need of further research
1)	*[Detailed description of each action, procedure and method of executing each task/activity, with information on the equipment used, safety devices and personal protective equipment (PPE)...]*	*[Information about the competence required for: (1) optimal execution of the task/activity and each action (use of equipment; choice, use, and handling of materials); (2) the organization and disposition of work/ workplace and layout and environment; (3) understanding and applying the instruction handbook]*	*[Identification of: (1) the critical aspects affecting the health and safety of workers or limiting the efficient performance and reliability of tasks and actions; (2) every hazard and risk; (3) intrinsically safe machinery and equipment; (4) awkward postures, incorrect work practices, environmental conditions (microclimate, dust lighting, layout, etc.); (5) fatigue, complaints, occupational diseases, accidents or injuries; (6) work related stress or problems linked to organizational aspects (rhythm, shifts, etc.).]*	*[Identification of solutions/ suggestions on how to eliminate or minimize the identified problems, hazards and risks and apply the relevant ergonomic principles to: machines, equipment, safety devices, PPE, work procedures, work organization, environment, etc.;* *Guidance on: Training, Inspection, Instruction handbooks.* *Proposals for further research to find new solutions]*
2)				

[a] Each column should be completed for each activity in the work phase.

The annotations on the sheet – readable and concise – should reflect as much as possible the discussion within the FMWG, and clearly represent the connections (rows in Table 1) between the work tasks, the necessary competence to carry out such tasks, the critical aspects and suggestions for improvement. If there is not complete consensus, the majority opinion should be reported. The minority opinion should also be noted.

The facilitator's and researcher's knowledge and opinions should not be recorded on the form if not discussed and verified by the FMWG in all the aspects (from the description of the tasks to the suggestions for improvement). The facilitator's and researcher's point of view can be reported in the final report, although the fact that this is the contribution of the facilitators and researchers and not of the end-users should be noted. In this way it is possible to avoid or reduce the common mistake of attributing to workers statements that represent the thinking of the researchers.

5.7 Written report of the Feedback Method Work Group results and their validation

At the end of the process, the facilitators and researchers transfer the results onto a "readable copy" of the sheet and deliver it to every participant for their validation and/or for any corrections/additions. (an

example of this is shown in Annex D). This further step, that could seem superfluous, is important for at least two reasons:

a) The end users who have participated should have the opportunity to verify:

   — that the outcome is an unbiased report of the argument;

   — that their contribution has been understood;

   — and that it has been understood in a correct way.

b) The more reticent users and those who don't feel themselves sufficiently involved have a further opportunity to supply their contribution, to propose observations or to suggest additions.

The additional indications that users provide through this process will be adopted and marked in the final report.

5.8 Project overview and final technical report

The final phase of the "Feedback Method" consists of the drafting of the project overview and the final technical report. The project overview describes all the different project phases (including the methods and the materials used in the research, the activities carried out and the collected information: data on the machine, general statistics of accidents, their gravity, eventual prevailing dynamics, etc.) and outcomes, from the assembling of the machine dossier to the consolidation and validation of the FMWG report.

It should describe:

— the sample of participating companies;

— the data collected concerning the working environments;

— the activities carried out;

— the characteristics of examined machinery.

The activities carried out in the FMWG with the end-users will be described and in the report will be unbiased in reporting the matters discussed. Afterwards the facilitators and researchers will draft a synthesis of the FMWG reports, to facilitate action.

In conclusion, starting from the suggestions for prevention emerging from the FMWGs, the researchers will write up a table of synthesis within the technical report, where the risky situations characterized and any suggestions for prevention will be indicated.

It is clearly at the discretion of the researchers who they chose to share this report with. However, it is structured in such a way that its content is addressed to:

— standard setters, to become aware of the problems relating to the real use of specific machines in different work contexts and thus to draw up new or to revise existing standards accordingly (see also Annex E);

— designers and manufacturers, to produce better, more comfortable and safer machines and to provide precise instructions for use;

— employers, users and workers for training purposes and for defining appropriate work procedures;

— inspection bodies to enhance their knowledge and improve the efficiency of their interventions and advice.

This report therefore becomes the centrepiece of the job carried out and constitutes a technical synthesis of the contributions made by users both during the inspections and within the FMWG discussions.

Annex A
(informative)

Existing results

In 1997 the European Trade Union Institute, ETUI, commissioned Sind Nova–Roma and A.USL 7 of Siena, Italy, to develop a method for collecting the knowledge of workers who are expert users of machinery through the reconstruction of their jobs using different machines in various micro, small and medium-sized enterprises in Europe. The method was to yield concrete results within a reasonable time using limited resources and validated, verifiable and updatable instruments.

The "Feedback Method" designed by Fabio Strambi[17] is derived directly from the method used to carry out an ergonomic analysis[13,18,19,21] of the organizational structure of work, to identify critical points, and to make suggestions and offer solutions, which was tried and tested in research, studies and safety campaigns financed by the European Coal and Steel Community in the 1980s. The results obtained from successive applications of the method have been published[12,17,20] and were also presented to a seminar organized by the ETUI in Brussels in March 2006[12] attended by representatives of the European Commission, where the concrete possibility of collecting users' experience as input, to improve the standardization process, was noted.

The following paragraph, included in the European Commission's (Directorate General for Enterprise and Industry) Mandate to CEN and CENELEC for standardization in the field of machinery, is particularly salient:"...3.5. When executing the standardisation tasks covered by this mandate, CEN and CENELEC are requested to take due account of feedback from end-users of the machinery concerned." (19th December 2006)[14].

The "Feedback Method" has to date been applied successfully to five different types of machines, (listed in Table A.1), marked "CE" and manufactured in conformity with their C-standards in collaboration with public authorities, market surveillance bodies, social partners organization and technical institutes, see Table A.2.

Examples of activity descriptions with Tele-Handlers are reported in Table A.3, Manchester FMWG, and in Table A.4, Florence FMWG. The working groups have provided many suggestions for the improvement of standards and also precious information for designers, manufacturers and even for the buyers/users of machinery. The main indications to improve the standards for the self-propelled machineries forklift, combine harvesters and telehandlers have focused on important safety issues such as stability and visibility. The risk of overturning is high in soft ground or slopes. The forklift overturns just steering at speed.

Table A.1 — Machines studied by means of the "Feedback Method"

Type of machine	C standard	Countries	Factories	Users	Feedback Method Working Groups	Machines	Study Period
Woodworking Machines	EN 1870–1:1999; EN 848–1:1998	I	14	28	4	58	1997–2001
Forklift Trucks	EN 1726–1:1998	I, UK, FIN, F, D	45	60	11	1658	2003–2004
Angle Grinders	EN 50144-1:1999	I	19	19	3	85	2005
Telehandlers	EN 1459–1:1998	I, UK, FIN, S, D	35	35	5	39	2006–2008
Combine Harvesters	ISO 4254-7:2009	I, UK, DK, D	46	110	6	117	2009–today
Tractors							

Table A.2 — Partners in the "Feedback Method" studies (1997–2011)

Public Authorities, Administrations, Market Surveillance Bodies	Social Partners Organizations and Technical Institutes
HSE, Health and Safety Executive, United Kingdom **GroLa BG**, Großhandels-Berufsgenossenschaft, Deutschland **KAN**, Commission for Occupational Health and Safety and Standardization, Germany, www.kan.de **Ministère de l'emploi, de la République Française** **Ministry of Social Affairs and Health of Finland** **A. USL, A. USL 1 Massa e Carrara; A. USL 4 Prato; A. USL10Firenze; A. USL 7 Siena, A. USL 8 Arezzo, A.USL 9 Grosseto, Italy;** **Regione Toscana**, Italy **ISPESL/INAIL**, National Work Accident Insurance Institute, Italy	**ETUI**, European Trade Union Institute, Belgium **EFFAT**, European Federation Food Agriculture and Tourism, Belgium **ACIMALL**, Association of Wood Working Machinery Manufacturers. **EPSU,** European Federation of Public Service Unions, Belgium; **FagligtFaellesForbund,** United Federation of Danish Workers, Denmark **LO**, Landsorganisationen iSverige, Sweden **SEKO,** Union for Service and Communications Employees, Sweden **SindNova,** Roma, Italy **Unite the Union**, Britain and Ireland union, United Kingdom and Ireland

Table A.3 — Telehandlers FMWG, Manchester, United Kingdom. Work activity: moving the truck

Sequence of tasks	Operating Procedure	Competence	Hazards/Risks/ Critical aspects	Suggestions for prevention
Moving the truck	Moving forward	Drivers aware that boom should be as low as possible during driving to maximize visibility on the right hand side	Risk of collisions	Drivers acknowledged and welcomed that on some models, boom is set lower, giving driver a better chance of seeing over it.
			Not always possible to drive with boom low, e.g. on very rough ground, or when carrying suspended or wide loads	Operators would like a visibility aid for the off-side that works for all boom angles. For example, it was suggested to have a boom mirror whose angle adjusts as the boom is raised or lowered Fit fish eye mirror on front off-side
			Can be dazzled by sunlight	Fit tinted plastic strips to window for sun visors. Another suggestion was to fit a roller blind

Table A.4 — Telehandlers FMWGs, Florence, Italy. Work activity: preliminary operations

Sequence of tasks	Operating procedure	Competence	Hazards/Risks/Critical aspects	Suggestions for prevention
Sitting in the drivers' cab	The operator, once seated, adjusts the height and depth of the seat. In some models, it is also possible to adjust the suspension to the operator's weight.	Knowledge of the position of the seat-adjusting controls	If the seat is not adjusted, the driver's position may not be ergonomic and may increase the exposure to vibrations	Requirement for the manufacturer to report the exposure to vibrations under normal conditions of use (relative to the type of terrain on which the vehicle can operate)
	Adjustment of the rear-view mirrors	The adjustment is carried out manually and help from a colleague is needed to adjust some mirrors that are far from the cab	Even with well-placed rear-view mirrors, blind angles remain, thereby increasing the risk of collisions and accidents	Install rear-view mirrors that can be adjusted from the driver's cab to provide full visibility around the vehicle
	Use of holding systems on the driver's seat — safety belt buckled at the waist[a]	Knowledge of how to use the belt and awareness of the need to use it when the vehicle is moving	Risk of more serious accidents in case of collision and overturning	Because the safety belt buckled at the waist gives workers the impression that they are not properly seated in the driver's cab, it has been proposed to use belts buckled on the chest. Or, as an alternative, to adopt other systems for securing the driver. However, such systems should be easy to use.

[a] Users have reported the need to get up and get out of the vehicle very frequently during normal work. This is not conducive to the use of safety belt.

The following are some examples of the results obtained through the application of the "Feedback Method":

— Controls are needed on the speed, based on the variation of the inclination/height of the arm and the loading unit, fixing maximum limits that exclude the risk of overturning under the conditions foreseen by the manufacturer.

— Indicators should be made compulsory for inclination (lateral and longitudinal, on both axles of the vehicle), on the load in the forks, on the pressure in the tyres, etc.

— Adoption of alarm signals to warn that the vehicle and the load are in danger of overturning or of losing stability.

— The telehandlers FMWGs indicated problems linked to safety belt design, (Table A.4); the combine harvester FMWGs instead denounced the fact that that the safety belts are compulsory only for the machine equipped with Roll Over Protection Structure, ROPS.

— In relation to the self-propelled machines it is necessary to define specific standardized methods for evaluating the visibility from the driver's cab, (see Tables A.3 and A.4), and the introduction of auxiliary systems to ensure sufficient visibility round the vehicle as and when needed; these machines need also an adequate, standardised design of the position and functions of the controls.

— The reports of all the machines FMWGs indicate problems concerning usability of the protection devices, especially when using woodworking machinery and angle grinder. In particular for the angle grinders standards have to specify the characteristics of the mains switch on/off in order to avoid a unwanted operation, inadvertent starting by also excluding the possibility to lock the device in the ON position.

— The reports of the woodworking machines' FMWGs evidence the need to remove all the wood dust, a classified carcinogenic agent,[9] both during the production activity and cleaning and maintenance phase. According to those reports, standards should require each machine to be equipped with an

extraction system of the dust together with an interdiction to prevent the use of compressed air to clean the machine.

— Regarding self-propelled machines and particularly fork-lifts, the design of the pedals controlling forward/reverse and stop should be unified according with the one provided in automobiles. In the examined sample of fork-lifts, different dispositions were found even inside the same Company.

— Both designers and manufacturers should better address the residual risks management and improve the contents and the quality of the use and maintenance handbook (instruction manual); for example describing the correct work procedure, the worker training need, the environment requirements, the Personal Protective Equipment and so on. A clear recommendation provided by the working groups analysing woodworking machines is the need to complete the existing instruction with information on the exact use of guides and fences, on the safe handling and fitting of the tools and on how to perform special activities. The angle grinder working groups suggested to write in the handbook detailed instructions on how to minimize the risk associated with the electrical supply and accessories use.

Further important recommendations related to the maintenance of machinery are:

— Fork-lifts: to provide an automatic filling system for the traction battery pack;

— Telehandlers and combine harvesters: to improve the automatic cleaning devices for glazed surfaces and mirrors; to provide the possibility to visually check the tire pressure; to include in standards a statement by the manufacturer about the level of noise and vibrations produced by the machine in the same condition of the intended use, *in the cockpit* and not just outside the self-propelled machinery;

— Combine harvesters: to install adequate permanent means of access to machinery; to provide machines with automatic greasing systems and/or remote greasers.

NOTE Further information and possible solutions can be found at the following website: http://www.ergomach.eu/ergomach/Possible-solution/index.jsp.

Annex B
(informative)

Inspection form “Combine Harvester”

ETUI series applying the FEEDBACK methodology

ISO 4254-7:2009

Intended as replacement for EN 632:1995

Information form data questionnaire for use of skilled combine harvester operators

Company data relating to the type of production and general organization, as well as details of the individual harvesters used

Technical form to be filled in by each operator for any combine harvester used on the company premises.

Accident analysis – any need misses or accidents causing injury which occurred on the company premises or operators’ experiences.

Sensitive information (i.e. information that could constitute an invasion of privacy) when completing this data can be left out at company/operator discretion.

Please tick the relevant boxes ☐ in this questionnaire.

Terminology:

Combine harvester = Unit + cutting platform

Company sheet

Company _____

Country _____

State/location _____

No. of Employees ☐ 1 ☐ 2–5 ☐ 6–10 ☐ 11–20 ☐ more

Name of RSPP (Safety Officer) _____

Name of RSL (Workers’ safety representative _____

☐ company representative ☐ territorial/district representative

No. of Harvester Operators ☐ 1 ☐ 1–3 ☐ More

Shifts Undertaken ☐ Day ☐ Night ☐ Both

Hours Worked Per Operator ☐ 6–8 h ☐ 8–10 h ☐ 10–12 h ☐ more

Access to operator’s handbook? ☐ Yes ☐ No

Have combine operators received specific instruction? ☐ Yes ☐ No

Have combine operators received specific training? ☐ Yes ☐ No

Did the operators receive regular medical monitoring? ☐ Yes ☐ No

Medical exams _____

Name of the medical doctor _____

Description of work-activity when combine harvesting

☐ work on one's own ☐ Contract Harvesting ☐ Both

Description of workplace when combine harvesting

☐ Enclosed Farm ☐ other (Not Ring Fenced) Farm ☐ Road Travel

Average terrain ☐ largely flat ☐ gentle slope ☐ slope

Characteristics of combinable crops (approximate)

Laid crops _____% Low Cutting _____% Standing Crops _____%

Average field size [Ha] ☐ up to 5 ☐ 6–10 ☐ 11–50 ☐ more

Average Field Length [m] ☐ up to 100 ☐ 101–250 ☐ 251–500 ☐ more

Suitable room for manoeuvre ☐ always ☐ sometimes ☐ rarely

Suitable spaces in the field for the crops discharge into the tanks

☐ always ☐ sometimes ☐ rarely

Average yield [dt/Ha] ☐ up to 40 ☐ 41–60 ☐ 61–80 ☐ more

Combine Harvesters Used

N0	Make	Model	Year of manufacture	CE YES/NO
1				
2				
3				
4				

Do you have overhead power lines (OHPL) on the farm harvested? ☐ Yes ☐ No

Does your unit have OHPL warning device fitted? ☐ Yes ☐ No

Do you think a device is needed? ☐ Yes ☐ No

Is the machine stored into a covered building/structure? ☐ Yes ☐ No

Any comments on this section?

_____

_____

_____

UNIT (harvester) N _____

Machine

Cutting Platforms used (header/table type)

☐ Conventional Header ☐ Stripper Header ☐ Draper ☐ Maize cutter

☐ Single rotor ☐ Double rotors ☐ Straw-walker

☐ Transversal threshing ☐ Longitudinal threshing

☐ Auto level max autolevel % _____

Height of unit/harvester ☐ 4 m ☐ more than 4 m

With grain tank lids open ☐ 4 m ☐ more than 4 m

With auto level engaged ☐ 4 m ☐ more than 4 m

Max width _____ mt

Max length _____ mt

Can the unit operate with grain lids closed? ☐ Yes ☐ No

Operators Cabin (operator's platform-command centre)

Operators Cab ☐ Yes ☐ No

Place for operators' manual storage ☐ Yes ☐ No

ROPS ☐ Yes ☐ No

Seatbelt ☐ Yes ☐ No

Training/passenger seat ☐ Yes ☐ No

Passenger seatbelt ☐ Yes ☐ No

Access to Cab

☐ staircase ☐ retractable ladder

☐ (rung) ladder distance between the floor and the1st rung _____ cm

☐ stairs distance between the floor and the1st step _____ cm

Kind of steps ☐ grid steps ☐ solid steps

Access handhold ☐ Yes ☐ No

Non-slip safety device ☐ Yes ☐ No

Does the landing have a rail around it? ☐ Yes ☐ No

If YES, please report its high: _____ cm

Cross rail ☐ Yes ☐ No

If "Yes", please indicate the distance between the cross rails

	☐ > 60 cm	☐ < 60 cm		
Kind of landing	☐ grid floor	☐ solid floor		
Window cleaning		☐ Yes	☐ No	
Mirror cleaning		☐ Yes	☐ No	
Emergency exit provision:		☐ Yes	☐ No	
Fire Extinguishers fitted:		☐ Yes	☐ No	

Viewpoints

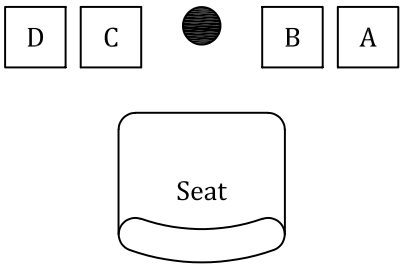
Mirrors	☐ one for each side	☐ more		
Electric adjustment:	☐ Yes	☐ No		
	☐ Needed	☐ Not needed		
heated mirrors:		☐ Yes	☐ No	
Rear view camera (driving operation):		☐ Yes	☐ No	
Rear view camera (coupling operation):		☐ Yes	☐ No	
Antidazzling devices (to avoid the sun glare)		☐ Yes	☐ No	

Ergonomics/comfort

Seating adjustment/comfort		☐ Yes	☐ No	
if "Yes", please indicate:	_____			
Seat restraints/belts		☐ Yes	☐ No	
if "Yes", please tick	☐ belts	☐ other: _____		
Air conditioning		☐ Yes	☐ No	
Heating		☐ Yes	☐ No	
Dust Filtration		☐ Yes	☐ No	
Noise levels*	☐ dB(A) _____	☐ not declared		
WBV (Whole Body Vibration)*	☐ m/s^2 _____	☐ not declared (*See operator's manual)		
Noise levels when unloading/discharging	☐ dB(A) _____	☐ not declared		
Place for meal/drink storage		☐ Yes	☐ No	

During operation – operational/controls in cabin

Controls in cabin (type of pedals)



A _____

B _____

C _____

D _____

Does forward/reverse motion ceases when the operator leaves the seat? ☐ Yes ☐ No

Can the engine start when not in neutral? ☐ Yes ☐ No

Do the brakes hold when engine is off? ☐ Yes ☐ No

control types to:

autolevel ☐ push-button ☐ lever ☐ other _____

header control ☐ push-button ☐ lever ☐ other _____

start separator control ☐ push-button ☐ lever ☐ other _____

discharge control ☐ push-button ☐ lever ☐ other _____

gear direction control ☐ push-button ☐ lever ☐ other _____

sound-visual alarm warning ☐ Yes ☐ No

if "Yes", please indicate: _____

crop loading level gauge ☐ Yes ☐ No

if "Yes", please indicate ☐ level gauge

☐ fuel gauge

monitor ☐ Yes ☐ No

Colour coding of controls

Red for emergency header cut off ☐ Yes ☐ No

Orange (brakes, gears forward/reverse, park locks) ☐ Yes ☐ No

Yellow (mechanical engagement; separator/cutter-head) ☐ Yes ☐ No

Black for all other functions ☐ Yes ☐ No

Gears

Clutch-operated: ☐ Yes ☐ No

Fully hydrostatic: ☐ Yes ☐ No

Neutralize: ☐ effective ☐ non effective

Brakes

Foot Brakes/hydraulic operated: ☐ Yes ☐ No

Foot Brakes/air operated: ☐ Yes ☐ No

Foot Brakes/Mechanical: ☐ Yes ☐ No

Park Brake/Handbrake ☐ Yes ☐ No

Cabin Lighting ☐ Yes ☐ No

Anti dazzle/reflective glare devices (applied to screens/monitors/displays etc) ☐ Yes ☐ No

Outside Lighting

Standard Halogen ☐ Yes ☐ No

Xenon ☐ Yes ☐ No

Shadows/reflective dazzle at night ☐ Yes ☐ No

Warning beacons ☐ None ☐ One ☐ More

Delayed night lights for leaving machine ☐ Yes ☐ No

Working lighting ☐ Yes ☐ No

reversing light ☐ Yes ☐ No

Any comments on cab section?

Grain Tank

Entry/Exit (Ingress/Egress): Do you need to access the tank for cleaning seed crops etc or maintenance (such as greasing, cleaning grain tank window, and repairs?) ☐ Yes ☐ No

Frequency? ☐ Once a day ☐ 1–4 times a day ☐ More than 4 times ☐ Never

Is there a safety switch to open lids from the inside of the tank? ☐ Yes ☐ No

Grain tank lids: Hydraulic ☐ Yes ☐ No Manual ☐ Yes ☐ No

If manual, do you need to climb onto the top of the combine to open and close lids? ☐ Yes ☐ No

Any comments on this section?

Discharge Auger/unloader

When engaged/operating is the end of the auger higher than the combine unit i.e. above 4 m? ☐ Yes ☐ No

When disengaged and in transport position, does the auger/tube extend beyond the combine unit at the rear? ☐ Yes ☐ No

Is it possible to see the discharge auger during disengaging? ☐ Yes ☐ No

Any comments on this section?

Engine Bay

Is the inlet refuelling accessible from the ground? ☐ Yes ☐ No

If "No", is it accessible from the cabin landing (platform)? ☐ Yes ☐ No

Or (specify): .....

Access via steps (e.g. when taking fluids/oil/coolant to the bay):

Suitable hand holds? ☐ Yes ☐ No

Suitable guard rails? ☐ Yes ☐ No

Air Cleaner access:

Is the air cleaner accessible from the ground? ☐ Yes ☐ No

If "No", is it accessible from the cabin landing (platform)? ☐ Yes ☐ No

Suitable hand holds ☐ Yes ☐ No

Suitable guard rails ☐ Yes ☐ No

Radiator cleaning (swing-out radiators):

Is the radiator accessible from the ground? ☐ Yes ☐ No

If "No", is it accessible from the cabin landing (platform)? ☐ Yes ☐ No

Suitable hand holds ☐ Yes ☐ No

Suitable guard rails ☐ Yes ☐ No

Radiator cleaning, are there pinch points? ☐ Yes ☐ No

Is there adequate working space, non-slip surfaces around the engine? ☐ Yes ☐ No

Lighting in engine bay (when working at night)? ☐ Yes ☐ No

Battery Housing in engine bay? ☐ Yes ☐ No

If "Yes", how is it possible to reach the battery?

Please specify: _____

Fire Control in Engine bay (extinguishers) ☐ Any ☐ None

Is the engine maintenance register/book available? ☐ Yes ☐ No

Comments on Engine Bay

_____

_____

Cutting Platform/Header

Is mounting/dismounting of cutting platform header feasible with only one operator? ☐ Yes ☐ No

Does header operation shut off when leaving the seat? ☐ Yes ☐ No

Emergency shut-off for header operation ☐ Yes ☐ No

Speed of shut off/wind down on operation in emergency? How fast? _____

How many Cylinder/Ram stops? ☐ one ☐ two

With feeder house cylinder stops in place, is maintenance on the knife still possible? ☐ Yes ☐ No

If "No", do you work on the header lowered without ram stops? ☐ Yes ☐ No

Do you have reel/cylinder stops? ☐ Yes ☐ No

Mounting Header. Is it single docking? ☐ Yes ☐ No

Is it multiple docking? ☐ Yes ☐ No

Are there any pinch points when docking? ☐ Yes ☐ No

Do you always stop the engine when coupling up? ☐ Yes ☐ No

Cutting header transport unit: ☐ Yes ☐ No

How is the unit transported? Please indicate: _____

Any comments on this section?

_____

_____

Stone-traps

Does the stone-trap fully empty on pulling the lever? ☐ Yes ☐ No

If "No", do you then have to get under the combine and empty it manually? ☐ Yes ☐ No

Any comments on this section?

_____

_____

Primary Unit

Are there any inbuilt warning signs on the combine to advise width, length of machine? ☐ Yes ☐ No

Are the joints, the drive-chains and the belts sheltered by either crankcase or by cover? ☐ Yes ☐ No

Separator:

Does the separator automatically cut out on leaving the seat? ☐ Yes ☐ No

Does the separator automatically cut out on lifting safety guards? ☐ Yes ☐ No

Maintenance and Adjustment (e.g. belts/chains/greasing around the unit):

Do you have adequate platforms/ladders for this maintenance? ☐ Yes ☐ No

Are grease points in banks? ☐ Yes ☐ No

If "No" does it require a balancing act to grease points? ☐ Yes ☐ No

Straw-choppers/chaff spreaders:

Is the chopper engagement? ☐ Inside cab ☐ Outside cab

Chopper hood/Straw deflectors:

In transport position are they safe? Do they swing out of the way? ☐ Yes ☐ No

In work position do they present a contact hazard e.g. points? ☐ Yes ☐ No

Daily Checks Undertaken

Belt Tensions ☐ Yes ☐ No

Chain Tensions ☐ Yes ☐ No

Engine Checks Levels etc. ☐ Yes ☐ No

Tyres ☐ Yes ☐ No

Greasing ☐ Yes ☐ No

Any comments on this section?

_____

_____

General maintenance, accessibility and work around the whole machine

As operators would you like to comment on any structures (chassis, guards, grain lids etc) and/or operational features which you feel would improve the safety of the machine you use.

_____

_____

Accidents/Near-misses

Have you had an accident or injury during your work as a combine operator? (E.g. slips, trips, falls from height, burns, cuts,(such as when replacing knife or changing sections) overhead power line near misses,

joint pains such as knee caused by constant clutch work or other repetitive strain injury). Could you comment and explain how this/these happened.

Occupational/work related disease or complaints due to the use of the machine

Thank you for your cooperation and time spent filling in this data form. The responses you have made will contribute to recommendations for improving the safety features on future machines. As operators this is of paramount importance for our safety and that of future operators.

Thank you for your cooperation and time spent filling in this data form. The responses you have made will contribute to recommendations for improving the safety features on future machines. As operators this is of paramount importance for our safety and that of future operators.