International Standard

ISO 12604-2

First edition
2024-02

Aircraft ground handling — Checked baggage —

Part 2: Handling requirements and guidelines

Traitement au sol des aéronefs — Bagages enregistrés —

Partie 2: Exigences et directives de traitement

Reference number
ISO 12604-2:2024(en)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 9, *Air cargo and ground equipment*.

A list of all parts in the ISO 12604 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

This document specifies the handling conditions for baggage checked-in by airline passengers to be carried into aircraft cargo holds, in order to:

— contribute to improving work conditions for baggage handling agents and reducing the incidence of musculo-skeletal disorders (MSD) in this population;

— facilitate enhancing the overall efficiency of baggage handling;

— provide instructions for the design of automated baggage handling systems increasingly used at airports. Annex A gives examples of measures allowing standard baggage to be conveyed through automated transfer and sorting facilities.

In this document, the following verbal forms are used:

— “shall” indicates a requirement;

— “should” indicates a recommendation;

— “may” indicates a permission;

— “can” indicates a possibility or a capability.

Recommendations are, while not mandatory, considered to be of primary importance in providing safe and efficient baggage handling. Any deviation from the recommendations should only occur after careful consideration and thorough service assessment have shown alternate methods provide an equivalent level of work safety.

The carrier and handling services provider are responsible for identifying and complying with legal requirements that can be locally applicable, such as Health and Safety government legislations and regulations applicable to machinery or manual handling of loads.

ISO 12604-1 specifies standard mass and dimensions requirements for baggage checked-in by airline passengers to be carried into aircraft cargo holds.

ISO 12604-3 covers ergonomic design requirements for baggage handling workstations.

Aircraft ground handling — Checked baggage —

Part 2: Handling requirements and guidelines

1 Scope

This document specifies the requirements of baggage handling for individual pieces of baggage checked-in by airline passengers at airports to be carried into aircraft cargo holds.

This document applies to all manual handling workplaces in the processing chain for sorting, safety handling and routing of the baggage (containers and bulk baggage, departure and arrival circuits, at terminal and at aircraft, excluding passenger check-in process).

This document does not specify the baggage handling systems in and out of airport terminals, except the baggage weights and dimensions to be handled, and the critical characteristics of manual workstations.

This document does not specify the aircraft loading system.

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 11228-1:2021, *Ergonomics — Manual handling — Part 1: Lifting, lowering and carrying*

ISO 12604-3:2022, *Aircraft ground handling — Checked baggage — Part 3: Workstation ergonomics*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
handling company
carrier, contracted service provider or airport authority that performs all or part of baggage handling, including loading/unloading it into/from aircraft, at an airport

3.2
baggage gripping ideal criteria
set of characteristics required for a *piece of baggage* (3.3) to be deemed ideal for gripping

Note 1 to entry: The criteria are specified as follows: the piece of baggage can be grasped with both hands, with a firm grip, neutral wrist position less than 0,25 m between the centre of mass of the piece of baggage to be handled and the centre of mass of the *handling agent* (3.8).

3.3
piece of baggage
bag, suitcase, trunk or similar article travelling with a checked passenger and containing items necessary for the passenger's journey, such as clothing and personal articles within certain limitations in accordance with the applicable carrier conditions of carriage, that is accepted and checked-in for loading and carriage aboard the same aircraft

Note 1 to entry: It does not include freight, express cargo, courier mail, or unaccompanied piece of baggage travelling as freight.

3.4
standard baggage with specific characteristics
piece of baggage (3.3) that meets mass and dimensions requirements of standard baggage, but with some characteristics that involve stress for conveying and/or handling (e.g. spherical piece of baggage, fragile, light, very small piece of baggage)

3.5
baggage with demanding handling
piece of baggage (3.3):

— that exceeds the mass or dimensions limits;

— whose characteristics do not satisfy *baggage gripping ideal criteria* (3.2) (cannot be grasped with both hands, etc.);

— that is oversized.

Note 1 to entry: The mass and dimensions limits are defined in ISO 12604-1. The piece of baggage considered as "heavy" is identified by a specific label.

3.6
cart
bulk load trolley used for baggage conveyance

3.7
contingency
dysfunction or unexpected event that disturbs an intended process or organization

3.8
handling agent
personnel responsible for baggage handling

3.9
operator
company or people using airport facilities and equipment

3.10
departure workstation
workstation where pieces of baggage are processed before departure

3.10.1
spout down
inclined plane receptacle intended for baggage retrieval

3.10.2
pier
linear conveying system (belt or rollers) for accumulating baggage for purposes of retrieval

3.11
arrival workstation
workstation where pieces of baggage are dispatched after arrival

3.11.1
carousel
flat or inclined and circular crescent chain

Note 1 to entry: Baggage circulates in a closed circuit.

3.12
out-of-circuit workstation
auxiliary workstation
workstation where pieces of baggage are not in the main stream

3.12.1
security inspection
check of pieces of baggage using x-ray, manual or other equipment, in order to move away any item or *piece of baggage* (3.3) which is prohibited for transport

3.12.2
manual indexing station
barcode reading through handheld scanner or manual keyboard entry

3.12.3
drop area
temporary storage
storage area for pieces of baggage waiting to be processed

3.12.4
passenger baggage reconciliation security procedure
baggage removal from the circuit for positive identification by its owner or *security inspection* (3.12.1)

4 Requirements and recommendations

4.1 General

4.1.1 The different characteristics of piece of baggage encouraging specific processing

The standard piece of baggage characteristics are defined in ISO 12604-1:2017, 4.1.

Handling of standard pieces of baggage with specific characteristics or baggage with demanding handling by an airport mechanized system often proves to be difficult. Everything should be implemented to ensure the conveyability of these pieces of baggage. If no solution is found, they shall be handled through a specific circuit.

Protective plastic films enrolled around individual pieces of baggage may hide the handles of the pieces of baggage. Thus, provisions should be developed to ensure the release of the handles.

4.1.2 The different workstations concerned

The handling requirements and recommendations in this document are applicable to the different workstations occupied by handling agents, listed hereafter:

— departure workstations:

  — spout down,

  - pier;
- arrival workstation:
  - carousel;
- out-of-circuit workstations:
  - security inspection,
  - manual indexing station,
  - drop area,
  - passenger baggage reconciliation security procedure.

4.2 Conditions required for an acceptable manual handling

4.2.1 Risk evaluation method related to baggage handling conditions

Handling conditions depend on several factors that shall be estimated in accordance with ISO 11228-1:2021, 4.2.1. It is thus possible to know whether manual handling is acceptable based on a 3-step assessment. Figure 1 describes the step-by-step analysis.

Handling is assessed according to various criteria depending on one another. If the values observed are below maximum acceptable values for one step, the next one can be assessed. Otherwise, handling is not acceptable; and it is thus unnecessary to evaluate the other criteria through the following step, because mitigation action measures are already needed.

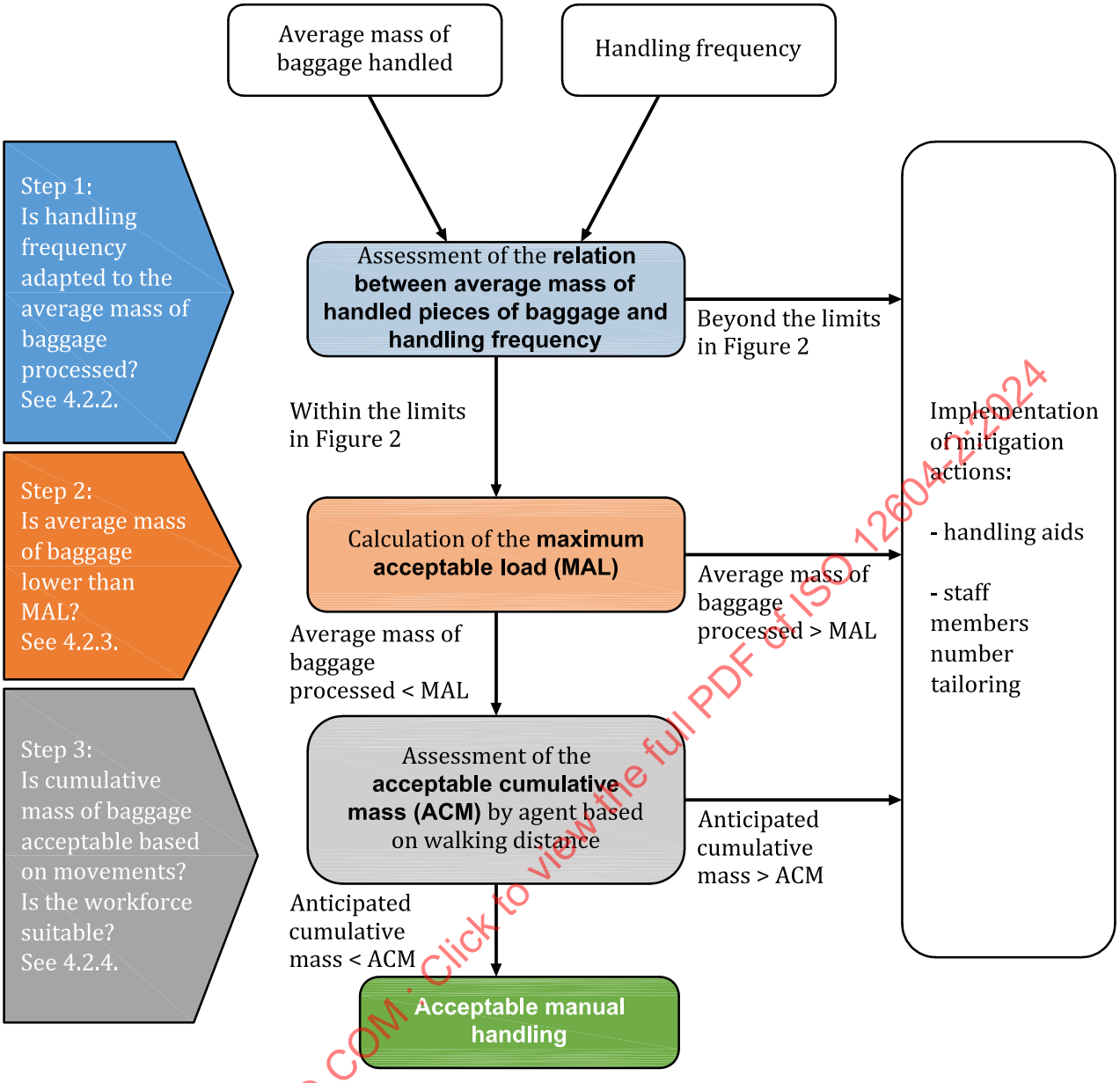


Figure 1 — Handling conditions evaluation of a handling agent according to ISO 11228-1:2021, 4.2.1

If observation data of the handling agents' tasks are below the maximum values, at every step of the process, manual handling is considered acceptable.

This risk evaluation method related to baggage manual handling conditions is only applicable to processing of pieces of baggage having a standard weight, i.e. lower than 23 kg.

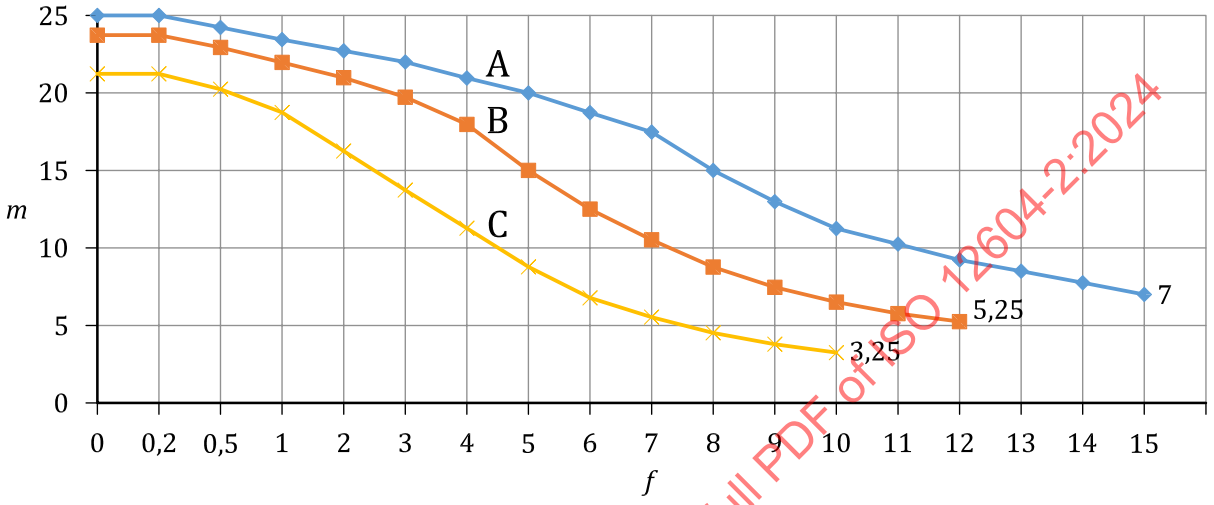
Heavy pieces of baggage shall be handled by agents with mechanical assistance tools suited for this type of handling, or by at least two people. However, handling by several individuals involves additional challenges that can occur when some staff members have their sight or movements obstructed by other members, and when the object has an insufficient number of hand grips.

4.2.2 Step 1: Handling frequency and anticipation of load

4.2.2.1 General

The recommended upper limit for frequency of handling depends on the mass of the handled object. When the couple (frequency of lifting/handled mass) is above the curve corresponding to handling duration (Figure 2), adaptation is necessary.

The analysis of the activity of the operators should be carried out considering the different working situations during a daily shift.



Key

m mass (kg)

f frequency (number of lifts per minute)

A handling duration less than 1 h

B handling duration from 1 h to 2 h

C handling duration from 1 h to 8 h

Figure 2 — Maximum frequency for manual lifting related to mass of the object in ideal conditions, for three different lifting durations

4.2.2.2 Handling frequency

In the event of a handling agent whose main activity consists in handling baggage (B curve), the number of pieces of baggage extracted from carts/containers shall not exceed 10 per minute. This frequency shall be adapted to the mass of baggage processed: not more than two per minute for 17 kg pieces of baggage, not more than one every 5 min for 21 kg pieces of baggage (see Figure 2). One piece of baggage handled several times is accounted as an additional piece of baggage each time it is handled.

The weight of each piece of baggage is unique. Nevertheless, the average weight is quite identical for recurrent flights (type of aircraft, destination, rate of occupancy). Therefore, periodic surveys should be carried out to calculate the mass to be considered in the risk assessment.

4.2.2.3 Limit of multiple handling operations of a same piece of baggage

In order to avoid handling several times a same piece of baggage, the number of pieces of baggage that are not processed automatically or excluded from the system (rejects, additional security inspection, etc.) shall be limited by:

— avoiding tag reading contingencies (dual label at check-in, etc.);

— reintroducing, upstream from the gallery circuit, pieces of baggage excluded from the system; this reintroduction shall use conveyor belts to avoid any handling;

— integrating all the security equipment into the processing circuit;

— making standard baggage with specific characteristics conveyable (i.e. use of trays);

— integrating an early baggage (advance check-in, long connections, etc.) storage system in the processing circuit;

— defining a specific circuit for managing and carrying non-conveyable baggage onto/from the aircraft;

— ensuring the availability of baggage carts and airline ULD to avoid double handling of the same piece of baggage;

NOTE ULD are carried on trailers dedicated to baggage conveyance and loaded in the aircraft.

— controlling the pieces of baggage loaded in carts, ULD and aircraft holds to perform a swift search and offload when required;

— ensuring transit baggage is planned and loaded separately on the aircraft;

— providing baggage slides on the passenger boarding means or alternative measures so as to prevent handling of unaccepted pieces of baggage by using stairs.

Baggage reconciliation procedures that spare agents several handling operations (e.g. putting the pieces of baggage down to peel-off its label, and then taking it back to place it in the relevant cart/container) should be favoured.

4.2.2.4 Baggage processing tools/spatial organization

Teams' organization of work should help make a sufficient number of empty carts/containers available and regular evacuation of full carts/containers. This avoids temporarily putting down pieces of baggage waiting for an available cart/container, and therefore limits the number of handling operations.

The workstations shall be implemented so that the locations of the parking areas for the carts/containers to be filled create a minimum of demanding postures and walking distances. See ISO 12604-3.

4.2.2.5 Limitation of time pressure and leeway

Handling frequency can be compounded by time pressure stress. In order to limit this time pressure and deal with “degraded” situations (flight delay, absent agent, peaks of activity, pieces of baggage to process at the last minute, etc.):

— agents should be allowed to adapt their rest periods to the activity;

— anticipation should be favoured through giving the agents the whole profile of the tasks to be carried out from the beginning to the end of the vacation;

— the legibility of labels at a minimum of 1 m (font size for information) should be ensured;

— the possibility of using a back-up mode should be anticipated, in case of system failure, so as to spread the handling of pieces of baggage.

4.2.2.6 Acceptability of the handling frequency criterion

When the couple (handling frequency/handled mass) is below the curve corresponding to handling duration (Figure 2), handling based on the handling frequency criterion is considered as acceptable. It is therefore possible to assess the next criteria: step 2.

4.2.3 Step 2: Maximum acceptable load (MAL)

4.2.3.1 Calculation of the maximum acceptable load

The maximum acceptable load depends on baggage handling conditions. The more distant the handling conditions are from the ideal criteria, the lower the maximum acceptable load is. ISO 12604-3 describes the most suitable conditions for baggage handling. The following shall particularly be implemented:

— conditions to avoid obstacles between the handling agent and the piece of baggage. The agent shall be able to be in contact with the piece of baggage;

— conditions to help grip and put the piece of baggage down at a convenient height.

For these optimal handling conditions, MAL shall be 23 kg.

Otherwise, MAL shall be reduced.

In case of obstacle preventing the handling agent from being in contact with the pieces of baggage to be lifted, the MAL should be reduced. Table 1 gives guidelines to be considered.

Table 1 — Maximum acceptable load based on the distance between the handling agent and the pieces of baggage

Distance between handling agent and pieces of baggage	Percentage of reduction of MAL	Calculated MAL
On contact and up to 25 cm	0 %	23 kg
30 cm	16 %	19 kg
50 cm	50 %	11,5 kg
65 cm	100 %	0 kg

Should the handling agent execute a rotation by over 90° with the pieces of baggage (conveyor-belt/cart/container), MAL shall be reduced by 30 %.

Should the handling agent lift by over 55 cm the pieces of baggage without assistance, MAL shall be reduced by 10 %.

Those criteria of handled mass limitation are cumulative.

When the mass of the handled pieces of baggage is higher than the MAL, the work situation should be adapted by modifying the mass, frequency and duration of lifting (staff dimensioning), and handling conditions in order to move towards the baggage gripping ideal criteria.

Some assistance means for baggage handling can improve these conditions if they meet different criteria.

4.2.3.2 Characteristic of departure workstations

MAL shall be reduced for departure workstations where handling aid according to ISO 12604-3:2022, 4.2.2 is not provided, due to postural stress (movements, high distance between the trunk and the load at putting it down onto the bottom of the carts/containers, inadequate grips, poor contact with the floor, etc.).

4.2.3.3 Acceptability of the MAL criterion

If the average mass of handled baggage is lower than the calculated MAL, handling based on the MAL criterion is considered acceptable. It is therefore possible to assess the next criteria: step 3.

4.2.4 Step 3: Acceptable cumulative mass (ACM) and walking distance

4.2.4.1 Calculation of the ACM

If handling criteria assessed in the previous steps have been considered acceptable, the ACM of handled baggage shall be assessed. The assessment shall be carried out on the walking distance during handling.

If the movements are less than 20 m, the acceptable cumulative mass is maximum 10 000 kg per day (8 h). If the movements are more than or equal to 20 m, it shall be less than 6 000 kg per day (8 h).

When the cumulative mass of baggage processed is more than 10 t per agent and per day with no walk exceeding 20 m during handling, or 6 t with load walk exceeding 20 m, the task should be adapted by modifying the mass, frequency, duration of lifting, staff dimensioning, and handling conditions in order to move towards the optimal conditions. Some assistance means for baggage handling can improve these conditions if they meet different criteria.

4.2.4.2 Staff dimensioning and acceptable cumulative mass per handling agent

Number of handling agents shall be dimensioned based on the number and type of baggage to be processed. Size of the team shall be defined:

— based on ACM;

— by anticipation of the baggage weight to be processed;

— depending on the infrastructure (flow, automation, etc.).

The method described hereafter enables the staff assigned to be dimensioned according to the number and type of baggage to be processed, in order to respect the maximum acceptable values of handled mass, per flight on one vacation.

The maximum number of pieces of baggage that can be handled per agent and per hour should be calculated as follows:

$$N_{max} = m_{ac} / m_{a8}$$

where

N_{max} is the maximum number of pieces of baggage that can be handled per agent and per hour;

m_{ac} is the ACM;

m_{a8} is the average mass of pieces of baggage processed in 8 h.

The cumulative mass of baggage anticipated for a given hour should be calculated as follows:

$$m = m_{f1} + m_{f2} + \ldots$$

where

m is the anticipated cumulative mass of baggage;

m_{f1} is the anticipated cumulative mass of flight 1;

m_{f2} is the anticipated cumulative mass of flight 2.

The anticipated cumulative mass for each flight is calculated as follows:

$$m_f = m_{fa} \times n_1$$

where

m_f is the anticipated cumulative mass of the flight;

m_{fa} is the average mass of baggage on this type of flight;

n_1 is the anticipated number of baggage for the flight for a given hour.

It is therefore necessary to specify, for each gallery (based on its configuration), the team size to be provided in relation with the average mass and number of baggage. The number of team workers thus can be anticipated by making the following calculation:

$$N = m_h / n_2$$

where

N is the number of agents to be provided for a given hour;

m_h is the anticipated cumulative mass of baggage for this hour;

n_2 is the maximum number of baggage that can be handled per agent and per hour.

This number of workers assumes that each agent carries the pieces of baggage only once, which is not always the case. A process requiring a double handling of load implies that the number of workers should be multiplied by two.

The design of the departure workstation should balance the individual working conditions, the adequate size of the working team and the space needed to perform the work safely, in accordance with ISO 12604-3:2022, 4.2.2.

EXAMPLE 1 Maximum number of pieces of baggage that can be handled per agent and per hour.

For a gallery whose handling conditions meet the previous criteria (steps 1 and 2) for which the handling agents do not need to walk during handling, Table 2 applies.

Table 2 — Maximum number of pieces of baggage that can be handled per agent and per hour without walking whilst handling (acceptable cumulative mass from 10 000 kg maximum per day)

Average mass of baggage on flights processed	For an 8-hour vacation	Ratio
8 kg	1 250 pieces of baggage maximum	156 pieces of baggage maximum per agent/hour
10 kg	1 000 pieces of baggage maximum	125 pieces of baggage maximum per agent/hour
15 kg	666 pieces of baggage maximum	83 pieces of baggage maximum per agent/hour

EXAMPLE 2 Maximum number of baggage that can be handled per agent and per hour.

For a gallery whose handling conditions meet the previous criteria (steps 1 and 2) in which the agents have to walk whilst handling (20 m and more), Table 3 applies.

Table 3 — Maximum number pieces of baggage that can be handled per agent and per hour when walking 20 m and more whilst handling (acceptable cumulative mass from 6 000 kg maximum per day)

Average mass of baggage on flights processed	For an 8-hour vacation	Ratio
8 kg	750 pieces of baggage maximum	93 pieces of baggage maximum per agent/ hour
10 kg	600 pieces of baggage maximum	75 pieces of baggage maximum per agent/hour
15 kg	400 pieces of baggage maximum	50 pieces of baggage maximum per agent/ hour

Cumulative mass of baggage anticipated for a given hour:

— number of baggage for a given hour: 233;

— average mass of a piece of baggage: 15 kg.

Number of agents to be provided:

For a gallery configured according to the ISO 11228-1 and in which the agents walk less than 20 m with the baggage:

— number of agents to be provided = 233/83 = 2,8 i.e. three agents.

For a gallery in which the agents walk 20 m and more with the baggage:

— number of agents to be provided = 233/50 = 4,6 i.e. five agents.

4.2.4.3 Means for limiting movements

4.2.4.3.1 Spatial distribution of the tasks

The standard baggage circuit should enable to avoid human handling operations.

If handling tasks cannot be avoided, the cumulative mass handled manually by each worker during an 8-hour vacation should be lower than the ACM.

The working area in which the agent operates should not be too vast. It should be reduced when the agent carries a load. In case of movement with carriage of load (absence of automated facility, shifting of rejects, out of circuit, etc.), the cumulative mass of baggage processed by the agent shall be reduced (see 4.2.4.1 and 4.2.4.2).

In the event of walk with carriage of load, means of load movement should be set up, through suited flow paths, intended to transfer them in limited carriage duration (trolley, etc.). This criterion should thus be taken into account in the design and development of infrastructures. Working floors and paths shall be flat and without obstacles.

4.2.4.3.2 Oversized baggage processing

The oversized baggage processing area shall be accessible.

Distance between baggage retrieval points and baggage drop points should be limited.

If baggage retrieval and baggage drop points are far-off, the agent should be provided with assistance devices for handling and load movement.

If using of equipment is impossible (lack of space, etc.), the amount of baggage moved by the handling agent should be limited, or manual handling by two or more agents should be organized.