

# **BIN-LIFTS AND WHEELED BINS ON WASTE COLLECTION VEHICLES: ACCIDENT RISKS, CASE STUDIES, AND NEW AND EMERGENT TECHNOLOGIES**

*This WISH reference document is aimed at health and safety improvements in the waste and recycling industry. It is linked to **WISH WASTE 04 SAFE OPERATION OF WASTE AND RECYCLING COLLECTION VEHICLES** but is not a formal part of that guidance. It gives information which may assist you when making your decisions, such as when producing risk assessments, during procurement processes etc. The case studies in this document may help you but you will need to decide how you will do things yourself.*

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*This reference document was originally produced in 2019 simply as a series of accident case studies relating to the use of bin-lifts on the rear of RCVs and similar vehicles. This updated 2026 version 2 retains these case studies as appendix 1 (see appendix 1 for their use). However, the main part of this reference document now concentrates on case studies and commentary on some of the new/emergent technologies aimed at accidents involving the use of bin-lifts in automatic mode which have come to the market since the original REF 02 was written and/or are under development.*

## Introduction and scope

Wheeled refuse collection containers (both domestic 'wheelie bins', and larger trade waste bins, as defined in BS EN 840) and vehicle mounted bin-lifts have been in use in the UK since the mid-1980s. Despite technological developments and collective experience with this equipment, significant numbers of serious accidents, including deaths, still occur. Over recent years the risks associated with bin-lifts on RCVs (refuse collection vehicles – bin lorries) used in automatic mode have been a particular focus of attention.

The first part of this reference document looks at three new/emergent technologies (beam/scanning systems, wearables/tags, and image recognition/AI camera systems) specifically aimed at reducing the risks associated with RCV bin-lifts used in automatic mode. This section may be of particular use to those seeking to procure new vehicles or modify existing ones. The second part (appendix 1) covers other accident risks related to bin-lifts presented as a series of accident case studies on these risks.

**Note.** All the various technologies discussed below can either be provided on RCVs when purchased from new or retrofitted to existing vehicles. In some ways specifying from new can be more desirable. For example, when fitted from new the system should be 'certificated' as part of the overall conformity assessment and certification for the vehicle and its equipment. If retrofitted a formal assessment of whether a new hazard/s has been created, or any existing risk increased, should be conducted. If such a new hazard/s has been created and/or an existing risk increased, the modification may be regarded as substantial and the system may need to be re-conformity assessed and certificated, including its interface with existing control systems, and to ensure that an appropriate 'safety performance level' is reached. This issue is discussed at question 9 in WISH REF 13 'safe use of automatic bin-lifts FAQs sheet', available at: [WISH REF 13](#).

**Tip.** The purchase of new vehicles and retrofitted systems can sometimes be seen as purely a 'procurement' task. However, there is a value in including operational input. Involving collection operatives in the decision-making process can also have a value – in-the-end it is collection operatives who will use the bin-lift and its systems, and collection operatives may have practical and other knowledge which you do not have. Employee engagement can also be valuable during monitoring, such as in the first few weeks after a new vehicle/system is put into use – are operatives having any problems/issues with the system, are there practical considerations which have not been accounted for etc?

## Linked WISH documents

This reference document should not be read on its own. Rather it should be considered alongside other relevant WISH documents, in particular:

**WISH WASTE 04** – ‘Safe operation of Waste and recycling collection vehicles’, available at [WASTE 04](#)

**WISH INFO 10** – ‘Safe use of refuse collection bin lifters and bins’, at [INFO 10](#)

**WISH INFO 26** – ‘Safety in the operation of automatic bin lifting equipment on RCVs’, available at [INFO 26](#)

**WISH REF 13** – ‘FAQs sheet – Safe Use of Automatic bin lifts on RCVs’, at [REF 13](#)

As with all WISH documents, the above are all free downloads from the WISH website.

**Note.** *WISH cannot and does not endorse or recommend any specific technology or supplier over any other. The text below is not comprehensive and is simply intended to provide you with information which can be used as an input into your decision-making process and does not constitute any form of recommendation or endorsement. You will still need to make your own decisions.*

**Note.** *The information provided below represents the current ‘state-of-the-art’. Over time the technologies discussed will undoubtedly develop, additional features may be added, other technologies than those considered below may come to the market etc. You need to take this into account in what seems likely to be a developing market.*

## New and emergent technologies

Following a series of serious accidents, and at least two fatalities, the risk of inadvertent activation of RCV bin-lifts used in automatic mode resulting in persons being lifted by/entangled in the lift leading to injury or worse is a current high-profile topic. Details of the risks and other information are given in WISH INFO 26, available at [INFO 26](#). Initial moves to address this issue by physical control measures, in addition to improved training, awareness etc, have tended to fall into two broad categories:

- Modifications to existing control systems. For example, introducing a 'pause' during the lift-cycle during which the system checks there is still a bin clamped in the lift
- Adding more and/or changing the orientation/plane of lift activation sensors/switches to reduce the risk of a person inadvertently activating the bin-lift mechanism

While measures such as the above can provide a risk reduction, they tend to have flaws and/or do not address all the relevant risks. For example, a modification to a control system may stop a RCV's compaction mechanism if a bin is not detected in the lift clamp. This addresses the risk of a person being crushed in the compaction mechanism but may not address the risk of entanglement in the lifting equipment itself. In addition to the above control system and sensor modification approaches, since the writing of the original version of REF 02, three new/emergent technologies and/or new applications of existing technologies have come to the market and/or are being trialled:

- Sonic, LIDAR etc beam/scanning and similar systems
- Wearable/tag sensor systems
- Image recognition camera systems (commonly, and often incorrectly, called AI camera systems)

The section below provides an overview of these new/emergent systems, their 'pros-and-cons', and gives case studies on their use. The aim being to provide information to those considering these systems on new RCVs or as a retrofit to existing lorries.

### Beam/scanning systems

These systems typically use a 'beam' which scans the bin-lift 'danger zone', such as a sonic, LIDAR or similar beam. In basic terms the system is usually 'looking' for something which is taller than a bin, such as an adult human being. If the system detects something taller than a bin the bin-lift enters a safe mode of operation.

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The height the beam/scanner is set at is typically a key issue. For example, overfull bins with partially open lids ('grinning/top-hatted' bins) may cause false activations if the beam is set too low, but conversely the beam needs to be set not too high to be effective. Beam/scanning systems which look for something which is taller than a bin may also fail to detect people who are shorter than average. For example, a child who approaches a RCV out of curiosity etc.

Beam/scanning systems sensors tend to be mounted fairly low on the rear of a RCV, so that they can scan across the top of a bin. As a result, they may be prone to damage and/or may need frequent cleaning. In addition, LIDAR and similar systems can fail because of their susceptibility to environmental interference, such as heavy rain, snow, fog, or dust, which can scatter the beam and create inaccurate 'ghost' images. Those considering fitment of a beam/scanning system may want to discuss this type of issue with their potential supplier.

Because of their nature (they do not directly differentiate between a bin and a person) beam/scanning systems should usually be considered as a risk reduction measure. This is not to say that they cannot be effective. However, it is known that at least one supplier has decided not to pursue such systems because of issues encountered during tests and that the system was not as effective as hoped for/did not reduce risk sufficiently. Conversely, other suppliers are seeking solutions to this type of issue to produce more effective beam-type applications. As noted above, this is likely to be a developing market.

## Wearables/tag systems

These systems are already in use at some waste sites, and have historically been regarded as secondary safety devices, or safety 'aids', rather than a primary means of protection. For example, fitted on heavy mobile plant as a pedestrian safety measure at tipping floors (pedestrians wear tags which the system fitted to mobile plant can detect). Their use and reliability in this type of application have been accepted over time – some companies specify that their mobile plant used in areas where pedestrians may be present comes fitted with wearables/tag systems. However, their use with RCV bin-lifts is a fairly recent development.

Collection operatives wear a 'tag' attached to or sewn-into their high-visibility clothing or similar. The tags can be transceiver type, RFT (radio frequency tagging) or other. The system 'looks' for the tags and if a person wearing a tag is detected in the 'danger zone' the bin-lift will not operate/not operate in automatic mode, or if someone enters the danger zone during a lift-cycle the lift stops/enters a safe mode of operation.

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As noted, wearable/tag systems have been in use for years and are known technology, albeit their use with bin-lifts is a fairly new development. Wearables/tag systems can have flaws and/or additional requirements. For example, transceiver tags usually require daily battery checks to ensure tags are still working – a discharged or low charge battery may cause signal failure. Conversely, RFT tags, generally, do not require charging. There have also been concerns about tag systems because of potential signal interference resulting in a ‘fail to danger’ (this issue is highlighted specifically in the EU restriction on the standard EN 1501-5).

One known potential flaw is that these systems typically only protect a person wearing a tag – if someone who is not wearing a tag, such as a member of the public, enters the danger zone the system cannot detect them and does not ‘know’ they are there. In brief, such ‘simple’ tag systems may ‘fail to danger’. To address this issue some tag systems work in a ‘positive-negative’ manner. These systems require two conditions to be met before the bin-lift will operate: that no one wearing a tag is in the danger zone AND that someone wearing a tag is in a designated zone, such as at the lift’s control panel, with a clear view of the lift. This means that if someone such as a member of the public enters the danger zone and an operative wearing a tag is not at the designated zone the lift will not operate. Or, if an operative is at the designated zone they can see the member of the public and act, such as by activating an emergency stop, although in this case human input is required.

The above type of tag system may be susceptible to being defeated. For example, by taping or otherwise fixing a spare tag onto the control panel so that the system ‘thinks’ someone is always in the designated zone. Such malpractice can usually be discovered by data analysis and vigilant monitoring. What a supplier has done to assess potential malpractice and prevent it is a valid question to be asked during procurement. Good levels of compliance monitoring and additional training are also likely to be required. HSE guidance note INDG392 advises that such ‘personnel detection systems’ are software devices and should only be considered as secondary safeguards.

If you are considering a wearable/tag system you should ask your potential supplier questions regarding how the system works (such as does it work in a positive/negative manner), what residual risks may remain, any additional training requirements, reliability of the system etc. You will almost certainly also have to conduct additional awareness and instruction training with your collection operatives. Conversely, tag systems are tried-and-tested technology, typically are low maintenance and do not require frequent cleaning and generally are known to be robust in waste and recycling applications. However, be cautious that manufacturers may describe them as a “safety aid” placing ongoing responsibility on the vehicle driver.

**Case study.** A tag-based detection system has been in routine operation for more than two years with a commercial waste operator and more than a year with a local authority. Feedback is that the system has operated well in all weather conditions, on various collection rounds, and has been retrofitted on different OEM vehicles and bin lifts. Across 6,678 operational days, the system has recorded 249,000 automatic interventions to prevent bin-lift movement when a crew member entered the danger zone - around one intervention every 13 minutes. Data gathered over the period indicates improvements in crew behaviour. Entries into the danger zone reduced by 75% on the first collection round it was used on, and the local authority reported an overall 59% reduction over seven months. Reports are that these interventions did not affect overall collection times and crews have reported the system is unobtrusive in day-to-day work. Because the system relies on tag serial numbers, the resulting data allows identification of behavioural patterns without the need to sift through recordings of visual information. This enabled operators to identify trends, including specific times of day, days of the week, or locations where unsafe entries are more common and to target training or supervision accordingly. For example, aggregated data shows that entries into the danger zone typically peak between 7–8 am and decline as the round progresses. The commercial operator has now mandated the system on all new collection contracts.

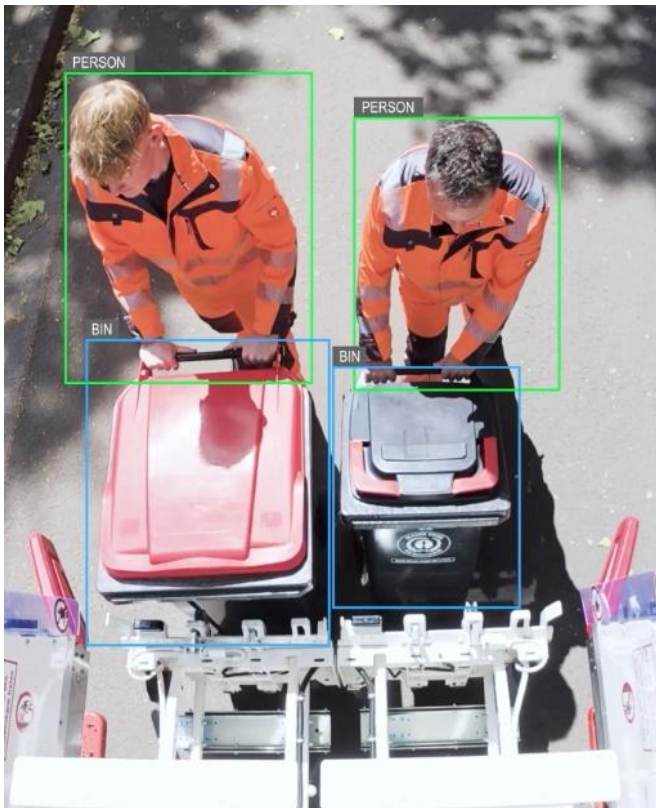
## Image recognition camera systems

These systems use a camera/s to look for 'human-shaped' objects. If the system detects a human-shaped object in the danger zone the bin-lift will not start, or if someone enters the danger zone during a lift the lift is stopped/reverts to a safe mode. This type of system has been in use for some time in non-waste applications. For example, on some public transport vehicles such as buses to detect pedestrians, cyclists etc when the bus is reversing, turning etc. Their use with RCV bin-lifts is, however, new.

The effectiveness of camera systems depends on how 'good' they are at recognising a human being, which itself relies on 'AI' database information. For example, if a person is partially obscured by an object such as a bin, or if a person's body shape is divergent such as a disabled person, or a small child (not only size but also relative limb to torso ratio), effectiveness in poor light conditions or during bad weather etc. Typically, the more developed/'experienced' a camera system is the better it is at recognising a person across a wide range of circumstances – their reliability is dependent upon the 'depth/width' of database recognition of 'what is a human'. However, one obvious advantage over wearable/tag systems is that camera systems are not reliant on a tag being worn by a person. The database should be a key consideration of the camera system manufacturer/supplier when determining the safety performance level of the overall system.

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In common with tag systems, camera systems can operate in a positive-negative manner, albeit differently. Some more advanced camera systems can be programmed to recognise both human beings and bins. With these systems a recognisable bin-shaped object needs to be in the danger zone (on the bin-lift) AND that there are no human-shaped objects in the zone (that the collection operative/s has stood-back from the bin) for the lift to operate in automatic mode. In other words, both conditions need to be met before automatic operation - no person present plus bin in place. The photograph below shows a still from a camera system differentiating between persons and bins.



Example of an image recognition camera system in use. The system recognises human-shaped objects (green outline noted as 'person') and bin-shaped objects (blue outline noted as 'bin'), preventing automatic bin-lift operation if a human-shaped object is in the danger zone and, in this case, if a bin-shaped object is not in the zone, the lift enters a safe mode of operation

Some more advanced camera systems use two cameras, to verify the image and prevent operation if there is a mismatch. If you are considering a camera type system you should ask your supplier questions such as regarding what is the systems 'safety performance level' (PLr) and their risk assessment which led to the performance level, how long the system has been in development and use, what experiences have other clients had with the system, how easy is the system to update based on data gathered and experience gained both by your own use of the system and other clients' use - is knowledge and experience shared by the supplier and used to refine and update the system?

**Case study.** Two local authorities in Northern England have been testing and operating an image recognition camera system since spring 2025, designed and installed on their RCVs by one of the main bin-lift suppliers. Feedback is that there have already been noticeable reductions in incidents and near-misses (one authority noted that they had experienced no new significant accidents or claims since the system was installed) and while it is still 'early days' that the expectation expressed by the customer was that the system will in the future establish itself as their 'safety benchmark' and provide significant positive safety improvements going-forward. Although the system is mainly aimed at preventing serious accidents, improvements have also been seen in minor and manual handling injuries. In addition, the technology has improved lift consistency by identifying bin alignment and positioning issues before the lifting comb engages, resulting in fewer incidents of bin and lifting equipment damage, and that the system can detect unsafe behaviours in real time allowing action to be taken promptly. Both authorities reported an initial 'running-in period' with refinements of the system being undertaken by the supplier, but that this was short and largely issue-free. Changes have also been seen in collection operative behaviour – as operatives have become more familiar with the system, and the danger and safe zone limits it operates within they are tending to work safer by avoiding activations of the system.

## Common issues

Some issues are common to beam, tag, and camera systems, and to many other types of system. For example, how does the system manage multiple bin-lifts (there have been serious accidents when a collection operative has been struck by or entangled in an adjacent lift to the one they are using), does the system prevent lifts lowering on a person who walks into the danger zone while the lift is raised, does the system 'fail-safe' if a fault is detected or a camera lens is blocked/dirty etc (at the least any fault or other problem should result in automatic mode being disabled leaving the lift to be operated in manual). In addition, there are often compatibility issues when retrofitting systems to older lorries. How to manage incompatibilities and older vehicles is covered in more detail in WISH INFO 26. If you are considering a beam, tag, or camera system you may want to ask your potential supplier about this type of issue, how they address them, and what is their experience of the effectiveness of the system (including, as relevant, as a retrofit to older vehicles), and over what time period has their system been operating.

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One common good point with many beam, tag and camera systems is that they often record 'events' such as activations of the system when a person is in the danger zone when they should not be. In effect, they can be used as automatic near-miss recording systems. Such data logging can be useful in demonstrating that procedures have been followed, targeting remedial training and monitoring activities have been conducted etc. Another advantage of this type of 'black box'/data logging capability is that the information gained can be used to update a system to make it more effective, and if shared with the supplier it can allow them to refine the technology and update the same system in use across other organisations, potentially including non-waste sector applications. In the event of an accident, such knowledge sharing and updating can also potentially help prove that you were keeping at the 'cutting-edge' of good practice and have done all you reasonable could do to reduce risk.

Whatever type of system is used, where manual loading, such as bagged waste, side waste etc, of an RCV is possible (or planned), it must be independently assessed by a 'conformity assessment body'. If a system is retrofitted, this body should be involved in the risk assessment to determine whether the modification is substantial and to provide reassurance that an adequate safety performance level has been reached.

One less beneficial common issue is that collection operatives can tend to become reliant on the system. For example, relying on the system to stop the bin-lift when performing tasks such as clearing debris from lift clamps, retrieving over-size objects from RCV load hoppers etc. Beam, tag, and cameras systems are not a replacement for isolation – bin-lifts must still be isolated before tasks such as the above are carried-out. Beam, tag, and camera systems are a back-up to isolation and not a replacement. You should be aware of this issue and incorporate it into your training and monitoring activities.

## Appendix 1. Other bin-lift accident case studies

The section above concentrates on new and emergent technologies aimed at the specific risk of inadvertent activation of RCV bin-lifters when used in automatic mode. This is not the only type of accident involving bin-lifts. The case studies below are all based on real accidents. In the same way as you would use your own accident records as an input to your risk assessment/s, you should also consider the below when compiling your assessment/s on the operation of bin-lifts and when assessing whether your controls are adequate.

### ***Case study - waste collector (loader) struck by bin, still attached to the bin lift, as it returns to ground level***

A refuse collection worker was at the vehicle's side mounted control panels when the raised bin lid fell off and struck the stop button on the other side of the vehicle. As he walked under the raised bin to release the stop button, his colleague released it from the other side of the vehicle and proceeded to lower the bin lifter. The collection worker was crushed between the bin and the ground, sustaining injuries as a result.

### ***Case study - waste collector struck by a bin falling from the bin lift***

A 1100 litre waste bin fell from a top loader bin lifter, killing the loader. Investigation revealed that, depending on the type of waste in the bin, the full weight of the bin may exceed both its own and the bin lifter's safe working load (SWL). Collectors require a simple method to determine if the total load of the bin and contents are within SWLs for both the bin and bin lifter. In addition, any incompatibility between the bin and bin lifter exaggerates the risk of the bin being released during the tipping cycle.

### ***Case study - waste collector entangled in bin lift during the tipping cycle***

A seasonal collection worker was seriously injured when he was crushed by the bin lifter as it descended. He may have been attempting to stop the hopper overflowing by pushing waste back into the hopper while the bin was tipped. Information, training, and supervision provided for seasonal workers should be suitable to ensure safe loading.

### ***Case study – waste collector crushed foot***

A refuse collection worker was seriously injured when his foot was crushed in the bin lifter of a refuse collection vehicle. He stood on the bin lifter clamp bar so that he could be raised to remove lodged waste that was preventing the vehicle compartment roof from closing. Systems of work were not suitable to ensure that jams in the hopper and bin lifter mechanisms were cleared safely. Information, training, and supervision was insufficient to ensure that a safe system was followed.

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## ***Case study – inadvertent activation of bin-lift in automatic mode***

In separate incidents two members of the public and a refuse collector were picked up by the bin lift clamp and dragged into the RCV hopper by an automatic bin lift. The injured persons were all seeking to deposit waste over the rave rail and into the hopper by hand. In leaning against, and, or, standing on the bin-lift mechanism they activated the automatic emptying cycle, the bin clamp gripped the clothing on their upper torso and dragged them up into the hopper. The systems of work failed to ensure that the members of the public could approach the vehicle; the system of work should have ensured that the automatic controls were deactivated when the vehicle was being manually loaded and the positioning and activation of the sensors should be configured to minimise the potential for such false activations of the bin lifting equipment. See also section above on new and emergent technologies.

## ***Case study - waste collector injured when releasing a waste bin 'hung up' on the bin lift, or lost in the back of the hopper***

A collection worker climbed onto the bin lifter to remove a waste bin that had fallen into the hopper when he slipped and fell from the back of a refuse collection vehicle. Collectors did not have clear instructions not to climb onto bin lifters, and the on-call system was not able to provide backup staff to deal safely with such problems. Monitoring and supervision were not sufficient to ensure safe systems of work were adhered to.

## **Other accidents recorded**

While no case studies are provided, and outside of bin-lift related accidents, other accident types recorded during collections activities which you may need to consider in your decisions and risk assessments include:

- Collectors injured when moving waste bins to or from storage to the collection vehicle
- Collectors and members of the public struck by reversing vehicles
- Collectors and members of the public struck by vehicles moving forwards
- Workers injured when they fell while riding on the outside of a moving vehicle
- 'Sleepers in bins' risks (see WISH WASTE 25 'Managing access to large waste and recycling bins' available at: [WISH WASTE 25](#))

See the list of linked other relevant WISH documents provided above for more information.