

Transfer Car Guidance and Safe Working Practices



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1. Foreword

This guidance has been prepared by PABIAC in consultation with the Health and Safety Executive.

2. Introduction

Over the years, there have been several incidents involving transfer cars within the corrugated board industry. Some of these incidents have resulted in individuals sustaining irreversible life changing injuries.

This guidance has been written by the PABIAC Corrugated Industry Delivery Committee to help identify the main hazards associated with continuous handling equipment and systems, specifically relating to safety on transfer cars. The guidance is aimed at supporting users of transfer cars in assessing existing controls and suggests practical control measures to help reduce the risk of injury.

Aimed primarily at health and safety practitioners, managers, supervisors, and users of transfer car. This guidance highlights the main health and safety issues to consider and assess when purchasing, installing, operating, and maintaining transfer cars.

While it can be used to conduct workplace inspections, the risk assessment / hazard identification table is not intended to be a substitute for a suitable and sufficient risk assessment. However, when using the table to identify current risk reduction measures against the guidance set out in this document, the process may lead to a review of your existing risk assessments and controls.

3. Transfer Car Hazards

Transfer cars have a number of hazards with the potential to cause harm, i.e., crushing, shearing, entanglement, drawing in, impact, and slip, trip or fall injuries. In addition, there is the potential for injuries to be caused by falling, jammed or trapped objects; as well as hazards associated with the layout of the systems and its interface with other equipment and activities, these include:

- Being struck by powered transfer cars.
- Being trapped between parts moving against, or past, one another or fixed parts.
- A trap, shear, in running nip point or impact between moving parts and or fixed structures.
- Being struck by falling objects.
- Being injured while trying to free objects jammed, trapped, or caught in the system.
- Falls from height.
- Stored energy.
- High pressure fluid ejection if hydraulic or pneumatic power is used.

NB: As part of managing health and safety within your business, you must ensure that control measures are implemented to prevent people being injured while working on or around machinery and equipment.

Within a corrugated plant, transfer cars are a critical part of the production process and as with any other piece of plant or equipment, the starting point is to identify all the tasks (routine and non-routine) where people can be exposed to moving transfer cars.

When reviewing these tasks and deciding upon your controls, use previous experience and incidents (including details of incidents from other sites), past accidents and near miss data including any procedural violations. Don't rely purely on PPE or a safe system of work as being a sufficient control. A simple modification to the task, i.e., additional safety features on the transfer car design, improved site layout or restricted access to transfer car lanes could prevent an injury.

In addition, ensure effective energy isolation and lock-off systems are in place, and managers / supervisors monitor compliance at suitable intervals to confirm that the controls and arrangements you have implemented are working.

4. How to use the guidance

To get the best out of the guidance it is advisable to take a team approach to identify any gaps or shortcomings with your existing safeguards. A typical team might include the production, engineer and safety manager, supervisor / team leader, safety/employee representative and most importantly the operators who intervene with transfer cars, or who work in the vicinity where transfer cars operate.

Using the risk assessment table as a guide and applying the hierarchy of control, consider each hazard in turn and ask yourself if your existing controls are sufficient to prevent an incident occurring and someone being injured.

Safeguards fall into a hierarchy of levels, and each must be considered in turn, beginning with the highest level of protection, and then working down the hierarchy, making use of the measures as far as is 'Reasonably practicable.' Combined measures from more than one level may be required to reduce the risk. However, the preference should always be to adopt the highest level of safeguarding possible.

To assist companies in following the process and applying the hierarchy, the guidance is supported by a comprehensive range of visual 'good practice' examples. These control measures are not an exhaustive list and there may be other effective controls which could be adopted.



The provision of information, instruction, training, and supervision is an additional measure to the levels of the hierarchy and compliments each one.

For full descriptions of the types of safeguards please see the Provision and Use of Work Equipment Regulations Approved Code of Practice 1998.

Within the document there are references to British, European and International Standards relevant to transfer cars. Standards are periodically reviewed and updated. For the most up to date information refer to the British Standards Institute (BSI).

5. Definitions

Audible alarm

horn, bell, or other distinctive audible warning device that sounds to indicate impending machine motion.

Conveyors

a continuous conveyor for the transportation of material units, such as corrugated board stacks or sheets. The carrying mediums can be rollers, plastic chains, or belts. The feeding conveyor is used for the transportation of corrugated board stacks from the corrugator to the converting machines or from the converting machines into the storage area. (Ref: BGI 854)

Distance guard

guard which does not completely enclose a hazard zone, but which prevents or reduces access by virtue of its dimensions and its distance from the hazard zone, for example perimeter fence or tunnel guard.

Enclosed guard

guard which prevents access to the hazard zone from all sides (EN ISO 14120:2015)

Electro-sensitive protective equipment (ESPE)

assembly of devices and/or components working together for protective tripping or presence sensing purposes and comprising as a minimum

- a sensing device;
- controlling/monitoring devices;
- output signal switching devices and/or a safety-related data interface.

Fixed guard

guard affixed in such a manner (for example, by screws, nuts, and welding) that it can only be opened or removed by the use of tools or by destruction of the means by which the guard is affixed.

Guard locking device

device intended to lock a guard in the closed position and linked to the control system.

Hazard potential source of harm.

Hazardous event an event that can cause harm.

Hazard zone

any space within and/or around machinery in which a person can be exposed to a hazard

Hold-to-run control device

control device which initiates and maintains machine functions only as long as the manual control (actuator) is actuated.

In-running nip

area created either by two rotating components that are rotating inward, or by one component rotating toward an adjacent surface.

Interlocking device

mechanical, electrical, or other type of device, the purpose of which is to prevent the operation of hazardous machine functions under specified conditions (generally as long as a guard is not closed).

Interlocking guard

guard associated with an interlocking device so that, together with the control system of the machine, the following functions are performed:

- the hazardous machine functions "covered" by the guard cannot operate until the guard is closed;
- if the guard is opened while hazardous machine functions are operating, a stop command is given;
- when the guard is closed, the hazardous machine functions "covered" by the guard can operate (the closure of the guard does not by itself start the hazardous machine functions).

Pressure-sensitive protective device

sensitive protective equipment of the "mechanically activated trip" type intended to detect the touch of a person or body part of a person, and which can also act as impeding device.

RFID key system

transponder based RFID access / security control system.

Transfer car

movable cars with installed manually or power-driven conveyors for the transportation of material units to be conveyed. These material units are taken over from a continuous conveyor, are moved laterally and are discharged to another continuous conveyor or another machine or vehicle.

NB: There are fully automatic transfer cars as well as transfer cars driven by operators:

- automatic mode operating mode where no operator intervention is required for operation.
- manual mode operating mode where all operations are under the control of an operator

Trapped key interlock device

device, part of a trapped key interlocking device, which fulfils a function by trapping or releasing one or more keys in a given system.

Transfer Car Risk Assessment Table

Hazard Area	Hazard	Hazardous event	Potential Consequences
		Transport of corrugated stacks (Transfer car movement)	
Transfer car lanes / routes Cross over passageways Transfer car standby areas Transfer car maintenance areas	Struck by moving transfer car	 Risk of being hit and / or run over if physically exposed to a moving transfer car. Risk of being hit and / and or run over if undertaking work i.e., maintenance work in the area and the transfer car is active. Risk of being hit and / and or run over if TC lanes are used as walkways, throughfares. Risk of being hit and / and or run over if TC lanes are used as routes to deliver materials to machines or conveyor lines. Risk of being hit and / and or run over if engineering or maintenance work is being undertaken in TC lanes or within 1.5m of the lane. i.e., working on or near conveyors. 	Amputation Crushing of limbs Fracture Laceration Bruising Puncture wounds
As above	Struck by moving transfer car	 Risk of crushing and / or shearing between the moving transfer car and the conveyors / shear points in the event of a person standing close to the transfer car or a person walking into a lane unexpectedly from the side. 	Amputation Crushing of limbs Fracture
As above	Struck by moving transfer car	 Risk of crushing and / or shearing between moving transfer car against any fixed equipment / structure. 	Amputation Crushing of limbs Fracture
As above	Struck by moving transfer car	 Risk of crushing and / or shearing between ground floor level and top level of fixed conveyors. 	Amputation Crushing of limbs Fracture
As above	Struck by moving transfer car	 Injury due to a collision between mobile equipment and the transfer car. 	Fatality Crushing of limbs Amputation Fracture

As above	Struck by moving transfer car	 Injury due to the failure of the safety related control system: - Light curtains, light sensors, scanners, or presence detection sensors are inappropriate for the application or incorrectly positioned. Safety scanners are not configured correctly. 	Crushing of limbs Amputation Fracture
As above	Struck by moving transfer car	 Unexpected start-up of the transfer car Retrieving fallen board from the transfer car lane / route or close to the conveyor edge 	Fatality Crushing of limbs Amputation Fracture
Transfer car platform	Fall from height	Fall from transfer car platform while attempting to step on / jump off a moving transfer car	Fracture Bruising Laceration
		Reception and delivery of corrugated stacks (Transfer car stopped)	
Conveyors	Contact with moving conveyors	 Impact and / or entrapments with moving parts of the machine / machine parts. 	Crushing of limbs Amputation Fracture
Conveyors	Slips, Trips and Fall	 STF of personnel on conveyors while intervening with stacks of board Risk of tripping and / or slipping on transfer rollers 	Fracture Bruising Laceration
Conveyors	Manual Handling	Repositioning of raw material on transfer car conveyor section	Lifting injury Strain / Sprain
Conveyors	Struck by moving product	 Risk of impact and / or entrapment by corrugated stacks Stacks of raw material / work in progress falling from the transfer car conveyor section / platform 	Crushing of limbs Fracture Bruising Laceration
General area, exposure to buzz bars	Electricity shock	Direct and indirect electrical contact risk	Electric Shock Electrocution

Transfer Car Hierarchy of Control Table

Hierarchy of Controls	Recommended Control Measure	Transfer Car Guidance Reference
Eliminate the risk	Eliminate transfer car use and replace with mechanical / conveyor systems	TC1
Isolate people from the hazard	 Install a combination of fixed guarding / ESPE to protect the restricted area Access to area is via a controlled gated entry – control philosophy in place to ensure that the transfer car <u>cannot operate</u> whilst there is activity / presence in the car cell. 	TC2 - TC6
Prevent contact with the hazard	• Ensure light curtains, light sensors, scanners (ESPE) or presence detection sensors are installed on the front and rear of the transfer car.	TC7
Prevent contact with the hazard	 Review safety scanner functionality and activation of the warning field to a safe limited speed. Optimize warning and safety zone detection field configurations ensuring the safety scanner matches the stopping performances of the transfer cars. Transfer cars to be fitted with two laser units which will scan above and underneath of the conveyor at a distance of at least 100 mm from the from edge of the conveyor. Any obstacle / person in the scanning area will slow the transfer car down and within a preset distance stop the car. If only one laser units is used and scanning underneath of the conveyor is not possible because the conveyors are completely covered, this area has to be safeguarded by a second laser scanner. This scanner has to scan the area above the conveyor by at least 100 mm. Implement a regular safety check regime for all critical safety devices in line with the manufacturers recommendations and risk assessment determined by ISO 13849-1: 2015 Safety related control systems. 	TC8 - TC14
Prevent contact with the hazard	 Operate a proximity alert system 2 UWB Antenna – located front and rear of transfer car to enable a complete detection zone within figure of 8 zone pattern. Output to activate transfer car and E-Stop function when within zoned areas. 	TC15 - TC18
Reduce the risk	 Isolate transfer cars if access is required in the transfer car lane to move materials to machines or undertake maintenance/ engineering work. Physical isolation to prevent any movement of the transfer car, supported by a Permit to Work and a Safe System of Work. 	TC19

	 Where any engineering / maintenance work is undertaken within 1.5m of the transfer car lane, in addition to the above, physical barriers must be in place to prevent inadvertent full or part body access to the TC lane. A management system must be in place to supervise and monitor compliance. 	
Reduce the risk	Install audible and visual warning systems on the front and rear of the transfer car.	TC20 - TC22
Prevent contact with the hazard	 Where it is necessary for pedestrians to cross a transfer car lane / route, identify and install defined crossing points along the route. Use the hierarchy of control to restrict access to the transfer car lanes, starting with guarding locking gates. Guard locking switches can be used which will lock the access gate closed until the transfer car is stationery and in a safe location. Prevent unwanted access to the transfer car's route / path by placing a minimum of 1,400 mm high fences. 	TC23 - TC28
Reduce the risk	 Review transfer car limit speed and reduce to < 18m/min Demarcate / identify floor areas to identify all transfer car lanes to highlight the hazard / danger that a transfer car is operating in the area. Display warning signs in prominent places near to the transfer car lanes 	TC29 - TC31
Prevent contact with the hazard	 To avoid a foot or body entanglement hazard between the transfer car and conveyor structures of corrugate stacks, identify all potential entrapment points. Ensure metal plates are fitted between all conveyor lines (i.e., work in progress lines), eliminating all gaps where possible. Remove all fixed elements on the transfer car from within 300 mm of its outer frame / contours. Ensure foam pads or diagonal vertical side metal plates are fitted on both sides of every conveyor leading to the transfer car lane >500 mm escape area for persons to step outside the route / route / path of the transfer car. Raise all floor areas to the same level as the conveyor and transfer car by installing working platforms. Operation of transfer car is within a protected area and controls cannot be reached from the conveyor section. 	TC32 - TC42
Reduce the risk	 Transfer car operating modes. Safe access and egress from the transfer car. Energy Isolation. 	TC43 - TC44
General info	 Safe System of Work (SSoW) in place outlining Lock-out Tag-out Try-out (LOTOTO) procedures. Risk assessment and SSoW for all routine and non-routine transfer car related tasks. Risk assessment and SSoW in place for all transfer car operational interventions. SSoW in place stipulating point of operation. SSoW in place stipulating transfer car inspection regime to be followed. Implement a recognised methodology to identify and reduce STF incidents. 	TC45 - TC46