

Safe Use of Dumpers



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Strategic Forum for Construction Good Practice Guide



Working in Partnership



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Contents

	Page
Foreword	4
1.0 Introduction and Summary	6
2.0 Definitions	7
3.0 Legal Duties	10
4.0 Planning the Use of Dumpers	11
5.0 Selection of Dumpers and Operational Considerations	15
6.0 Planning, Supervisory and Operating Personnel	25
7.0 Familiarisation	33
8.0 Dumper Stability	35
9.0 Dumper Exclusion and Segregation	43
10.0 Loading and Discharging Operations	51
11.0 Driving, Towing and Use on the Public Highway	61
12.0 Maintenance and Inspection	65
Annex A Legal Framework	68
Annex B Case Studies	70
Annex C Sample Training Syllabus	75
Annex D Example of a Course for Safe Working Practices Around Construction Plant and Equipment	79
Annex E Example of a Checklist for Familiarisation	81
Annex F Example of Daily (pre-use) Checks	82
Annex G Tyre Maintenance, Repair and Replacement	84
Annex H Further Information and Guidance.....	87
Annex I Working Group Membership	90

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Foreword

Dumpers, particularly the forward tipping types, are commonly used on many construction sites to predominately transport spoil and materials around site. This involves the machine negotiating ground and terrain which is variable and not always suitable for a loaded dumper, and discharging their loads into excavations or on spoil heaps. Sadly, a large number of incidents during dumper operations have led to serious injuries, some tragically fatal. Not only do these accidents have a terrible cost in terms of human suffering, they also have a significant emotional and financial cost for all concerned. There is therefore a very strong business case for improving safety performance.

Using dumpers safely depends on a number of factors including planning, supervision, selection of a suitable machine, competence of personnel, effective exclusion zones and keeping within the operational limits of the dumper. If any of these are deficient, the risk of a serious accident increases significantly and it is therefore essential that all of those involved ensure that dumper operations are properly planned, managed, supervised and carried out safely by competent people.

This guidance was borne out of an industry forum set up through a partnership of the Health and Safety Executive (HSE), the Civil Engineering Contractors Association (CECA) and the CPA in order to reduce the number of incidents with dumpers and help those involved with planning and carrying out dumper activities achieve a better awareness of the particular risks involved and the measures that can be put in place to mitigate those risks.

This guidance has been developed by a large working group representing all parts of the industry and I thank the Chair, Editor and the Working Group for their time, diligence and efforts in producing this comprehensive guidance.

The advice in this document is straightforward, comprehensive and easy to adopt. This guidance may go further than the minimum you need to do to comply with the law and I commend it to anyone who manages, plans, supervises or carries out dumper operations. Please read the publication and turn the advice into action.



Kevin Minton
Chief Executive
Construction Plant-hire Association

The Civil Engineering Contractors Association (CECA), along with the CPA and HSE, took the initiative to tackle the increasing number of dumper incidents which were leading to untimely deaths and as part of the industry campaign on dumper safety, a seven-point strategy was devised with development and production of a safe use guidance forming an integral part of the strategy. CECA are pleased to have participated on production of the guidance and thank the working group members for their hard work.

We recognise that compliance with the guidance will help significantly in mitigating future dumper incidents and we urge all clients, manufacturers, owners and users of dumpers to read the guidance and put the contents and recommendations into practice.



Alasdair Reisner
Chief Executive
Civil Engineering Contractors Association

1.0 Introduction and Summary

This safe use guidance is specifically written for forward tipping variants of dumpers. The term 'dumper' used throughout this document always refers to forward tipping dumpers.

As with all construction equipment, selection of the most suitable machine, effective planning and supervision, together with competent people is essential if dumpers are to be used safely and efficiently. Unfortunately, some of the large number of dumpers in use are operated incorrectly or put into unsafe situations, often resulting in accidents and incidents which sadly cause serious injuries and death.

The purpose of this document is to set out the precautions and procedures that should be taken into account when planning and carrying out dumper operations. These will enable the work to be carried out safely and to assist duty holders in complying with their legal duties.

Dumpers should not be specified where more effective or safer plant, equipment or methods can be used, and dumpers are designed in principle to only carry bulk materials contained securely within the skip. Other types of use, or where loads exceed the confines of the skip, should not be carried out unless risk assessed and in accordance with the machine manufacturer's specifications.

Site managers, supervisors and operators of dumpers should understand the principles of safe operations and the potential for mishap. They have a legal duty to ensure that all dumpers are used safely. Serious misuse of dumpers contravenes the Health and Safety at Work etc. Act 1974, which could well lead to an individual prosecution.

Dumpers, particularly when loaded, have a high centre of gravity and can be prone to overturning on steep inclines, soft or uneven ground. A fully loaded dumper also reduces forward visibility significantly, increasing the risk of collisions with nearby pedestrians and can also result in the dumper colliding with objects, structures or other plant.

Many dumpers currently in use have an open operator's control station which, in the event of an overturn, relies on the operator wearing a seat belt to keep them within the protective area of the rollover protection structure (ROPS). Research shows that some operators believe that they have a better chance of survival if they do not wear a seat belt so that they can jump clear of the overturning machine. Analysis of dumper overturning incidents indicates that operators were not able to jump sufficiently clear and in time and have been crushed by their own machine. Those wearing seat belts have been shown to survive (with minor injuries) rather than die. The non-wearing of seat belts during dumper operation should be of concern to both employers and employees.

NOTE: A site specific risk assessment may indicate that seat belts should not be worn in certain circumstances e.g. where operating next to water.

Operating dumpers on spoil heaps can lead to instability and overturning. Industry safety initiatives advocate the banning of this practice wherever possible. If there is a need to travel on spoil heaps, designated and engineered routes that have been pre-compacted and are away from the edges of the spoil heap must be provided.

The use of dumpers fitted with a cab is becoming common place as an aid to providing a comfortable environment for the operator during operation. Some cabs may however restrict all-round visibility when compared with non-cabbed versions. Additionally, not all cabs may provide the full required impact protection, including against broken glass, required to allow the operator to remain in the cab during the skip loading process. Before allowing this practice, managers and supervisors should check the level of protection afforded by the cab against operating circumstances e.g. the size and type of loading machine against manufacturer's specifications.

2.0 Definitions

batter

a receding slope of a wall, structure, or earthwork

body

open container attached to the dumper chassis in which the bulk material to be transported is contained

NOTE: An alternative and more commonly used term for a dumper body is "skip". This term is used throughout this document.

capacity

struck capacity

when the material in the skip is level with the top of the skip

heaped capacity

when the material in the skip is heaped above the top of the skip

deflection-limiting volume (DLV)

the space occupied by a large, seated, (male) operator wearing normal clothing and a hard hat

dumper

self-propelled crawler or wheeled machine, with an open forward tipping body or skip, which transports and dumps or spreads material (see Figures B.4, B.5 and B.6 of Annex B of BS EN 474-6)

NOTE: Except for self-loading dumpers, loading is performed by other machines or equipment.

dumper user

person or organisation managing the use of a dumper to undertake a task

exclusion zone

designated area to provide segregation between people and machines from which people are prohibited from entering without specific permission

falling-object protective structures (FOPS)

system of structural members arranged in such a way as to provide operators with reasonable protection from falling objects (for example, trees, rocks, small concrete blocks, tools)

forward tipping dumper

a dumper where the body or skip is located in front of the operator control station

immobilise

prevent a dumper from moving

method statement

document produced to describe the safe system of work for the use of a dumper

operator control station

the place where the operator is situated when operating the dumper and contains a platform housing the seat, gauges, instruments and steering, braking, transmission and skip tipping controls

operator protection system (OPS)

system of structural members to reduce the possibility of a seat belted operator being crushed, should the cab be impacted by a loading machine of specified size

personnel

banksman

see direct support personnel

competent person - general

person who has such capacity combined with practical skills, theoretical knowledge and experience as is necessary to carry out the function to which the term relates in each particular context

direct support personnel

someone who directly supports the working activity through the provision of instructions and signals and other support e.g. attaching equipment

plant controller

competent person authorised to control the work activities of the machine.

dumper operator

person who is operating the dumper

plant marshaller

an appointed individual who guides and assists the movement of plant within a defined route or area and includes the guiding and assisting the operational movement of plant for configuring purposes whilst statically situated. Duties include communicating, providing instructions and guiding plant whilst ensuring safe movement of pedestrians and other vehicles

NOTE: *The role is not a direct support role and does **not** include the attaching of loads, providing direct instructions for working (non-marshalling) activities, or connecting/disconnecting components and equipment during a machine's working activities.*

site management

person or organisation responsible for operations on a construction site or part of a construction site

NOTE: *This includes Principal Contractors, package and sub-contractors.*

supervisor

person responsible to higher management for the day-to-day performance of individuals or a small group, guiding the group toward its goals, ensuring that all members of the team are safe, productive and resolving problems, within their competence, as they arise

plan

document describing the safe system of work

rear tipping dumper

a dumper where the body or skip is located behind the operator control station

reversible seating dumper

a dumper where the seat console at the operator's station can be rotated through 180 degrees, allowing the operator to be facing the body or skip during the direction of travel

risk assessment

systematic process of identifying the hazards, evaluating the potential risks arising and identifying the necessary measures required to eliminate or reduce those risks to an acceptable level

rollover protective structures (ROPS)

system of structural members whose primary purpose is to reduce the possibility of a seat belted operator being crushed should the machine roll over. Structural members include any subframe, bracket, mounting, socket, bolt, pin, suspension or flexible shock absorber used to secure the system to the machine frame, but exclude mounting provisions that are integral with the machine frame

safe system of work

a formal procedure which should be followed to ensure that work is carried out safely and is necessary where risks cannot be adequately controlled by other means

temporary works coordinator (TWC)

competent person with responsibility for the co-ordination of all activities related to the temporary works

vehicle edge protection

means to prevent a wheeled vehicle falling over the edge of an excavation or embankment

3.0 Legal Duties

3.1 *General*

The Health and Safety at Work, etc. Act 1974 (HSWA) and regulations made under the Act, require employers and self-employed persons to ensure the safety of employees and others not in their employ (including members of the public). Part of that duty is ensuring the safe use of construction plant, including dumpers, on site. Those with duties include:

- Clients;
- Designers;
- Management Contractors;
- Principal Contractors;
- Main Contractors;
- Sub-contractors;
- Other Employers;
- Self Employed;
- Employees;
- Plant Manufacturers;
- Dealers;
- Hire/Rental Companies (Plant Owners).

In addition, plant manufacturers, plant dealers and rental companies have a duty under both HSWA (Section 6) and the Supply of Machinery (Safety) Regulations to provide adequate information to enable construction plant to be used safely.

Annex A lists the main sets of regulations, made under HSWA, which apply to the management and use of plant.

***NOTE:** Northern Ireland has its own set of regulations which tend to mirror those in Great Britain, but may have minor differences. Employers should ensure that they are aware of the regulations in the jurisdiction in which they are working.*

4.0 Planning the Use of Dumpers

4.1 Task planning

The use of a dumper should always be planned, following a robust risk assessment.

The planning process should include:

- a. Identifying the task to be undertaken;
- b. Identifying the hazards associated with the task;
- c. Carrying out a risk assessment to identify who might be harmed and how;
- d. Identifying risk management measures, including selecting appropriate equipment and appropriate monitoring of the operation;
- e. Determining and developing the method to be used;
- f. Recording the planning in a method statement;
- g. Ensuring that all involved in the operation have the required competence;
- h. Communicating the plan to all persons involved;
- i. Reviewing the plan before the tasks starts and incorporating any changing circumstances;
- j. Monitoring the operation appropriately.

4.2 Identifying the task to be undertaken

As the first stage in the planning process, the task to be undertaken should be clearly identified, together with the location and sequence. Part of this process is ensuring that the most suitable equipment is chosen for the task.

4.3 Identifying the hazards associated with the task

The hazards associated with the task should be identified. These might be associated with the location and environment where the task is to be carried out, the type of dumper, the type of material, the machine loading the skip, the location and condition of the loading and discharging points, the travel route, and the people associated with the task or located in the vicinity. This process should also consider the effect of other operations being carried out in the vicinity and the need for communication and co-ordination.

4.4 Machine selection

As part of the planning process, machine selection is critical. Regulation 4 of The Provision and Use of Work Equipment Regulations 1998 (PUWER) requires that equipment must be suitable for both the actual work it is to do and the location where it is to be used. In the case of a dumper, the machine should be appropriate for the task, not just the machine that happens to be on site.

Selection of the correct machine can be influenced by financial pressures and ignorance of the possible consequences of selecting the wrong machine. This should be addressed by the education of those involved in machine selection.

Detailed guidance on the selection of dumpers is given in **5.0**

4.5 Carrying out a risk assessment

Having identified the task and the associated hazards, a risk assessment should be carried out to identify who might be harmed, the likelihood of them being harmed and the severity of any harm. This assessment should be recorded and reviewed at several stages during the planning process. If any circumstances relating to the planned

operation change, The risk assessment should be reviewed to take account of these changes.

4.6 Identifying control measures

Once the risk assessment has highlighted the risks involved in the operation, the procedures and measures required to control them should be identified and recorded. Consideration should also be given to the suitability of a dumper for the task to be undertaken or whether another, more suitable type of equipment should be used. This decision should be reviewed in the light of changing circumstances and any changes recorded.

NOTE: Control measures may include the provision of workplace lighting to reduce the likelihood of injuries during access and egress and during travelling and discharging operations.

4.7 Developing the method to be used

Having identified the hazards, evaluated the risks and worked out the control measures required to carry out the operation safely, these components should be developed into a coherent plan. This should include consultation with those who will be undertaking or be affected by the task. Any contingency measures and emergency procedures should be included in the plan.

4.8 Recording the planning in a method statement

Once the plan has been developed it should be recorded in a method statement. The length and detail of this document depends on the complexity of the operation to be undertaken and on the risks involved. The method statement should include the following information:

- a. Project;
- b. Location;
- c. Date of issue, revision number and approval sign off;
- d. Task description;
- e. Loading and discharge points;
- f. Loading arrangements, including position of the dumper operator during loading (see **10.0**);
- g. Sequence of operations;
- h. Ground and operational area – assessed and passed as suitable for the loading, discharge and travelling operations to be undertaken (see **8.0**);
- i. Requirements for Exclusion Zones and any sequencing of other activities to maintain safe areas (see **9.0**);
- j. Arrangements for adequate supervision of operations;
- k. Arrangements for banksmen/plant marshalls (if required);
- l. Names of personnel involved in the operation;
- m. Suitable and sufficient information, instruction and training for the dumper operator, loading equipment operator, banksman and supervisor;
- n. Authorisation of operators and supervisors;
- o. Communication of the safe method of work;
- p. Contingency planning;
- q. Arrangements for ensuring that equipment provided is maintained and fit for purpose (see **12.0**);

- r. Arrangements for ensuring that equipment is checked and inspected at appropriate intervals (see **12.0**);
- s. Arrangement for reviewing the plan in the light of changing circumstances and communication of any changes to those involved.

4.9 Competence

Before starting the operation, it should be ensured that those carrying out and supervising the task are competent and authorised to carry out their role. An industry certification card does not mean that the holder has the necessary competence (skills, knowledge, training and experience) to carry out their role for every task.

Product-specific training and familiarisation of operators is essential as there are significant differences between different manufacturers and models of dumper.

Detailed guidance on competence assessment and training is given in **6.0** and familiarisation in **7.0**.

4.10 Communicating the planned safe system of work to all persons involved

One of the most important aspects of successful planning is to ensure that the contents of the planned safe system of work (risk assessment and method statement) are communicated effectively to, and between, all parties involved, taking account of language differences. Effective communication means that steps should be taken to establish that the safe system of work has been understood. Arrangements should be made to ensure that copies of method statements are given and explained to the appropriate people (including the Principal Contractor) and that others involved in the work are fully briefed. Similarly, any changes to the plan should be communicated to all parties, any feedback listened to and acted upon.

Confirmation of the plan being communicated and understood should be obtained and recorded. It is generally not enough to just obtain a signature from those attending the briefing.

It is essential that part of the communication process includes co-ordination with other activities that may impinge on the task to be undertaken.

4.11 Reviewing the plan before the work starts

Immediately before a work starts, the specified method statement should be checked to see if any aspect of the work has changed and the effect that these changes could have on the safety of the operation. If any modifications to the plan are required, these should be communicated effectively to all those involved. The competent person should amend the method statement and initial any significant changes.

4.12 Change management

Any changes to the plan, such as substituting a different make or size of dumper, should be actively considered, as the changes may have a significant effect on the safe operation of the dumper. For example, substituting a 9 tonne dumper for the 3 tonne machine originally considered, may mean that the larger machine cannot safely negotiate the planned route, whilst the converse would mean that the smaller machine may be at risk of being overloaded and have reduced gradient capability.

An example of where a different size dumper may have to be substituted during the life of a project is where scaffolding is erected, reducing the width of a gap through which a dumper needs to pass.

It is essential that when management and other personnel change part way through a contract that the new people are fully briefed on existing task plans and any changes that may be required.

4.13 *Monitoring the operation*

The site manager should undertake or arrange for appropriate monitoring of the operation, particularly if the operation is complex or taking place over a long period of time. The frequency of monitoring should reflect the duration, complexity and environment of the operation.

4.14 *Briefing*

Daily briefing of all those involved in operations involving the use of dumper(s) and supporting plant is essential and the briefing should encourage feedback of perceived issues.

On sites where there is more than one contractor, regular meetings are essential to make everyone aware of changes taking place on site and the consequent effect on safety, for example; on changed dumper loading, discharging and travelling zones.

5.0 Selection of Dumpers and Operational Considerations

5.1 *An Outline of Dumper Features and Construction*

Dumpers are predominately designed to transport earth and other loose granular materials in a forward-facing skip. They consist of a chassis mounted on an axle at each end, with a power unit and transmission system that provides drive to one or both axles. The chassis may be either rigid or articulated.

A rigid chassis machine has either one or two steering axles. Two steering axle machines give a reduced turning circle. On articulated machines, the two halves of the chassis are joined by a centrally-located pivot which allows the chassis to articulate in the horizontal plane, providing the steering function. The central pivot also provides a certain amount of articulation in the vertical plane, allowing each axle to follow the ground contours and maintain traction.

Dumpers have a hydraulic system for steering, skip tipping and on certain machines, elevation of the skip to allow a high-discharge feature and a swivel action of the skip to allow a side tipping action. The operator control station is located behind the skip which presents visibility, access and operator protection issues, which are addressed in this document. Control stations may be open or protected by a cab.

Dumpers fitted with appropriate tyres are able to travel on uncompacted and uneven terrain and have defined ability to travel up, down and across inclines. Use on slopes (up, down and across) that exceed the manufacturer's specified limits can result in instability of the machine, which may in turn lead to overturning (see **8.0**).

Ride-on dumpers have carrying capacities ranging from 1 tonne up to 10 tonnes, with the dimensions of a dumper increasing in proportion to the carrying capacity. This means that the operator control station of larger types is both higher and further away from the front of the machine. This may cause forward-facing visibility issues during travelling and manoeuvring, particularly when the skip is loaded. Reversible seat type dumpers are available, which may alleviate these some of these issues (see **10.11**)

Rear-tipping dump trucks should be considered where:

- a. Haul distances are extensive between loading and discharging points;
- b. Large volumes of material need to be transported;
- c. Continual operation on slopes and inclines is required;
- d. Ground conditions vary, especially in inclement weather, winter season;
- e. Sites are not size constrained.

With the exception of the self-loading type, dumpers require loading by another machine, either from mobile plant such as a 360 excavator or static plant such as a conveyer. **Table 1** provides a guide to dumper types to determine the most suitable type for particular activities.

Type	Power Unit	Chassis	Transmission	Typical carrying capacity	Operational Factors	Example
1. Forward tipping	IC/Diesel/Electric/Hybrid	Rigid or articulated	Manual	1 – 3 tonnes	Suitable for small, compact sites with minimal turning space. These types generally have a narrow wheel track and minimal ground clearance. Sites should be level as possible with smooth terrain with only slight gradients to negotiate. Typical machine loading types would be limited to hand-loading (shovel), 180° or 360° excavators with an approximately 2 metre wide bucket. Operation of a manual transmission – fitted with a friction-type clutch - may require specific training of the operator for effective and safe operation.	
2. Forward tipping	IC/Diesel	Articulated	Shuttle/Powershift/Hydrostatic	1 – 10 tonnes	Similar to Type 1 except fitted with either a shuttle transmission - where a clutch is eliminated but requires manual gear changing; a powershift transmission - where gear selection is undertaken hydraulically; or hydrostatically which allows stepless gear ratio changes when engine speed is increased. Larger units - 4 tonne plus – are more suitable for operation on uneven terrain, poor surfaces and inclines, depending on tyre size and type. Larger units can impose high ground loading pressures – depending on tyre size. Larger skip sizes mean the size of a compatible loading machine – particularly a 360°excavator – increases although care is required to prevent overloading with large bucket sizes.	
3. Forward tipping – high lift	IC/Diesel/ Hybrid/Electric	Articulated	Manual/Shuttle/ Powershift/Hydrostatic	1 - 3 tonnes	Similar to Types 1 and 2 but contains the ability to elevate the skip up to maximum height whilst keeping it level prior to tilting the skip for discharge purposes. This aids for example, direct loading of a builders-type skip. Elevation of the skip however raises the machine's centre of gravity, making it susceptible to instability rendering it only suitable for operations on level ground. Materials that have a tendency to stick should not be used with elevating skip types as 'stuck' material not able to discharge at height will cause the machine's centre of gravity to exceed the tipping line and become unstable. The machine should not be driven with the skip in the elevated position.	

Table 1 – Types of Dumper

Type	Power Unit	Chassis	Transmission	Typical carrying capacity	Operational Factors	Example
4. Swivel skip	IC/Diesel/Hybrid/ Electric	Articulated	Manual	1 - 3 tonnes	<p>Similar to Types 1- 3 but contains the ability to rotate the skip up to 90 degrees either side of the machine's centre line. Discharging material either side of the machine causes the machine's centre of gravity to move in a sideways direction. This coupled with a narrow track can reduce any available stability.</p> <p>Machines in this size bracket further have the ability to elevate and rotate the skip which can create a significant reduction in stability and requires extreme care from the operator. Planning of discharging activities of these types should ensure that the skip is not overloaded and that sideways and/or elevated discharging is only on firm, level ground.</p> <p>Discharging material sideways to the machine should not be done when travelling.</p>	
5. Swivel skip	IC/Diesel	Articulated	Shuttle/Powershift/ Hydrostatic	1 - 9 tonnes	<p>Similar to Type 4 except equipped with a shuttle, powershift or hydrostatic drive. Machines in the 3 tonne and over bracket generally only have a rotating skip function and not an elevating function.</p> <p>Larger units - 4 tonne plus – are more suitable for operation on uneven terrain, poor surfaces and inclines, depending on tyre size and type. Larger units can impose high ground loading pressures – depending on tyre size.</p>	
6. Self -loading	IC/Diesel	Rigid	Manual/Shuttle	1 - 3 tonnes	<p>These types are equipped with a pair of hydraulically-operated loader arms containing a limited-action tilting bucket which can extract or 'scoop' loose material at ground level and deposit within the skip. When discharging the load from the skip, the loader arms need to be raised to avoid the discharged material from re-entering the bucket. Specialist training for operators is required for these types.</p>	

Table 1 – Types of Dumper (continued)

Type	Power Unit	Chassis	Transmission	Typical carrying capacity	Operational Factors	Example
7. Reversible seating	IC/Diesel	Articulated	Hydrostatic/Powershift	6 - 9 tonnes	Similar to Type 2 except that the operator's seat and associated controls can be rotated through 180 degrees. This allows the operator to face the skip during loading and discharging operations and have the skip located behind them during travel, allowing clearer vision during travel operations. The operator should be facing the direction of travel at all times to negate the need to carry out reversing operations.	
8. Tracked dumper	IC/Diesel	Rigid tracked	Hydrostatic	1 - 3 tonnes	Utilises a tracked chassis with tipping skip, with some variants able to discharge sideways as well as forwards. Tracked dumpers have a lower centre of gravity than wheeled types and due to the track drive, have increased traction and lower ground pressures, making them suitable for operating on poor ground conditions and inclines. These machines also tend to have increased manoeuvrability due to the track steering action. They are, however, only suitable for travelling over short distances. Specialist training for operators is required for these types.	

Table 1 – Types of Dumper (continued)

It is essential when planning the use of dumpers that the correct machine is selected for the task to be carried out. **Figure 1** shows the process of selection in flowchart form. The selected machine should be physically compatible with the stature of the intended operator.

Regulation 4 of the Provision of Work Equipment Regulations 1998 (PUWER) requires employers to ensure that work equipment, including a dumper is:

- Suitable for the purpose for which it is to be used;
- Appropriate for the location in which it will be used;
- Only used for operations and under conditions for which it is suitable.

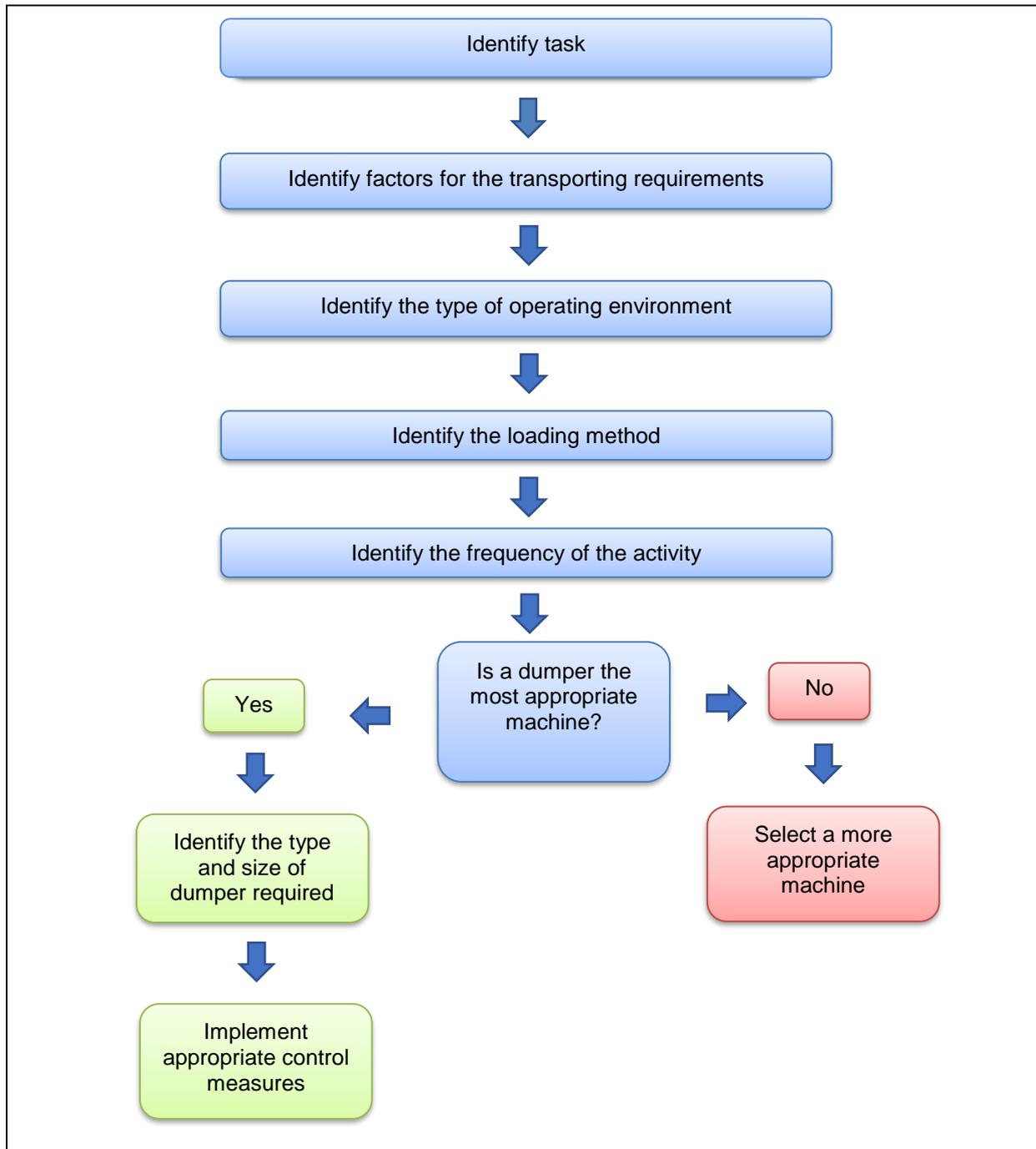


Figure 1 – Dumper Selection Process

5.2 Access and Egress to the Operator Station

Dumpers should be equipped with correctly spaced steps and hand rails allowing three points of contact to be maintained when accessing and egressing the control station from ground level. The operator should be facing the machine when ascending and descending the machine at all times. Jumping from the machine can cause injuries to the operator.

NOTE: The requirements for steps and hand rails are set out in BS EN ISO 2867.

Analysis by the HSE indicates that 57 out of 400 incidents studied were from stepping off a dumper and included fractures and head wounds amongst the injuries sustained.

Steps and handholds should be:

- a. Clearly marked;
- b. Free from damage;
- c. Clear of mud and other material which can cause a slip hazard;
- d. Accessible from ground level.

An evaluation of the individual's ability to safely access the operator station without discomfort should be carried out.

Before leaving the dumper, the operator should ensure that the parking brake is on, the machine is in neutral gear, the engine is switched off and the keys removed. When re-entering the dumper the operator should ensure that the seat belt is attached and adjusted and the machine in neutral gear before the engine is started.

During loading of the dumper skip the operator will, in most cases, need to leave the operator station and move to a safe place away from the machine. Continually ascending and descending to and from the operator station during the working day can lead to operator fatigue and tiredness. This increases the likelihood of slips, trips and falls where handholds or firm footing can be missed or be inadequate. The effects of fatigue can be increased by environmental conditions such as hot weather, rain or cold.

The physical size of the machine can further exacerbate fatigue due to the increased number of steps required to access the operator station. In all cases, a monitoring process should be employed to consider and seek control measures to minimise the factors due to access and egress issues.

5.3 Operator Comfort - Non-cabbed Dumpers

The use of non-cabbed dumpers may expose the operator to fatigue and discomfort from the elements. Fatigue is a known major cause of incidents and leads to a decline in mental and/or physical performance, lowering productivity. Factors that can affect fatigue include exposure to:

- a. Strong sunlight;
- b. Heat;
- c. Cold;
- d. Damp and wetness;
- e. Dust;
- f. Noise;
- g. Strong winds;

- h. Whole body vibration;
- i. Body Jolts;
- j. Poor light.

NOTE: Some of the above factors may also affect operators of cabbed dumpers.

The failure to address fatigue can lead to:

- a. slower reaction times;
- b. the reduced ability to process ongoing information;
- c. memory lapses;
- d. absent-mindedness;
- e. decreased awareness;
- f. lack of attention;
- g. an underestimation of risk and reduced coordination.

Work planning should take account of environmental factors when establishing working time. The use of a cab-equipped dumper may mitigate some of the exposure effects experienced by operators on non-cabbed versions.

5.4 Cabbed Dumpers

Dumpers fitted with a cab minimise exposure to outside elements, reducing operator discomfort, including exposure to noise, dust, sunburn, low temperatures, rain and snow. In some cases, a cab may also provide a safer environment for the operator in roll-over situations. Cabbed dumpers can be categorised into two distinct types:

- a. Non-Operator Protection Systems (Non-OPS) equipped;
- b. Operator Protection Systems (OPS) equipped.

Non-OPS equipped machines have cabs and other components that have not been tested for their ability to absorb, withstand or deflect dynamic forces resulting from contact with the loading machine. Although these types of cab may provide appropriate environmental protection and meet ROPS and FOPS requirements, a risk of protrusion by the loading machine, or its components, still exists. This very significant risk requires that the operator station is vacated during the loading activity.

Cabs fitted with screen guards and/or skip guards cannot be automatically assumed to be an OPS-compliant cab.

An OPS equipped machine will have a strengthened cab frame and/or a protective outer frame and other equipment which has been designed and tested to withstand the dynamic forces resulting from contact with specified loading machines, minimising penetration into the operator's DLV area. This may allow the operator to remain seated within the cab during the loading process. Assessment of this possibility will be based on the following factors:

- a. The type, size and configuration of the loading machine, including factors such as the bucket size;
- b. The method and sequence of loading;
- c. The level and extent of cab protection provided by the dumper manufacturer, based on the loading method;

- d. The dumper manufacturer providing the relevant information so that a user can determine whether the manufacturer's impact testing process meets the operational requirements of the user;
- e. That the cab structure and/or all equipment provided by or approved by the manufacturer for OPS purposes is, as a minimum, CE marked for ROPS and FOPS.

Employers should not allow their operator to remain seated within the OPS cab during the loading activity unless they are satisfied that it is safe. This should be established by a risk assessment taking account of the manufacturer's testing process, the loading activity, the loading machine and loading techniques to be used. The dumper manufacturer should be consulted as part of the risk assessment process.

The risk assessment should show that:

- a. the potential for any part of the loading machine striking the cab frame is negligible and;
- b. any deformation of the cab or protrusion of the machine cannot encroach on the operator's DLV area should a strike occur.

5.5 Additional Protection Devices (non-OPS)

Dumpers may be fitted with additional equipment to provide protection during loading operations such as rear mounted skip guards and front screen guards, either at time of first supply or retro-fitted. Fitment of this type of equipment does not automatically mean that the machine is OPS-compliant, and that the operator can remain seated during the loading activity. (see 5.4)

NOTE: The fitment of additional devices should always be carried out in consultation with the dumper manufacturer.

5.6 ROPS and Seat Belt Wearing

Dumpers should be equipped with a roll over protective structure (ROPS) which is a system of structural members whose primary purpose is to reduce the possibility of a seat belted operator being crushed should the machine roll over. Some dumpers are fitted with hinged ROPS to allow the machine to pass under low obstacles. It is essential that hinged ROPS are raised and locked in the upright position as soon as a low obstacle has been passed.

A ROPS will only provide protection to the operator if the dumper's seat belt is fastened, adjusted correctly and worn by the dumper operator during all working activities. Seat belts will also prevent operators being thrown from the seat if an articulated dumper is not operated correctly such as being driven at speed on uneven ground. Only in exceptional cases and following a risk assessment of the activity, for example working near to water, should an exemption be given to the wearing of a seat belt.

Studies have shown that operators, in some instances, distrust the potential effect of the ROPS frame and elect to jump from an overturning machine. Investigations of these occurrences has shown that the operator has not managed to jump clear of their overturning machine, resulting in crushing that led to severe injuries and fatalities. Operator training and subsequent refresher training/familiarisation should emphasise the need to always wear a seat belt.

Seat belts should be in good working order, with their condition and functionality checked during the pre-use checks. Where a defect exists, it should be reported to the supervisor and the dumper not used until the seat belt has been repaired or replaced.

Planners, supervisors and dumper users should consider the effects of the frequency of connecting and disconnecting a seat belt during the working day when the operator

leaves the operator station for loading activities. Continual connection and disconnection may tempt operators not to wear the belt during part or all of the working day, or leave a seat belt connected but 'sit' on the belt. Both activities are a major factor in causing injuries or death in a roll-over situation. Continual connection and disconnection can also increase the rate of wear or cause defects.

Dumper users may request their supplier to fit a specific colour of seat belt, enabling supervisory staff to identify at a distance whether a seat belt is being worn. The colour chosen should provide a contrast to the colour of clothing being worn by the operator. An alternative is the use of coloured sleeves over the belt.

Certain dumper manufacturers provide systems that require that the seat belt clasp is inserted into the buckle before allowing movement of the machine. These systems may also activate a green beacon (see 5.7) to indicate that the seat belt is engaged.

Different configurations of seat belt may be specified by a user or manufacturer for specific activities or environments. **Table 2** identifies the main types of seat belt that are available and their advantages and limitations.

Type	Advantages	Limitations
Lap belt (fixed)	<ul style="list-style-type: none"> Ease of use Robust 	<ul style="list-style-type: none"> Requires continual adjustment for different operators Operators may not correctly adjust the required tension to limit body movement Does not prevent upper body movement on uneven ground
Lap belt (inertia reel)	<ul style="list-style-type: none"> Ease of use Applies correct tension to the body 	<ul style="list-style-type: none"> Does not prevent upper body movement on uneven ground Continual movement on uneven ground can cause the belt to tighten, become uncomfortable and increase the operator's resistance to its use Retracting mechanism prone to damage or inaction
3-point diagonal belt (fixed)	<ul style="list-style-type: none"> Robust Limits both lower and upper body movement 	<ul style="list-style-type: none"> Requires continual adjustment for different operators Operators may not correctly adjust the required tension to limit body movement
3-point diagonal belt (inertia)	<ul style="list-style-type: none"> Robust Limits both lower and upper body movement 	<ul style="list-style-type: none"> Continual movement on uneven ground can cause the belt to tighten, become uncomfortable and increase the operator's resistance to its use Retracting mechanism prone to damage or inaction
Full harness	<ul style="list-style-type: none"> Provides full body movement protection in all operating situations 	<ul style="list-style-type: none"> Difficult, complex and wieldy to apply Requires continual adjustment for different operators Operators may not correctly adjust the required tension to limit body movement

Table 2 - Seat Belt Configurations

5.7 Seat Belt Wearing Indicators

Dumper users may also request the fitment of a rotating green beacon which is activated when the seat belt clasp is inserted into the buckle. This enables those responsible for monitoring the safe use of dumpers to periodically check that the seat belt is being used correctly.

Unless specifically agreed and identified as a necessary working practice in the risk assessment, the practice of the operator connecting a seat belt and then intentionally sitting with it below or behind them in the seat, is unacceptable and should be dealt with according to organisational procedures.

If a dumper fitted with a green beacon is to be used on the public highway, this practice infringes the Road Vehicles Lighting Regulations (1989) which specifies that green lights are reserved for medical emergency vehicles, consequently when traveling on the public highway green beacons should not be illuminated. Where dumpers are working on/near to a railway line, users should consult with the line owner such as Network Rail in case a dumper's green beacon is mistaken for a rail signal by an approaching train.

6.0 Planning, Supervisory and Operating Personnel

6.1 General Work-Related Competence for Dumper Operations

An often-used definition of a competent person is “a person who has such capacity combined with practical skills, theoretical knowledge and experience as is necessary to carry out the function to which the term relates in each particular context.” A person who is competent to carry out one task will not necessarily be competent to carry out another with the same equipment. For example, an operator who is competent to transport soils may not be competent to transport fluid-type loads.

Employers should ensure that their personnel are competent to work safely with dumpers carrying out loading, transporting and discharging operations. Employers should therefore assess the competence of their staff and, where necessary, provide appropriate training to achieve the level of competence required. The training needs to reflect the ability and level of responsibility of the individual, the degree of complexity of the task, together with the risks involved. Further guidance on assessment of competence is given in the Strategic Forum for Construction - Plant Safety Group, *Competence to Operate Construction Plant - Good Practice Guide* (free download from www.cpa.uk.net).

Employers have a duty to ensure the health of their employees and that any employee is fit to undertake the tasks they are required to carry out. Further guidance on assessing the medical fitness of construction plant operators is given in the Strategic Forum for Construction - Plant Safety Group, *Medical Fitness to Operate Construction Plant - Good Practice Guide* (free download from www.cpa.uk.net).

It is essential that planning, supervisory and operating personnel involved with the selection, and use of dumpers have the necessary attributes and abilities to ensure that they will be able to carry out their duties both effectively and safely. The necessary attributes and abilities for planning, supervisory and operating personnel are set out below.

6.2 Competent Persons (planning)

6.2.1 Attributes

Competent Persons carrying out planning of the use of dumpers should know and understand:

- a. The principles of dumper operation;
- b. What the dumper can and cannot be used for;
- c. The hazards associated with dumper operation including;
 - Overturning
 - Overloading
 - Electrocution – contacting or being near to overhead power lines
 - Colliding with pedestrians
 - Crushing and trapping
 - Loss of control
 - Limited forward vision
 - Insecure loads and materials.
- d. The checks and inspections that are required on a daily and weekly basis;
- e. What can happen if the dumper is poorly maintained;
- f. That travel routes are safe for laden and unladen travel;

- g. That the loading equipment is suitable and compatible for the dumper size and type;
- h. How to ensure that the correct loading and discharging methods are used;
- i. How to ensure that all loading and discharging locations are suitable;
- j. That all work must be carried out to a method statement and that the method statement is a description of the safe system of work developed from a risk assessment of the task to be undertaken;
- k. That accidents and incidents are mainly caused by incorrect planning and use;
- l. The increased risks when dumpers are being operated in the vicinity of other people and ensure/maintain an exclusion zone wherever possible or the implementation of proximity warning systems;
- m. The effects of weather on dumper operations;
- n. Their responsibilities under the Health and Safety at Work etc. Act 1974.

6.2.2 Abilities

Competent Persons should be able to:

- a. Carry out a risk assessment of the work to be carried out;
- b. Develop a safe system of work based on the outcomes of the risk assessment;
- c. Record the safe system of work in a method statement;
- d. Carry out an effective observation and know what to look for;
- e. Communicate effectively with supervisors, operators and line managers;
- f. Recognise bad practice and unsafe behaviour;
- g. Assess foreseeable mis-use;
- h. Develop good working relationships;
- i. Raise health and safety standards;
- j. Display consistency and be persistent;
- k. Raise and address issues confidently and not be afraid of conflict.

6.3 *Supervisors*

6.3.1 Attributes

Supervisors should know and understand:

- a. The principles of dumper operation;
- b. What the dumper can and cannot be used for;
- c. The hazards associated with dumper operation including;
 - Overturning (sideways and forward)
 - Overloading
 - Electrocution – contacting or being near to overhead power lines
 - Colliding with pedestrians
 - Crushing and trapping
 - Loss of control
 - Limited forward vision
 - Insecure loads and materials.

- d. The checks and inspections that are required on a daily and weekly basis;
- e. The consequences of using a poorly maintained dumper;
- f. The need to ensure that travel routes are safe for laden and unladen travel;
- g. That the specified loading equipment is being used for the dumper size and type;
- h. That the correct loading and discharging methods are being used;
- i. How to ensure that all loading and discharging locations are safe and suitable and do not deteriorate or alter during operations;
- j. That work must be carried out to the method statement unless it is unsafe to do so in which case work must stop;
- k. That accidents and incidents are mainly caused by incorrect planning and use;
- l. The increased risks when dumpers are being operated in the vicinity of other people and ensure/maintain an exclusion zone wherever possible; or that proximity warning systems are in use;
- m. The effects of weather on dumper operations;
- n. The effects of weather on the operator, particularly where non-cabbed machines are being utilised;
- o. Their responsibilities under the Health and Safety at Work etc. Act 1974.

6.3.2 Abilities

Supervisors should be able to:

- a. Carry out an effective observation and know what to look for;
- b. Communicate effectively with operators and line managers;
- c. Recognise bad practice and unsafe behaviour;
- d. Assess foreseeable mis-use;
- e. Develop good working relationships;
- f. Raise health and safety standards;
- g. Display consistency and be persistent;
- h. Raise and address issues confidently and not be afraid of conflict.

6.4 *Operators*

6.4.1 Attributes

Operators should know and understand:

- a. The principles of dumper operation;
- b. What the dumper can and cannot be used for;
- c. The hazards associated with dumper operation including:
 - Overturning (sideways and forward)
 - overloading
 - electrocution – contacting or being near to overhead power lines
 - colliding with pedestrians
 - crushes and trapping
 - loss of control

- limited forward vision
 - insecure loads and materials.
- d. The role that seat belts play and the importance of using them correctly, having them maintained and reporting any defects (which might entail the dumper being taken out of service);
 - e. The consequences of using a dumper that is poorly maintained;
 - f. The checks and inspections that they need to undertake on a daily and weekly basis;
 - g. That they follow all operational practices in accordance with their training;
 - h. That they must organise their work in accordance with the method statement (generic or task specific), including coordination with others who may be affected, and follow the method statement unless it is unsafe to do so, in which case work must stop;
 - i. That they must report all unsafe working practices and faults with their machine to their supervisor;
 - j. That poor planning, operation, training, maintenance, supervision or working environment, (or a combination thereof), are major contributory factors to accidents/incidents;
 - k. The increased risks when dumpers are being operated in the vicinity of other people and ensure/maintain an exclusion zone wherever possible;
 - l. The organisational procedures and requirements that they need to follow;
 - m. The need for familiarisation before operating new or unfamiliar types of dumper and/or attachment;
 - n. The effects of weather on dumper operations;
 - o. The effects of weather on the operator, particularly where non-cabbed machines are being utilised;
 - p. Their responsibilities under the Health and Safety at Work etc. Act 1974;
 - q. Their limitations in organising their work or operating the machine in any given environment.

6.4.2 Abilities

Operators should be able to:

- a. Communicate effectively with other workers and line managers;
- b. Interpret relevant information and follow given instructions;
- c. Organise the work activity or part of the work activity with others;
- d. Select and/or request resources and additional equipment required;
- e. Carry out the checks and pre-use inspections that are required on a daily and/or weekly basis as required;
- f. Operate the dumper according to manufacturer's requirements and safe working practices;
- g. Raise and address issues confidently and not be afraid of conflict or of stopping work when necessary to ensure safety.

6.4.3 Dedicated Operator

There are a number of benefits where a dumper is operated by one assigned operator, rather than several people:

- a. The operator feels a sense of ownership and will look after the machine;
- b. The operator will gain increased operating experience, enhancing their competence and operating efficiency more rapidly;
- c. The operator will more readily notice changes in the machine's performance and be able to notify their supervisor of defects before they become dangerous;
- d. The operator is able to note and adjust to changing site conditions, including haul routes, exclusion zones etc. during the project.

6.5 Assessment of Training Needs

During personnel selection, an assessment should be made of the training needed for an individual, bearing in mind that this could be influenced by any previous training and experience. When supervisors or operators are recruited, it is essential that employers check that their qualifications and experience relate to the work they are being assigned to.

Where the type of dumper to be used, or where operational requirements are outside the employee's previous experience, additional training should be provided. In any event, some further work specific training is likely to be necessary.

6.6 Pre-training attributes

Prior understanding of construction or relevant industrial activities and, for operators, of machine operation, can assist in the learning of required skills and knowledge. **Annex C** provides a list of helpful attributes and indicates where the shortening of a training programme may be possible in the light of previous experience. A lack of knowledge and experience should not prevent any suitable individual from attending a training course.

6.7 Training

Any gaps in the knowledge, skills and understanding of competent persons (planning), supervisors and operators must be remedied by suitable and sufficient training. This may be carried out in-house or by an external training organisation. At the end of the training period the trainee must be assessed to ensure that the set learning objectives have been met.

A sample training syllabus is provided in **Annex C** but essential items for inclusion in a training programme should include:

- a. Knowing their role and responsibilities as a dumper operator;
- b. Knowing the purpose of principal components, the basic construction, controls and terminology of dumpers;
- c. Being able to conform with the manufacturer's requirements as set out in the operator's handbook, other types of information source and relevant regulations and legislation;
- d. Being able to carry out all pre-use checks;
- e. Being able to configure the dumper ready for travel, both on the site and highway;
- f. Being able to travel laden and unladen over uneven ground, inclines and loose surfaces;
- g. Recognising the challenges of excavations, slopes, spoil heaps;
- h. Recognising the need to follow the instructions and signals from banksmen;
- i. Being able to manoeuvre in areas having restricted space;

- j. Knowing that the designated loading and discharging areas are safe and suitable;
- k. Knowing the actions required and consequences of dealing with hazards including underground and overhead services;
- l. Being able to position the dumper to receive loads from a loading machine whilst complying with loading procedures;
- m. Knowing the reasons for zonal working and segregation requirements;
- n. Being in a safe place during the loading activity;
- o. Knowing that the load is safe to transport and why the dumper should not be overloaded;
- p. Knowing that all personnel need to be clear of the machine prior to and during movement;
- q. Ensuring all round visibility is maintained;
- r. Being able to travel the dumper at speeds suitable for the load type and conditions;
- s. Being able to discharge loads into trenches and over edges employing over-run and edge-protection devices;
- t. Being able to park, shut down, isolate and secure the dumper at the end of the work activities;
- u. Reporting near misses and incidents.

6.8 Training – Cabbed Reversible Seating Types

Basic training should be undertaken following the syllabus outlined in **6.7**.

For cab-equipped types, that the potential areas of limited visibility are recognised and understood.

For reversible seating-type machines, loading and discharging operations should be undertaken with the seat facing the skip at all times. Travelling activities should be undertaken with a mix of the seat facing the direction of travel and facing the skip. This replicates non reversible seating types, unless certification is specific to reversible seating types.

Requirements for familiarisation training can be found in **7.0**.

6.9 Training – Health and Safety Issues

Dumper operation training should include generic construction or workplace-specific health, safety, welfare and environmental training. These topics should include:

- a. The causes and consequences of unsafe site activities and operations such as the non-wearing of seat belts, overturning of a dumper and potential collisions with pedestrians;
- b. Behavioural aspects relating to health and safety, with attitudes to safety issues discussed between trainees and their instructors.

6.10 Assessment

Employers should ensure that personnel are assessed to establish that they are competent to carry out the tasks they are required to undertake. Assessment will be required at various times during employment including:

- a. On recruitment;
- b. On completion of initial and subsequent training;

- c. Before undertaking a new task;
- d. Periodically to ensure that competences have been retained.

It is not enough to rely on the assessment elements of card schemes as they cannot take into account the working environment and specific task. All personnel should be assessed by their employer against industry-approved training and occupational standards.

Assessments should contain both practical elements to demonstrate the skills and standards achieved together with the answering of questions, to demonstrate relevant underpinning knowledge. A thorough assessment should be carried out by occupationally competent and authorised assessors.

6.11 Applying Learnt Skills in the Workplace

Employers should ensure that newly trained operators are limited to activities and/or working areas they have encountered during the training programme until they become confident in operating to the parameters experienced during training. When being required, for example, to travel over long distances with loads or negotiate spoil heaps, employers should ensure that new operators are adequately supervised.

Employers and supervisors should be aware of the limit of the skills attained during the training course and provide further site-specific training as required. Manufacturers and importers of dumpers, as well as external training providers, who offer dumper training can be approached for advice on relevant training requirements.

For newly qualified operators, employers and supervisors should:

- a. Specify any particular work/operational requirements to nominated training providers prior to the start of training;
- b. Establish the type and the content of training and/ or assessment programmes undertaken by the operator;
- c. Identify differences between learnt skills and the requirements of the work site, utilising training body learning outcomes and/or training material;
- d. Initially limit the operator to activities and/or working areas encountered within the training programme;
- e. Provide time for the operator to study the dumper's operating notes/handbook and other related data;
- f. Provide time and facilities for the operator to practice with the new dumper type;
- g. Monitor work undertaken to gauge operator confidence and ability;
- h. Introduce new activities and/or working areas under supervision, especially if working within hazardous or busy areas, or on uneven ground, stockpiles etc;
- i. Carry out periodic assessments and ascertain when new or high-risk activities can be undertaken safely;
- j. Provide specific additional training for such activities as transporting fluid loads or using other types such as swivel skips, high-tip versions etc;
- k. Carry out regular checks and assessments of the operator's operational performance by competent persons within the employer's organisation;
- l. Carry out periodic spot checks by a third party (for example an external training provider who is certified as competent).

6.12 Training – Other personnel

There are considerable dangers to other site operatives working around or being near to dumper operations. The content of health and safety training programmes and site induction programmes should include the dangers of being around moving plant, the

limitations of vision from the operator's station and the limited stopping ability of a loaded dumper. Training programmes relating to the planning and control of movement and operations of plant are available for operatives, supervisors and managers from a number of training organisations. A typical syllabus is listed in **Annex D**.

6.13 Further guidance

Further guidance on training and assessment is given in:

Competence to Operate Construction Plant - Good Practice Guide. Strategic Forum for Construction - Plant Safety Group (free download from www.cpa.uk.net).

7.0 Familiarisation

7.1 *General*

Dumpers come in a variety of types, sizes and differences in operating controls, methods and characteristics. It is therefore essential that operators and supervisors are given adequate familiarisation on an unfamiliar type or model of dumper before they begin operations. Operators should be given adequate time to operate the dumper in a non-productive situation until they have gained sufficient confidence to operate the dumper competently.

The employer of the dumper operator is responsible for ensuring that adequate familiarisation is provided.

Familiarisation may be carried out by:

- a. an experienced person employed by the dumper owner or user, or;
- b. a representative of the dumper manufacturer or supplier or;
- c. any other competent, experienced and authorised person*.

* **NOTE:** *This could be the operator of the machine (see 7.2).*

The person giving familiarisation should have been authorised by a suitable person in a supervisory position, after checking that they are competent to do so.

All familiarisation should be recorded by both the operator and their employer.

Familiarisation for the operator of a dumper should include the following:

- a. Layout and use of all controls and gauges;
- b. Extracting, applying and following data from information sources such as method statements, machine specifications, machine decals, operator's manuals, capacity charts etc.;
- c. Identification of specific areas of risk whilst using the specific dumper;
- d. Machine specific operator's safety aids, such as inclinometers;
- e. Machine specific safe working procedures;
- f. Machine specific visual inspections of the dumper;
- g. Machine specific 'pre-start checks' and basic maintenance requirements as recommended by the manufacturer;
- h. The specific machine instruction manual should be provided to the operator while they are at the machine;
- i. The operator should be given time to read and understand the specific machine operating instructions.

An example checklist for carrying out familiarisation is shown in **Annex E**.

7.2 *Self-Familiarisation*

In certain circumstances, the operator may be the best person to familiarise themselves with new equipment, attachments, activities or methods of work etc. where other personnel with the relevant technical or working knowledge and appropriate experience are not available to carry out the familiarisation.

Where the operator undertakes self-familiarisation, they must:

- a. Have relevant and sufficient experience with other dumpers, or similar types if the machine to be used is different;
- b. Have relevant and sufficient experience with similar types of work activities;

- c. Be provided with and able to extract, understand, apply and follow information from sources such as the operator's manual, method statements, manufacturer's specific technical data etc;
- d. Be given sufficient time away from productive work to allow the familiarisation to be carried out and practiced.

Factors such as additional supervision and segregation of supporting personnel and exclusion zones should be implemented until competency of the activity or attachment has been achieved.

7.3 Further guidance

Further guidance on familiarisation is given in:

- *Competence to Operate Construction Plant - Good Practice Guide*. Strategic Forum for Construction - Plant Safety Group (free download from www.cpa.uk.net)
- **Annex H.**

8.0 Dumper Stability

8.1 General

All dumpers rely on the integrity of the ground over which they travel to remain stable. Overturning can be caused by:

- a. Ground failure;
- b. Uneven ground;
- c. Travelling on slopes that exceed the limits set by the dumper manufacturer;
- d. Underinflated tyres;
- e. Inappropriate driving style;
- f. Inappropriate movement of the skip during discharging;
- g. Raising the dumper's centre of gravity by carrying unsuitable loads e.g. carrying shutters across the skip.

The position of the centre of gravity (C of G) of a dumper has a significant effect on its stability. If the C of G moves outside the tipping line of the dumper it will fall over.

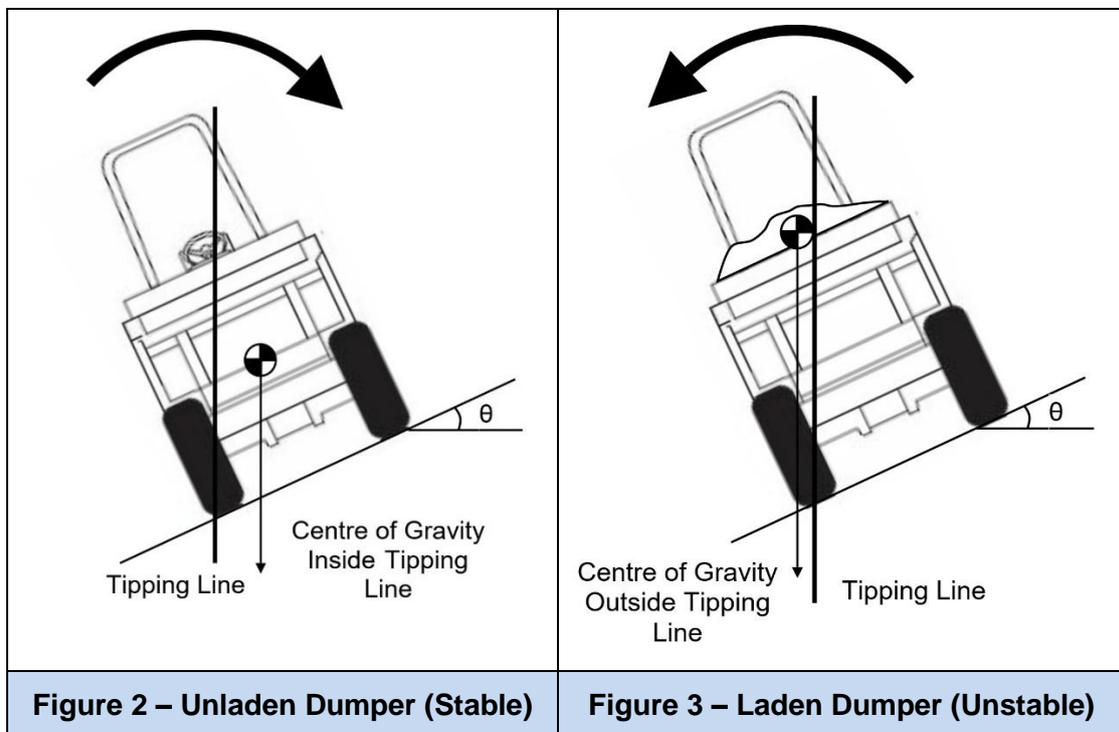


Figure 2 shows an unladen dumper on a lateral slope with its C of G inside the tipping line. The machine is therefore stable. **Figure 3** shows the same dumper on the same slope with a full skip, which raises the C of G to a point where it moves outside the tipping line and the machine becomes unstable.

Great care is required when using articulating dumpers, as these can be overturned by purely turning the steering wheel which may cause the centre of gravity to move outside the tipping line.

Tyres should always be inflated to the correct pressure. See **12.11** and **Annex G** for further information on tyre maintenance.

To ensure that a dumper remains stable during use it is essential that all dumper operations are always planned. All plans should be briefed to all personnel affected by the operations and feedback from those being briefed should be actively encouraged.

Machine selection is a critical part of the planning process. The machine should be appropriate for the task, not just the machine that happens to be on site. The planning process should consider the effect of the ground on the machine and vice versa. On very soft ground, the selection of a tracked machine may be required.

Any changes to the plan, such as substituting a different make or size of dumper, should be carefully considered, as the changes may have a significant effect on the safe operation of the dumper. Changes should be briefed to all concerned.

NOTE: As an example, substituting a 9 tonne dumper for the 3 tonne machine originally considered may mean that the larger machine cannot safely negotiate the planned route, whilst the converse would mean that the smaller machine may have reduced gradient capability.

8.2 Ground Conditions

8.2.1 Ground assessment

The starting point for ground assessment should always be the site ground investigation report.

Ground assessment is a complex subject which is covered in some detail in the Plant Safety Group publication, *Ground Conditions for Construction Plant - Good Practice Guide* (free download from <https://www.cpa.uk.net/sfpsgpublications/>).

This guide should be used by temporary works designers (in conjunction with site managers and engineers as works progress), along with other technical reference documents on soil types and site-specific conditions, when developing and reviewing the plans.

8.2.2 Ground related hazards

There are a number of ground related hazards associated with dumper operation should be taken into account during the planning process. These include:

- Soft ground;
- Voids;
- Underground services;
- Lack of maintenance of running surfaces;
- Excavations;
- Open or steep sided edges
- Slopes;
- Excessive travel speed;
- Wet ground;
NOTE: Operation in wet ground may also affect braking performance.
- Environmental constraints such as habitat protection;
- Dry and dusty roads – need for eye protection – vertical engine exhausts reduce dust disturbance.

Managers, supervisors and operators should have the necessary information to avoid dumpers becoming stuck in soft ground. Dumper operators should be able to recognise the early symptoms of becoming bogged down and stop the machine before it becomes stuck. If the machine has become stuck, the operator should not attempt to drive out by 'spinning' the wheels as this will usually churn up the ground and bog the machine more deeply.

8.2.3 Ground improvement

Where an assessment of the ground over which a dumper will pass reveals that it has insufficient bearing capacity, it may be possible to improve the ground by using techniques including:

- The use of a temporary road system such as “Trackway”;
- Construction of a temporary road using traditional road construction techniques;
- Construction of a temporary road using geotextiles with suitable fill;
- Construction of a temporary road using soil stabilisation techniques such as *RoadCem* (see <http://www.powercem.co.uk/>).

Wherever possible, the base for permanent roadways should be installed as early as possible and used as the base for the temporary road surface, allowing for a more robust haul route and reducing the need for future work when installing the permanent works.

8.2.4 Haul roads and other routes

Haul roads, routes between loading and discharge points and access ramps should be of sufficient size and strength, well maintained and clear of voids, potholes, structures etc. Gradients and inclines are a particular hazard to dumper operations and site haul routes should be arranged so that the need to travel on or across inclines is minimised. Where gradients are necessary, they should be shallow, preferable not exceeding a ratio of 1:10, even though a dumper may have the ability to operate on slopes in excess of this. Sharp changes of gradient should be avoided as this may cause machines to ground or loads to become unstable.

On a steeply sloping site, the haul route/s may need to zig-zag up the slope to minimise the driving gradient. Where possible, hairpin bends should be created with as wide a sweep as possible and be designed so that the sharp turn is carried out on a flat or near flat surface.

Where a sloping site that is being benched, transfer ramps between bench levels should again be designed and built with a shallow gradient. This will involve leaving or placing additional material which may need to be removed later, if it does not form part of the permanent works. This additional temporary work should be costed in at an early stage to enable site operations safe to be carried out safely

Negotiating steep slopes in wheeled plant raises a number of issues which increase operator stress, making the task unnecessarily hard and more prone to errors including:

- a. Increased operator concentration;
- b. Sight lines and visibility may be worse on a steep slope;
- c. The stability of the machine will be reduced;
- d. The increased level of torque needed to move the dumper results in higher noise levels from the engine;
- e. The higher level of traction involved leads to rapid wear to the running surface, leading to break up of the haul road, making it harder to negotiate.

Site speed limits should be set and enforced to reduce the risk of collisions and overturns. Operators should keep to the speed limits and take care to avoid potholes and raised bumps as they can, particularly when travelling at speed, cause a dumper to become unstable and uncontrollable.

NOTE: *Speedometers are available on some makes and models of dumper.*

Regulation 28 of the Construction (Design and management) Regulations 2015 - states that “*Suitable and sufficient measures must be taken to prevent a vehicle from falling*”

into any excavation or pit, or into water, or overrunning the edge of any embankment or earthwork.”

This places a strong requirement onto clients, designers and contractors to provide as-dug bunds or timber baulks, etc to the sides of all haul roads where it would not be possible for a wheeled vehicle to remain under control and stable if the vehicle inadvertently left the haul road – including:

- a. While passing another vehicle;
- b. Due to movement of the load;
- c. Following loss of control on the haul road;
- d. As a result of brake failure;
- e. In the event of a puncture;
- f. Due to driver illness.

8.2.5 Trenches

The backfilling of trenches needs to be carefully planned and is best achieved using an excavator rather than a dumper. Use of an excavator allows the dumper to place the load at a safe distance from the trench.

If a dumper is chosen for trench filling at the planning stage, a side tipping dumper should be the first choice as it reduces the risk of the machine overturning and collapse of the trench. Side tipping dumpers should not discharge whilst travelling.

Where a dumper is used to directly fill a trench, vehicle edge protection such as stop blocks, or a suitable berm should be used reduce the risk of the dumper being driven into the trench (see **Figures 4** and **5**). The effective use of stop blocks must be carefully planned and their position maintained. The stop block should be at least the same distance away from the lip of the trench as its depth.



Figure 4 – A Dumper Overturn

Where dumpers are controlled by a banksman, the stop block should be used as a visual indicator only. Stop blocks may be driven into by the dumper, consequently their location needs to be carefully controlled and the blocks should be of sufficient size for the dumper being used. As a rule of thumb the blocks should be in excess of half the height of the wheel of the axle height, whichever is greater. There is a tendency for stop blocks to become buried by an accumulation of spilled fill, reducing their effectiveness. Effective maintenance of the stop blocks, and tipping area will overcome this. Timber baulks should be back pegged to aid their restraint (see **Figure 5**).

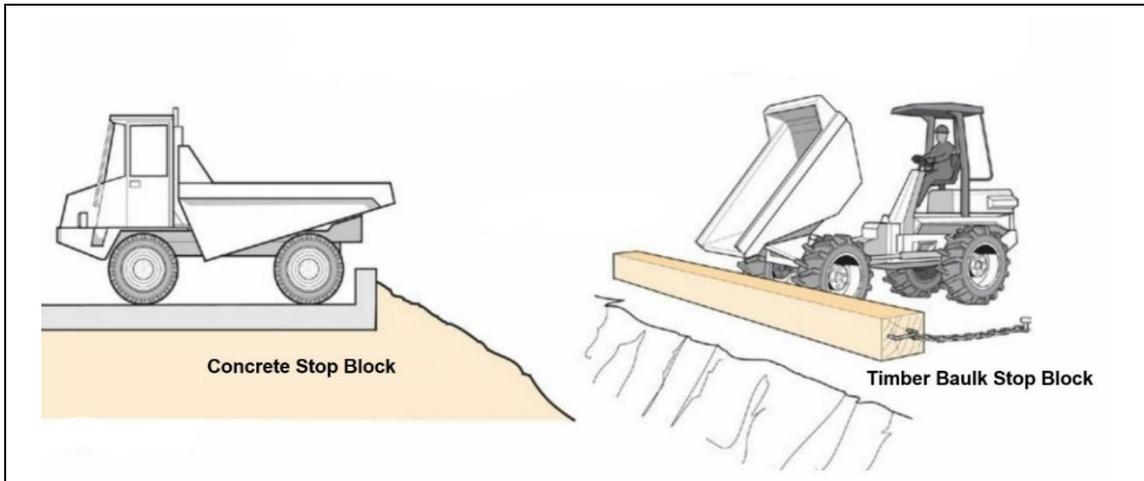


Figure 5 – Stop Blocks

8.3 Manufacturer's Information

The inclination limits given by dumper manufacturers in their operating manuals should be followed and used in planning the use of a dumper, taking account of the slopes on which it will be expected to travel.

Manufacturer's manuals include the maximum permitted slopes on which a dumper may be driven, both longitudinally and transversely, laden and unladen. Inclines are generally expressed as both a percentage of slope and slope ratio (see **Figure 6**). Users will need to note that manufacturers can differ in their approach on stability factors of safety. For example, some will take the results from tilt tests and derate by 50% whilst others will derate by 10%.

Manufacturers do not generally include the position of the machine's centre of gravity (C of G) in the operator's manual. They also generally do not provide ground bearing pressures due to the wide range of tyres fitted, both at time of manufacture and replacements on site.

NOTE: The parking brake may not hold on the maximum permitted up or downhill slope.

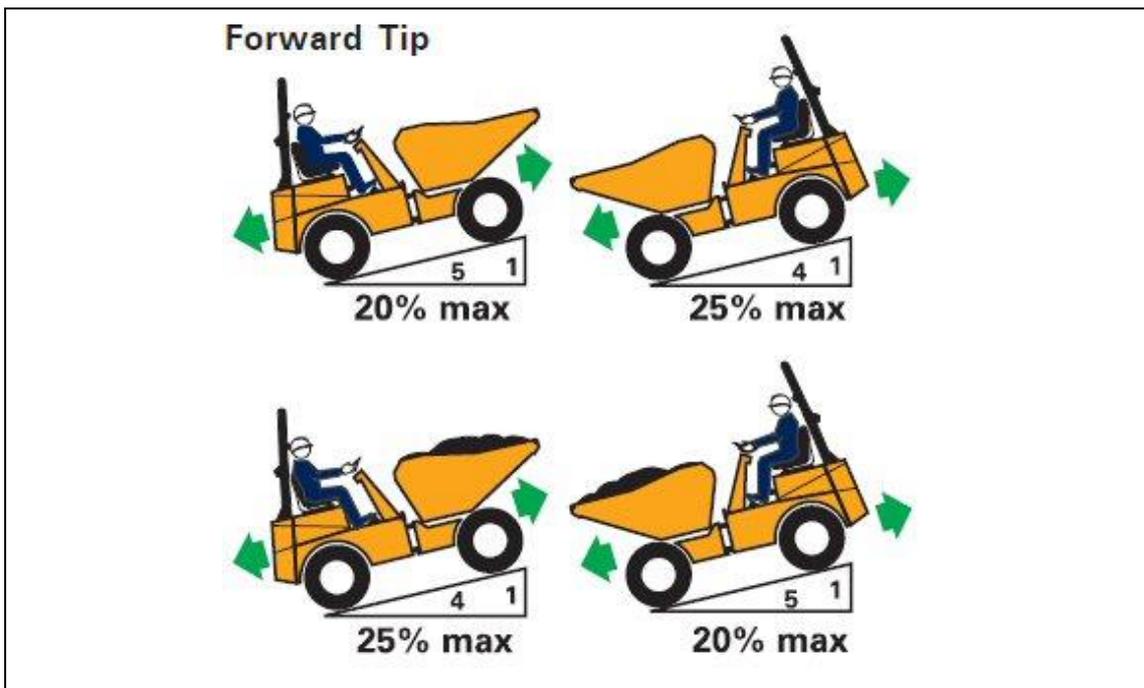


Figure 6 - Example of Slope Limits when Travelling on Inclines

8.4 *Inclinometers*

Dumpers may be fitted with inclinometers to indicate the degree of out of level when travelling on a transverse slope. These are a useful aid to the operator and should be specified or fitted as an optional extra, where available.

Some machines may come equipped with sensors which prevent travel on slopes which are above a set value. These systems should be treated with caution as cutting out the travel function may affect the ability of the operator to control the machine.

8.5 *The use of dumpers on stockpiles*

The use of dumpers on stockpiles should be avoided wherever possible, as there is a significant risk of overturning if proper planning and preparation is not undertaken.

Stockpiles are defined as temporary works and must be managed accordingly. Site Managers and Supervisors should be encouraged to seek additional underpinning knowledge on basic earthworks applications. However, it may prove difficult to ensure that stockpile slopes remain stable for the variety of materials that may be stock piled and then driven on by the dumper. Significant checks for ground stability and compaction are required to prove that a stockpile has sufficient stability to allow a dumper to be driven on it safely. This is a dynamic situation that is difficult to manage by temporary works design alone.

All efforts should be made to build and maintain stockpiles using excavators, with dumpers depositing the material at the base of the pile and excavators moving the material to form the pile. Where this is not a viable option and dumpers are to be operated on the stockpile, the following list indicates some of the activities that should be undertaken to reduce the risk of stockpile collapse and the potential for dumper overturn:

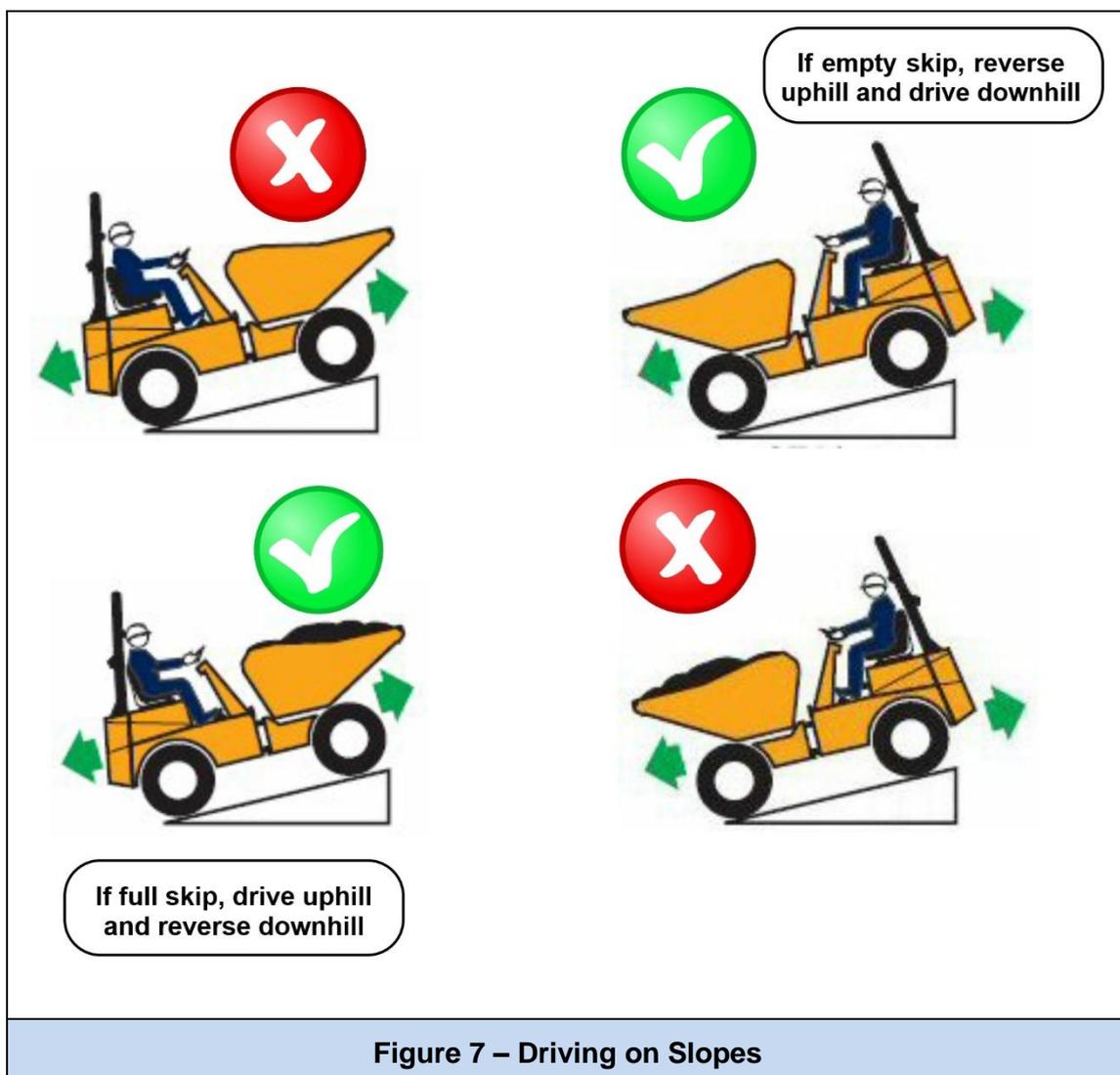
- a. The risk assessment and method statement for the stockpiling operation should include the necessary temporary works design and controls procedures;
- b. The classification of the stockpile material should be identified and the actual materials to be placed monitored for consistency;
- c. The compaction and stability of the ground should be assessed and verified;
- d. Safe access and egress to the stockpile should be provided. This should include widths and gradients as specified in the dumper manufacturer's instructions;
- e. Arrangements should be made for a competent person to monitor the stockpile's as-built condition and on-going activity;
- f. Stop blocks and/or edge berms or bunds should be constructed, and maintained;
- g. The height of bunds should be increased as the stockpile is formed. This should be carried out with an excavator or dozer;
- h. A turning circle at the top of the pile or an egress ramp should be provided. The ramp should be of appropriate size and angle;
- i. The stockpile should be formed and maintained using an excavator;
- j. As the stockpile is formed there should be on-going monitoring of compaction and material strength, layer by layer;
- k. The stockpile should be maintained for the duration of the spoil heap operations;
- l. The effect of rain on the stability of the materials and running surface should be considered, as should the effect of run-off on local water courses and other environmental considerations;

NOTE: Limiting a spoil heap's height may not be sufficient to prevent overturning of the machine.

Where the use of dumpers on stockpiles and slopes generally is unavoidable the following points should be considered when traversing the incline of a stockpile:

- a. The heavy end of the dumper should generally be uphill which means:
 - If laden drive uphill
 - If laden reverse downhill
 - If unladen reverse uphill
 - If unladen drive downhill.
- b. There should be a turning area at the top of the stockpile or if not, a route down the other side of the slope.
- c. Stop blocks are not always effective in stopping dumpers on slopes and there may be difficulty in maintaining the position of the stop blocks as the batter is always moving.
- d. An excavator or other suitable machine should be used to build and keep the stockpile trimmed and compacted. Dumpers should not be used for this task.

It is important that the operator consults the operator's manual for the specific dumper they are operating before starting work, to determine the direction based on the gradient of the slope (see **Figure 7**).



8.6 *Driving Techniques*

The operation of steering and braking should be smooth, with the operator anticipating changing conditions and altering speed and direction accordingly. The high number of machines equipped with hydraulically-based transmission systems have eliminated the traditional clutch pedal.

This can encourage operators to operate the service brake using their left foot, causing excessive deceleration which may lead to loss of control and/or load ejection.

Operators should be warned of the dangers of 'left-foot' braking during the training and familiarisation process. On dumpers which are designed to be braked using the left foot only, sufficient training should be undertaken to eliminate potential dangers.

Some dumpers may be equipped with additional foot controls in addition to the accelerator and brake pedals. These can cause significant confusion to the untrained/unwary and if operated incorrectly can create hazardous situations. Depending on the transmission type, the additional pedal can either act as a transmission disconnect used for changing gear, or act as an inching pedal allowing slow forward speeds for tight manoeuvring activities. Gear lever mounted buttons may also provide similar functions. In all cases, suitable training and familiarisation should be undertaken.

8.7 *Parking*

When parking the machine at the end of a shift or for a break the following points should be observed. Park:

- In a designated area;
- With the parking brake on and ignition key removed;
- On level ground;
- On firm even ground to avoid slips and trips;
- Away from excavations;
- Away from the path of other plant;
- Away from designated pedestrian access and egress walkways;
- Away from building access and egress routes.

In 2016 one insurance company received 200 claims for slips, trips and falls that were dumper related

9.0 Dumper Exclusion and Segregation

9.1 *General*

As with all mobile plant, dumpers have the potential to injure people in the immediate vicinity. The physical presence of the skip, particularly when fully loaded can greatly reduce the operator's ability to see nearby persons, increasing the risk of collision. This can occur during both use and maintenance activities. The people who might be injured include:

- Dumper operators;
- Operatives directly working with a dumper;
- Other operatives in the vicinity;
- The general public.

Each of these groups require differing degrees of exclusion, with the largest difference being between site inducted personnel and the general public. The former should appreciate the risks from mobile plant, whilst the latter should be treated as having no appreciation of the risks whatsoever.

It should also be remembered that segregation and traffic management plans should include the control of vehicles and other machines on site, as a collision between machines may put their occupants at risk e.g. a collision between a dumper and an elevated MEWP.

Regulation 27 of the Construction (Design and management) Regulations 2015 requires that a construction site must be organised in such a way that, so far as is reasonably practicable, pedestrians and vehicles can move without risks to health or safety and:

- a. Any traffic routes must be suitable for the persons or vehicles using them, there must be enough of them, they must be in suitable positions and they must be of sufficient size;
- b. Pedestrians or vehicles should be able to use the traffic route without causing danger to persons near it;
- c. Any door or gate for pedestrians which leads onto a traffic route is placed to enable pedestrians to see any approaching vehicle or plant from a place of safety;
- d. There is sufficient separation between vehicles and pedestrians to ensure safety;
- e. Where this is not reasonably practicable other means for the protection of pedestrians are provided, and effective arrangements are used for warning any person liable to be crushed or trapped by any vehicle of its approach;
- f. Where it is unsafe for pedestrians to use a gate intended primarily for vehicles, at least one door for pedestrians is provided in the immediate vicinity of the gate, is clearly marked and is kept free from obstruction;
- g. Each traffic route must be:
 - indicated by suitable signs where necessary for reasons of health or safety;
 - regularly checked and properly maintained.
- h. No vehicle is to be driven on a traffic route unless, so far as is reasonably practicable, that traffic route is free from obstruction and permits sufficient clearance.

The Principle Contractor should take first responsibility for a traffic management plan on the site and ensure that it is effectively communicated to all personnel on site.

9.1.1 Segregation and exclusion

An important part of the planning process is consideration of the requirements for segregation and exclusion. This should identify where the machine will be operating and who may be present in those areas. Appropriate measures should be put in place to exclude those people who have no reason to be in the machine's working area and control those people whose tasks require them to be in that area. **Figure 8** shows one example of a hierarchy of control that can be applied. Other control systems are available.

Hierarchy of Control		
Level	Description	Risk Control Measures
1 Eliminate	People plant interface removed	Large fenced off area with people eliminated from the work area. Plant operates without marshalling.
2 Minimise	Full, physical segregation of people and plant	Observe the Plant Safe Zones by physically restricting people from entering the RED and AMBER exclusion zones. Erect physical barriers around a single operation outside the maximum reach of the machine. This must be marshalled.
3 Minimise	Partial segregation of people and plant	Observe the Plant Safe Zones by restricting people from entering the RED and AMBER exclusion zones using visual means, cones or spray marks that denote the zones. This requires increased supervision and measures to prevent unauthorised access.
4 Mitigate	No segregation of people and plant	<p>Exceptional tasks that require essential personnel to enter the AMBER Plant Safe Zone (for example, kerb laying, disconnecting attachments, slinging loads, off-loading materials from fork lift trucks or lorry beds) must be mitigated through a robust site and task specific Safe System of Work.</p> <p>These tasks must only be conducted with:</p> <ul style="list-style-type: none"> • Clear communication between the plant operator or vehicle driver and essential personnel performing the task. • A method of preventing non-authorized access. • A full time Plant & Vehicle Marshal/Machine Controller. • Increased supervision, and a strict discipline in executing the task exactly as written. <p>Personnel must not enter the RED zone unless the machine is fully isolated, engine switched off and a method for preventing it restarting is in place (for example the ignition keys are removed from the cab).</p>

Figure 8 – Example of a Hierarchy of Control for People and Plant

9.1.2 Zonal working

A number of UK contractors are utilising zonal working methods where a site is divided into zones which are in essence one of three types:

- **Exclusion Zone**

An area that cannot be accessed at any time due to the nature of the risks present and include:

- **Fixed Exclusion Zone**

An area subject to exclusion that remains in a fixed location e.g. a fenced off area of a site occupied exclusively by a groundworks contractor.

- **Mobile Exclusion Zone**

An area subject to exclusion that due to the nature of the activity can change location e.g. the slew area of an excavator.

- **Restricted Zone**

An area that can only be accessed by authorised persons who have the necessary competence to identify, understand and mitigate the risks present in that area e.g. a traffic route used by dumpers with barriers to prevent unauthorised pedestrian access.

- **Normal Zone**

All areas other than restricted or exclusion zones e.g. a part of the site with unrestricted access to site personnel where dumpers are travelling.

The zones can either be associated with a specific activity such as plant operations or general activities (see **Tables 3 & 4**).

Fixed Exclusion Zones	Mobile Exclusion Zones	Restricted Zones
The area directly beneath a hoist	Slew path of an excavator	Areas around activities such as piling or earthworks which involve moving items of equipment.
Incomplete scaffolding	Area beneath slung loads	Areas housing equipment under pressure such as grout plants or industrial jacking systems.
Haul roads for muck shift operations used by dump trucks or wagons – apart from designated crossing points	Area beneath freshly sprayed concrete in tunnel works	Encapsulated areas for shot blasting or asbestos removal
Live carriageways adjacent to the localised works	Areas adjacent to any moving mobile plant or equipment	Areas where people numbers have to be limited due to size and allowance of space for the activities undertaken
		Confined spaces in which construction activity is required
Table 3 – Examples of zones associated with a specific activity		

Fixed Exclusion Zones	Mobile Exclusion Zones	Restricted Zones
Partially demolished structures	The operating envelope of mobile plant or equipment operated by third parties or the Client if work required is in a 'live' environment such a dock or an airport.	Third party controlled areas with specific access requirements such as Client facilities or other Contractor's work area
Existing infrastructure that is unsafe to enter due to its condition e.g. a plant room with poorly maintained steel mesh walkways		Areas of a site which have particular controls in place such as crossing points under pipe bridges or overhead cables.
Areas with hazards that present a significant risk such as: <ul style="list-style-type: none"> • Loose asbestos lagging in a structure • Confined spaces where no entry is required during the works • Live carriageways or rail lines 		
Table 4 – Examples of Zones not associated with a Specific Activity		

Zones should be identified and categorised as part of the planning process. Once identified, a risk assessment should be carried out and a method statement prepared to include the following:

Fixed Exclusion Zone

- The type and extent of segregation;
- Means of ensuring no access (unless for maintenance/remedial activities) is maintained;
- Who is authorised to change the zone status?

Mobile Exclusion Zone

- The activity that creates mobile exclusion zones ceases and the area is made safe before access by personnel;
- Arrangements on how this is achieved are detailed in the method statement;
- Examples of such arrangements are:
 - The 'Thumbs up' rule for approaching dumpers or excavators
 - Panel strength tests before entry under sprayed concrete lining
 - Use of hand portable radio systems in order to communicate directly with machine operators.

Restricted Zone

- The type and extent of segregation;
- Means of controlling access;
- Who is authorised to enter and work in the zone;

- Who is authorised to allow access into the zone;
- Any mobile exclusion zones within the segregated zone.

If work is required in static exclusion zones, they should be reassigned as a restricted zone status by the authorised person for that zone. This should only happen after the controls required are identified, put in place and the associated method statement plan has been revised and re-briefed to the appropriate personnel.

The exclusion and restricted zones should be identified by appropriate signage, examples of which are shown in **Figure 9**.



Figure 9 – Examples of Zone Signage

9.1.3 Highway and utility works

For work on the highway, including utility work, specific requirements are set out in the *New Roads and Street Works Act 1991*, its Code of Practice and the *Traffic Signs Manual (Chapter 8)* Parts 1 and 2.

Utility work presents particular problems with sites of limited area, the close proximity of the public, tight programmes and significant financial penalties for overruns.

9.1.4 Segregation and indicating materials

There are a wide variety of systems and materials available to segregate people from machines and indicate the boundaries of exclusion zones:

Some of these will prevent or impede access, whilst others will warn or identify an exclusion zone.

9.1.5 Control of access

The control of access to both sites and exclusion zones within a site, is essential if segregation of people and machines is to be effective. Control of access to an area should be based on the zonal working classification and consequential risks and other environmental factors.

Access should be controlled by gates operated either by security personnel or other means that ensures non-authorised access.

Where crossing points are provided for the general public, they should be gated and operated by controlling personnel.

9.2 Safety of dumper operators during loading

Where the dumper operator must leave the dumper driving position and stand to one side whilst the dumper skip is being loaded, they should ensure that:

- they are in a safe, designated place which should be ideally at least 3 metres away from the dumper, they are not between the loading machine and the dumper and;
- are on ground of a sufficient height so that they have eye contact with the operator of the loading machine (generally a 360° excavator).

The designated place or places should be planned and relayed to the operator during a pre-work briefing, including potential danger areas and revised positioning due to changing operational factors



Figure 10 – Example of an operator within the loading activity danger area



Figure 11 – Example of an operator clear of the loading activity

9.3 Proximity warning systems

Proximity warning systems are available to warn machine operators of the presence of personnel in the vicinity of the machine. Some rely on personnel wearing a system compatible transponder, whilst others use sensors on the dumper to sense the presence of personnel near the machine. All these systems should be treated as an aid to the operator and not relied on as infallible.

As well as giving warning of the presence of personnel to a machine operator, transponder-based systems can also be linked into a site wide system to allow the remote monitoring of personnel behaviour around vehicles and machines.

Transponder based systems rely on people near the machine wearing transponder units, however the system will not sense the presence of casual bystanders who are not wearing transponder units. This approach may be effective on a controlled site, but not on sites where access is more difficult to control.

Where these systems are employed, they must be maintained in effective working order. Battery life and signal strength should always be checked before relying on them.

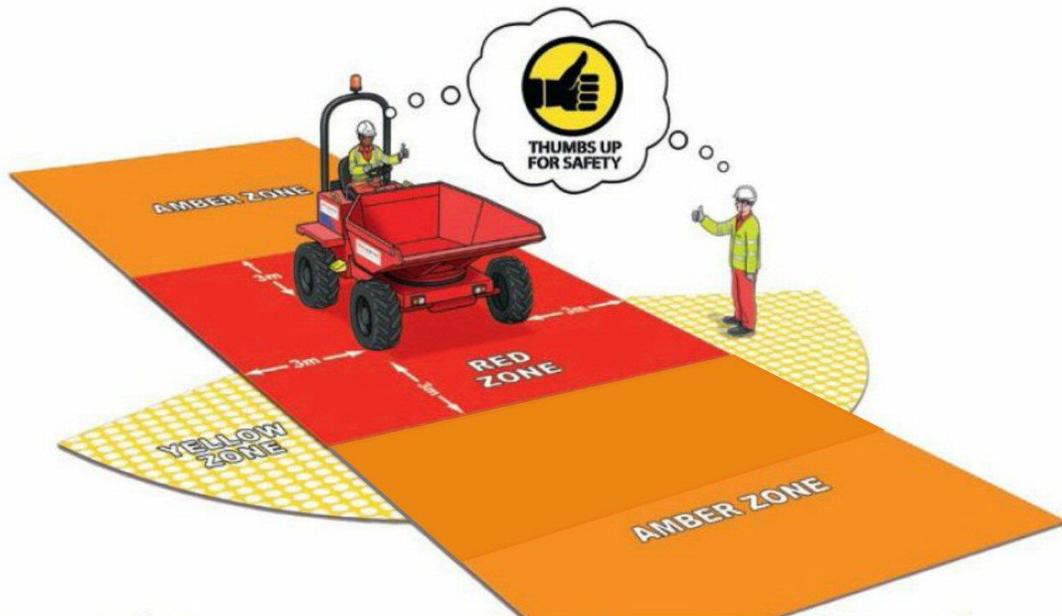
9.4 Training of operatives in the operating area of dumpers and other plant

Operatives in the operating area of dumpers and other plant should be given plant awareness training. This is addressed in **6.12** and the Plant Safety Group guidance on *Reducing Unintended Movement of Plant* (free download from <https://www.cpa.uk.net>)

9.5 Thumbs Up procedure

The 'Thumbs Up' procedure is a common method of communication adopted on UK construction sites. Operators give ground workers and other people in the vicinity of the machine a 'thumbs-up' sign which indicates that they are aware of their presence. An example is shown in **Figure 12**.

Safety Zone - Forward/Swivel Tipping Dumper



The Yellow Zone must be used to gain the attention of the operator before entering the Amber and Red Zones. You are in the line of sight of the operator and out of danger.



BEFORE entering the Amber Zone - machine MUST be immobilised and personnel must gain permission from the dumper operator.

BEFORE entering the Red Zone - Dumper MUST be immobilised and permission granted by the dumper operator.

Figure 12 – Example of the Application of the Thumbs Up Procedure

10.0 Loading and Discharging Operations

10.1 Loading Machine Considerations

10.1.1 360° Excavator

The most common machine for loading dumpers is the 360° excavator which has full 360° slewing ability and sufficient reach and height to efficiently load the dumper. Both tracked and wheeled variants of 360° excavators can quickly reposition during the loading activity. The bucket size of the machine will determine the number of loading passes required to fill the dumper skip. Large buckets may cause overspill from the skip and potential overloading as the excavator operator may be tempted to fully empty their bucket. A large bucket may also hinder full observation of the loading activity, increasing the risk of the bucket striking parts of the dumper.

If the dumper cab is an OPS type, then the excavator loading the dumper must not exceed the rating/size specified by the dumper manufacturer. If it is a non-OPS type, the operator must alight before loading takes place (see **5.4**)

10.1.2 180° Excavator (backhoe)

The 180° excavator is equipped with a front-loading bucket and a rear backhoe with 180° slewing capability. The rear backhoe is normally used for loading dumpers, but 180° excavator backhoes tend to have smaller capacity buckets, meaning that additional passes are required. A smaller bucket can, however, minimise the risk of overloading the skip.

10.1.3 Loading Shovel/ 180° Excavator front loader

The front bucket should not be used for loading purposes unless the width of the bucket does not exceed that of the dumper skip, as there is a high probability that overspill from the bucket may occur. The dimensions of the front bucket can further limit the loading machine operator's visibility, increasing the risk of striking the dumper. Loading using the front bucket requires the excavator to drive towards the parked dumper whilst raising the loader arms.

10.1.4 Conveyor

A conveyor transports material in a linear motion and the discharge point cannot normally be adjusted. This means that the dumper operator has to precisely locate the skip below the conveyor discharge point to minimise overspill. Preventing overloading needs the conveyor discharge to be halted, requiring loading to be carried out by a very skilled conveyor operative who can anticipate when to stop the conveyor.

10.1.5 Batching Plant/Mixers

The output from the mixer is usually a semi-liquid and requires the dumper to be manoeuvred under the discharge point. The material properties will allow an equalised spread of the material across the skip. The discharge of the material needs to be controlled so that no splashing of material occurs which may be a health hazard. The level of the material should be sufficiently below the top of the skip to prevent overspill during cornering and braking actions. Due to the higher density of liquid materials such as wet concrete, extra weight is placed on dumper components such as the axles and tyres, requiring care to avoid overloading the dumper. Discharge and cleaning procedures, including any environmental factors need to be ascertained prior to starting operations.

10.2 Loading procedures

The aim of the loading procedure is to ensure an efficient loading system without risk to:

- a. The operator of the dumper;

- b. Nearby direct support personnel and other site workers;
- c. The loading machine;
- d. The dumper being loaded;
- e. Nearby structures and objects.

Other factors to consider when preparing the area for loading purposes are that:

- a. The terrain for loading should be level and of firm ground;
- b. Other non-connected plant should be clear of the loading area;
- c. An effective exclusion zone should be in place to prevent workers entering the loading area (see **9.0**);
- d. The operator of the loading machine should have good visibility of the skip of the dumper which may require being at height where possible;
- e. A safe location for the operator to stand so that the loading machine operator is visible to the dumper operator and vice versa.

10.3 Loading procedures using an Excavator

The following procedure is recommended for safe and efficient loading of a dumper:

10.3.1 Forward Loading

- a. The dumper needs to approach the loading machine in line with the excavator's discharge point so that the excavator operator extends the bucket using the boom and dipper arms simultaneously;
- b. There needs to be sufficient distance between the stopping point of the dumper and the excavator so that the excavator can extend its boom and dipper arm to, where conditions allow, approximately three quarters of maximum extension to load the dumper. This will minimise the risk of physical contact with the dumper. The stopping position of the dumper should be clearly marked;



Figure 13 – Example of Forward Loading

- c. The bucket of the loading machine should be either at ground level or to one side of the approaching dumper. The dumper should be driven towards the stopping point at slow speed;

- d. The dumper should never be driven towards a raised bucket as the risk of overrunning the stopping point and contacting the bucket of the loading machine increases significantly;
- e. Loading of the skip should not start until the operator has applied the parking brake and stopped the engine and (for non-Ops cabbed versions) dismount the machine. This ensures that the machine cannot move unintentionally. Accidents of this nature have occurred where the operator has unintentionally moved a transmission or gear lever into drive when dismounting.
- f. The operator must be in a safe place (see 5.2) prior to the loading commencing
- g. The loaded material should not be above the top of the skip and effective supervision should be in place to prevent an overloaded dumper from being driven away;
- h. Once loaded to capacity, the loading machine operator should signal to the dumper operator that the machine may be moved. The loading machine operator should keep the bucket at ground level or to one side of the dumper until the dumper has cleared the loading area;
- i. The dumper operator must ensure that that the operator's station is clear of any overspill (which can cause a malfunction of the brake pedal), that they have sufficient forward view and the dumper is safe to travel.

10.3.2 Side loading

- a. The dumper needs to approach the loading machine towards the cab-side of the excavator and 90° to the excavator's discharge point;
- b. The spoil to be loaded should be on the opposite side of the loading machine to the dumper so that the slewing action of the excavator is towards the front of the dumper's skip;
- c. There needs to be sufficient width between the stopping point of the dumper and the excavator so that the excavator extends its boom and dipper arm to approximately half of maximum extension, minimising the risk of physical contact with the dumper. The stopping position of the dumper should be clearly marked;



Figure 14 – Example of Side Loading Using the Prescribed Method

- d. The bucket of the loading machine should be either at ground level or to one side of the approaching dumper. The dumper should be driven towards the stopping point at slow speed and align with the excavator's centre line (see **Figure 15.1**);
- e. During loading, the excavator operator should keep the slewing bucket at minimum radius followed by extension of the boom and dipper arms simultaneously towards and in line with the skip. This prevents an overrunning slewed bucket from striking the operator area (see **Figures 14, 15.2 and 15.3**);
- f. The dumper should never be driven towards a raised bucket as the risk of overrunning beyond the stopping point and contacting the bucket of the loading machine increases significantly;
- g. Loading of the skip should not start until the operator has applied the parking brake and stopped the engine and (for non-Ops cabbed versions) dismount the machine. This ensures that the machine cannot move unintentionally. Accidents of this nature have occurred where the operator has unintentionally moved a transmission or gear lever into drive when dismounting.
- h. The operator must be in a safe place (see **5.2**) prior to the loading commencing
- i. Once loaded to capacity, the loading machine operator will signal to the dumper operator that the machine may be moved. The loading machine operator must keep the bucket away from the dumper until the dumper has cleared the loading area;
- j. The dumper operator must ensure that the operating platform is clear of any overspill (which can cause a malfunction of the brake pedal), that they have sufficient forward view and that the dumper is safe to travel.

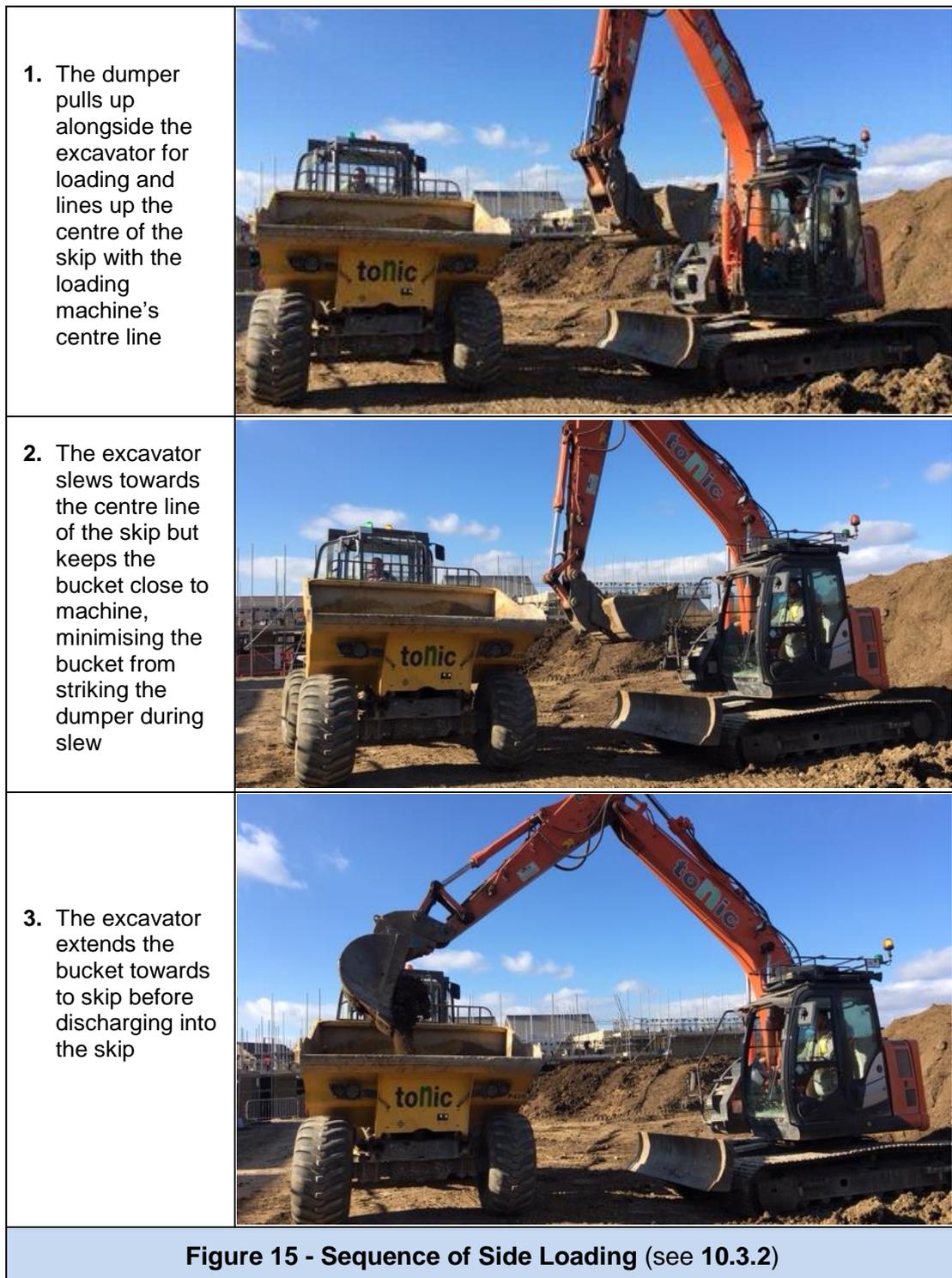
10.4 Loading in Confined Areas

Dumpers should not be used in places of confined areas such as basements as this involves several additional risks which need control measures. If there are no other options available, the following factors should be considered during the planning stage:

- a. Limited manoeuvring room for the dumper to approach the loading machine at the correct angles;
- b. A higher risk of the dumper being loaded whilst on an incline;
- c. Limited manoeuvring room to allow the dumper to traverse an incline in the correct direction, either laden or unladen;
- d. Close proximity of the loading machine to the dumper, increasing the risk of striking the machine;
- e. Limited options for the operator to be in a safe place during the loading activity;
- f. Poor environmental conditions such as dust and fumes;
- g. Restricted headroom.

10.5 Loading Procedures (moving plant)

Situations may exist where a dumper could be loaded by a moving machine such as a planer. This is however a high-risk activity which requires co-ordination of the speed of each machine and careful control of the conveyer discharge to prevent overloading. Other risks for this activity include the potential for the dumper operator to creep towards the conveyer discharge point. This may cause discharged material to fall into the control station, increasing the potential for the operator to be covered with discharged material and spoil landing on the accelerator pedal. Alternatively, the dumper may creep back from the discharge point causing overspill in front of the dumper. This activity should be properly planned with all parties involved with the operation trained and suitably briefed on its potential danger.



10.6 *Unacceptable loading practices*

The following common, but unacceptable, loading practices should be eliminated through good planning, training, and supervision:

NOTE: *These lists are non-exclusive.*

10.6.1 Loading machine operator's unacceptable practices

- a. Slewing the bucket above the cab or operating station area;
- b. Loading the skip when the operator remains on the operating platform/seat (non-OPS cabs or no cab);

- c. Loading the skip near to members of the public or others in the vicinity;
- d. Loading the skip when the operator is off the operating platform but still near the machine e.g. standing to the rear of the machine next to the radiator to keep warm;
- e. Repositioning a dumper (pulling or pushing) using the bucket of their machine;
- f. Overloading the dumper skip;
- g. Uneven loading of the skip;
- h. Overspill of material that encroaches onto the operator control station platform;
- i. Placing excessive pressure on the machine when compacting material in the skip;
- j. Overfilling with materials that spill when cornering.

NOTE: This can be a particular issue with liquid concrete.

10.6.2 Dumper operator's unacceptable practices

- a. Remaining on the dumper during the loading (non-OPS cabs or no cab);
- b. Not applying the parking brake and/or not placing the transmission into neutral;
- c. Not using the steps when dismounting from the dumper i.e. jumping from the platform to the ground;
- d. Getting off the operating platform but still near the machine e.g. standing to the rear of the machine next to the radiator to keep warm;
- e. Not clearing the operator station platform of any debris;
- f. Driving the dumper with limited forward visibility;
- g. Standing whilst driving to see over a high load;
- h. Driving an overloaded dumper;
- i. Driving with excessive speed;
- j. Driving the dumper without a seat belt buckled and adjusted correctly;
- k. Using a mobile phone whilst operating the dumper;
- l. Not turning the machine off during loading;
- m. Not removing the key whenever the machine is left.

10.7 *Overloading of the skip*

The level of the load placed within the skip should not be above the top of the skip (struck load) as this can create the following issues:

- a. The operator's forward vision is severely restricted, risking a collision with structures, people, other plant etc. or risking an overturn by driving into large voids, potholes or trenches;
- b. The excess material adds weight which places extra strain on the dumper's components, particularly the tyres, making the dumper harder to steer;
- c. The additional weight could overload the dumper's hydraulic system when raising the skip to discharge the load;
- d. If the load binds together during discharging, this can move the centre of gravity forward leading to the dumper overturning in a forward direction;
- e. The dumper's centre of gravity has been raised which will make it more unstable, particularly on inclines, uneven ground and when turning around corners;

- f. The excess weight creates higher ground pressure through the tyres which on soft ground can cause the dumper to lean either forward and/or to one side, increasing the risk of instability;
- g. The excess weight can excessively compact the ground, potentially damaging underground services and haul routes, particularly in wet conditions;
- h. Excessive speed when cornering or harsh braking can cause the material to be thrown from the skip.



Figure 16 – Example of potential overloading

10.8 Discharging Procedures

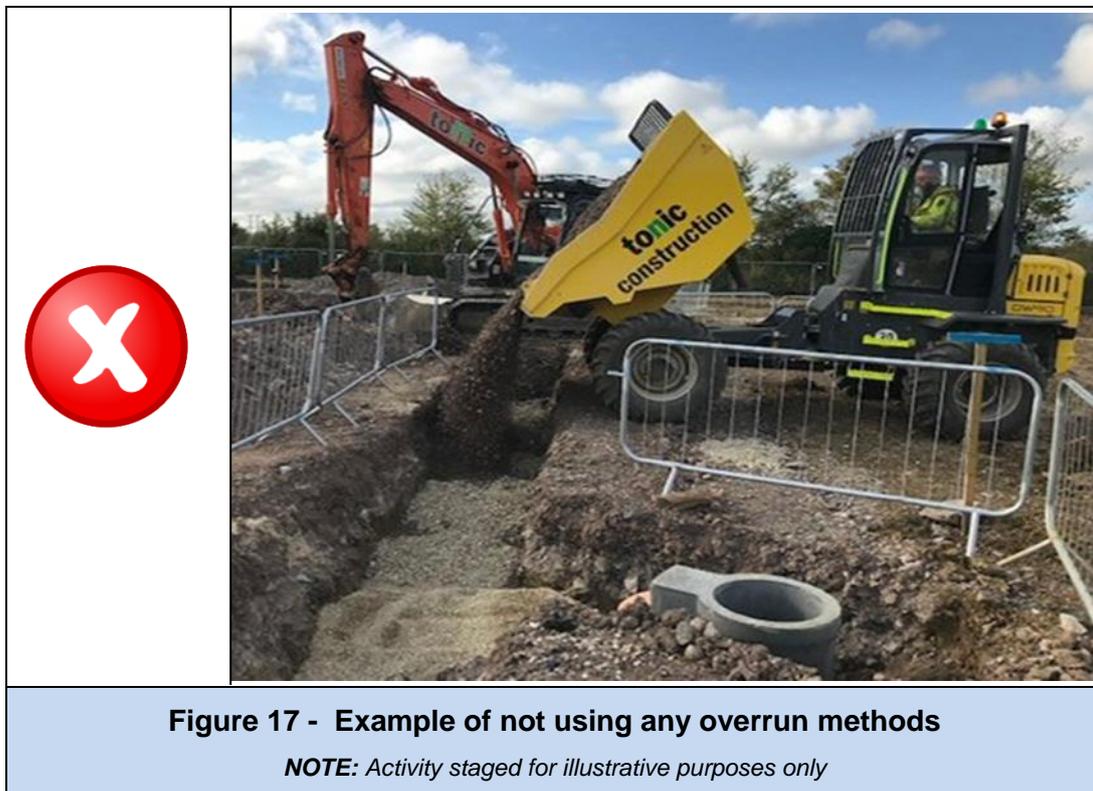
The location for load discharging should be planned and controlled so that risks are minimised during the discharging process, which may be hazardous due to several factors including:

- a. The dumper could be approaching an edge or an excavation;
- b. Continual discharge at a tipping point can cause changes in the ground and affect stability;
- c. As a skip is raised to discharge a load, the centre of gravity is both raised and moves towards the front of the machine, making it less stable;
- d. Cohesive soils can stick to the base of the skip and cause the dumper to overturn. Only free flowing materials such as gravel should be tipped.

The discharge area must be level and firm, allowing the dumper to approach the tipping area without manoeuvring on the approach. If the dumper is either angled forward or to one side when discharging, instability can occur due to the raised centre of gravity. The dumper must be at 90° to the tipping point prior to discharging.

It is good practice to tip away from the edge of an excavation so that a tracked machine (e.g. excavator or dozer) transfers the material into the excavation. Dumpers should not be unloaded using another machine. Dumper should not be used to push the material using the skip in the manner of a dozing blade.

Where the discharge of material is to be over an edge or within a trench, there should be a physical barrier such as an earth berm or 'stop-block' employed (see **Figure 5**). The ratio of the wheel diameter to barrier height should be sufficiently small to ensure that an overrun by the machine is prevented. The edge of the excavation should be able to carry the surcharging load that the wheels create without collapsing. Operators should, however, be made aware that they cannot not rely on a berm or block being able to stop the dumper. These aids can only minimise the risk of the dumper going over the edge. Dumpers have fallen into open trenches when a suitable barrier system has not been used or was insufficient (see **8.2.5**).



When a stockpile is being formed, the deposited material should be placed at the foot of the heap only, so that the dumper remains level and on firm ground.

Prior to discharging, the operator should apply the parking brake and place the transmission into the neutral position before raising the skip. The operator needs to constantly observe the discharging material, whilst operating all controls smoothly. In the event of a blockage during discharging, the operator must lower the skip and clear the blockage manually. Continual raising of the skip to clear a blockage could cause the dumper to tip forward.

Discharging must not begin until all personnel are clear of the discharging area so that they cannot be trapped or buried by the discharged material.

NOTE: Some dumper manufacturers allow whilst the machine is moving whilst others do not. Discharging whilst moving is not good practice.

High lift dumpers allow material to be tipped at height, but extreme care must be taken by the operator, due to the raised centre of gravity. Dumpers fitted with rotating or swivel skip allow loads to be discharged up to 90° from the dumper's centre line. On raising the skip, the machine's centre of gravity moves towards the discharge side and increases the ground bearing pressure under the corresponding tyres.

10.9 Removing Materials Using an Excavator Bucket

The activity of using an excavator bucket to remove materials such as shingle, sand etc. is occasionally carried out. Extreme care needs to be made when being undertaken as damage and accelerated wear can occur to the skip and further risk unintended

movement to the machine if the bucket fouls the skip. If excessive downward pressure is applied by the excavator onto the skip, this can overload the axles and tyres.

10.10 Self-loading Dumpers

Self-loading dumpers are equipped with a pair of hydraulically-operated loader arms containing a limited-action tilting bucket which can extract or 'scoop' loose material at ground level and deposit within the skip. When discharging the load from the skip, the loader arms need to be raised to avoid the discharged material from re-entering the bucket. Due to the very low volume of such machines in the UK, specialist training for operators is required.

10.11 Reversible Seating Dumpers (tracked and wheeled)

These types of machine allow the seating position including the steering controls and, in some cases, transmission and hydraulic controls, to be rotated on a platform through 180°. This allows the operator to select the position that provides the clearest view during manoeuvring and discharging operations, allows potential hazards to be spotted and significantly reduces the need to reverse the dumper (see **Figure 18**).

Complacency, fatigue and lack of attention may be factors that prevent operators from continually rotating the seating position, negating the benefits of this system. Factors which can ensure operators select the appropriate driving position for each activity include effective supervision and other incentives.

Where used on the public highway, the position of the seating will need to be checked so that the requirements of the Road Traffic Act are complied with, such as front white and red rear lighting.



Figure 18 – Example of a Reversible Seat Dumper

NOTE: Shown for clarity purposes only. Model without cab not available on the UK market

10.12 Transporting Materials

Materials to be transported in and discharged from the skip should be kept to loose, free-flowing materials. Materials that do not discharge easily have the potential to cause instability when the skip is being raised, which can cause a change in the centre of gravity of the machine towards the tipping line (see. **8.1**).

Liquid loads carried within the skip, such as uncured concrete, requires additional care for safe transportation. Liquids tend to have a higher density than soils. Movement of the machine, particularly on uneven ground or inclines, can cause the liquid to continually move around the skip and cause a change in the machine's centre of gravity. The liquid may also spill from the skip, contaminating areas such as the operator station. This may lead to operational issues with driving controls such as brake pedals.

10.13 Transporting Ancillary Equipment

The skip of a dumper can provide a method of transporting items or equipment such as small tools or building materials. However, this is not recommended due to several potential factors involved with this activity which require appropriate control methods and include:

- a. The height of the skip;
- b. Access/egress to/into the skip;
- c. Manual handling of items;
- d. Working at height;
- e. Damage of the items during transit;
- f. Raising the centre of gravity of the machine and reducing stability.

Skips of a dumper normally have sloping front and sides with a slippery surface. Persons entering the skip to place or retrieve loads are at risk of slips and falls which may result in injury. If the operator decides to raise the skip to aid loading or retrieving of equipment, this can create a risk to operatives who may try to 'catch' a piece of equipment that has been discharged from a raising skip, risking a strain or other significant injuries.

Materials or equipment that protrude beyond the edges of the skip should not be carried, as a skip has not been designed to allow the efficient loading and retrieval of items. Where other transportation equipment is not available, the following should be considered:

- a. Where a load protrudes sideways from a skip, there is a danger that contact could be made with an object or structure during travel, causing a shift in the load;
- b. Long loads that protrude beyond the front of a skip are also in danger of striking objects or structures. This may not be immediately evident from the operator's position;
- c. There is a further danger where the load is semi or unbalanced and may encourage an operative to support the load during travel. This may cause them to be in front of a moving machine, potentially out of sight of the dumper operator and at risk of becoming struck by the moving dumper if a slip or trip occurs.

11.0 Driving, Towing and Use on the Public Highway

11.1 Excessive Travel speed

Excessive speed may increase the risk of collision between the dumper and people. It may also increase the risk of overturns through hitting kerbs and other obstacles. Many operators do not appreciate the limitations of dumpers, which are not all-terrain machines. This is a particular problem on large open sites, at the early stages of the project where operators may be tempted to speed.

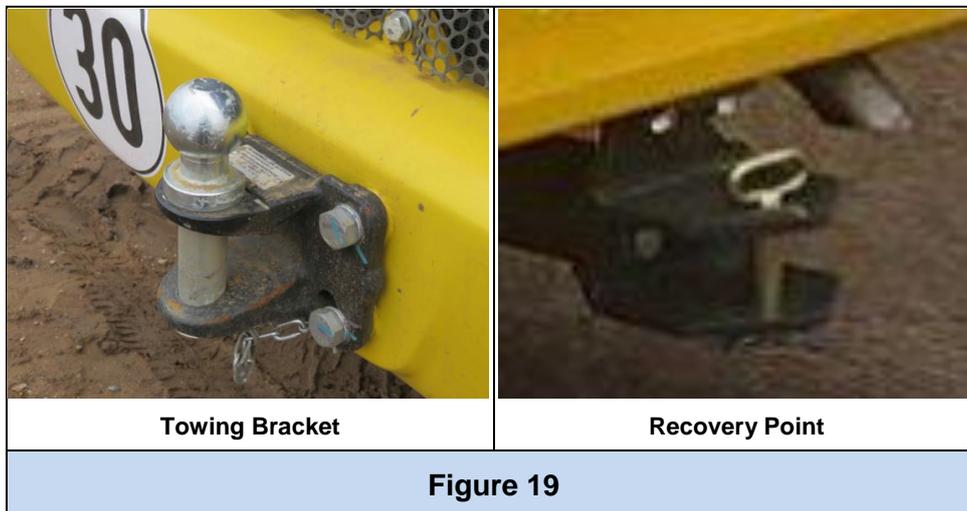
11.2 Towing Equipment with a Dumper

Dumpers sometimes are used to tow equipment such as compressors and small bowsers. These machines are not, however, specifically designed for towing purposes and other methods should be explored first.

Where the planning process is considering the use of a dumper to tow equipment, the following points should be taken into account:

- a. That no other more suitable machine is available;
- b. Towing activities are authorised by the manufacturer of the dumper to be used;
- c. The equipment to be towed does not exceed the specification set by the manufacturer in terms of the weight of the equipment and the downward load imposed on the towing point;
- d. The towing bracket is compatible with the towing eye on the equipment to be towed;
- e. The operator has been trained and is competent to carry out towing activities (see 6.0);
- f. The correct towing pin for the towing bracket is used and that the safety pin is located correctly in the towing pin.

NOTE: What appears to be a towing point may only be a machine recovery point and not designed for the towing of equipment.



- g. Towing balls come in a variety of sizes and where the size of ball differs from the towed equipment's towing hitch, there is a danger that the hitch can dislodge from the ball and the towed equipment become detached from the dumper;
- h. The manufacturer's handbook should be consulted to ensure a full understanding of the towing restrictions placed by the manufacturer. It should be noted that manufacturers' requirements differ between different models from the same manufacturer.

- i. The towing ability of the dumper may depend on whether the trailer is fitted with an overrun brake or is non-braked. Using an overweight non-braked trailer could cause loss of control during the braking activity.

TOWING A TRAILER

- ✓ Place ballast load in skip. This load should be a minimum of 25% of the machine's rated payload
- ✗ The gross weight to be towed plus the ballast load **MUST NOT** exceed rated payload of machine
- ✗ **DO NOT** exceed maximum tow bar pull or vertical load
- ✗ Towing must not be carried out on sloping ground
- ✓ Always use a Thwaites-approved towing pin

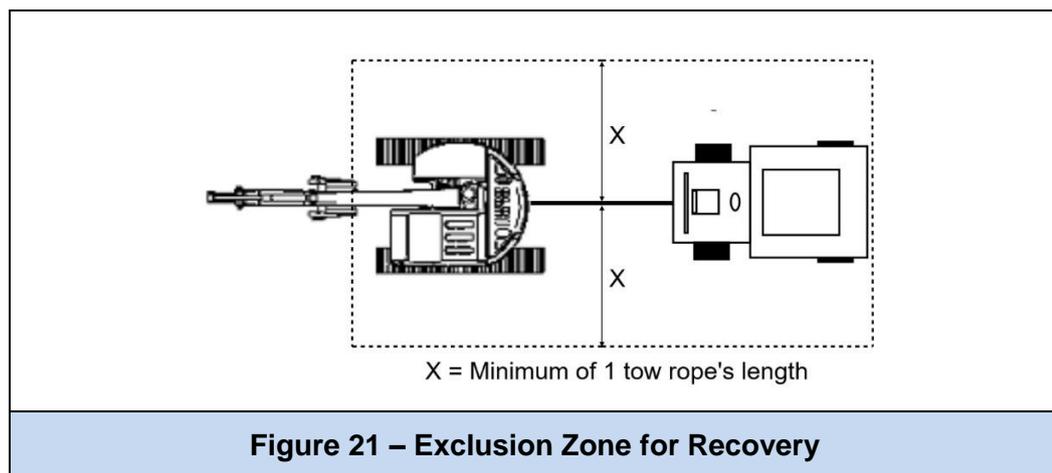
Figure 20 - Example of the Limitations of Towing with a Dumper

11.3 Recovery of a stuck dumper

Where a dumper has become stuck due to, for example, working in muddy conditions and where traction is lost, a safe system of work should be devised to eliminate any dangers from the recovery process. Factors that should be considered when planning a recovery operation include:

- a. The need to conduct a "point of work" risk assessment to assess the validity of the recovery plan;
- b. All personnel involved in the recovery operation should have the necessary competence;
- c. Removing as much material as is practicable from the skip if the dumper is laden;
- d. Clearing as much material from around the wheels as is practicable;

- e. Ensuring the route that the wheels will follow is clear;
- f. Retrieving in the reverse direction to that in which the dumper became stuck;
- g. Choosing a towing machine of suitable size that will create a slow, steady pull with minimal traction loss;
- h. Ensuring that suitable hitch points are fitted to the towing machine and the dumper being retrieved;
NOTE: *Not all dumpers will have hitch points at both the front and rear of the machine.*
- i. That suitable towing accessory (gear) such as a fabric sling, cable or chain is within the load capacity with at least a 50% overload safety factor;
NOTE: *Lifting accessories should not be used for towing.*
- j. Consideration of the risk to personnel of towing accessory failure. Wire ropes will whip if they break and broken chain links will act as shrapnel, both are capable of inflicting severe, and possibly fatal, injuries. The use of fabric slings should be considered as they are less susceptible to these issues;
- k. That the towing accessory (gear) has suitable points to be secured to each machine and will not become detached during the pull;
- l. Ensuring a clear, agreed, communication system between all parties involved with the operation and agreeing the circumstances that will immediately halt the operation;
- m. Ensuring the area between and around the two machines is clear, with a minimum distance around the machines of at least the towing cable or chain's length in case of detachment and whiplash (see **Figure 21**);
- n. If the failed machine has engine power and drive, that this is utilised to reduce the pulling load on the towing equipment and its components;
- o. Taking up chain/cable slack slowly before applying full load;
- p. If it is not possible to recovery the dumper by towing and the machine needs to be lifted out using a crane or other lifting equipment, the task becomes a lifting operation and must be planned and executed in accordance with lifting regulations including LOLER 1998.



Factors than can create dangers to the retrieval process include:

- a. Pulling a failed or stuck machine out using the bucket of a 360-degree excavator;
- b. Using too small a machine for towing purposes;
- c. Using poor quality or defective towing cables or chains;
- d. Wrapping a chain or cable around a component such as an axle;

- e. 'Jolting' the stuck machine by the towing machine;
- f. Allowing personnel within the whip area of a detached or broken cable.

11.4 **Recovery of an overturned dumper**

Where a dumper has overturned, help should be sought from a vehicle recovery specialist. Such operations are high risk and should not be undertaken by personnel without the necessary competence.

11.5 **Travelling on the Public Highway**

Under certain circumstances dumpers are permitted to travel for short distances on a Public Road as a "Works Truck". The definition of a works truck in the Road Vehicles (Construction and Use) Regulations (C & U) is *"a motor vehicle (other than a straddle carrier) designed for use in private premises and used on a road only in delivering goods from or to such premises to or from a vehicle on a road in the immediate neighbourhood, or in passing from one part of any such premises to another or to other private premises in the immediate neighbourhood or in connection with road works while at or in the immediate neighbourhood of the site of such works."*

Requirements for use as a "Works Truck" are:

- a. The dumper must be registered and taxed as a "special vehicle";
- b. The dumper must have third party vehicle insurance;
- c. The dumper must meet the following C & U requirements:
 - If the works truck can exceed 20 mph it must have a horn in good working order
 - If it can exceed 25mph it must have a speedometer in good working order
 - The engine must be in good working order (does not emit black smoke) and fitted with a silencer if necessary, so that it does not emit excessive noise
 - It must have brakes that enable it to stop within a reasonable distance
 - Mirrors are not required if the driver can easily see traffic to the rear
NOTE: *Mirrors are generally required to provide adequate visibility on site.*
 - The vehicle must be maintained in a safe condition so that it does not cause danger to the driver or other road users.
- d. The driver must hold a full car (Category B) licence and the following restrictions apply:
 - a. If a person passed their driving test before 1st January 1997, they can drive vehicles with a maximum authorised mass of 7.5 tonnes on a Category B licence
 - b. If a person passed their test on or after 1st January 1997, they can only drive vehicles with a maximum authorised mass of 3.5 tonnes.

NOTE: *Additional information is given in the DVLA Information Leaflet INF52 - Large Vehicles you can drive using your car or lorry licence.*

Further advice on Works Trucks is given in the Department for Transport Information Sheet - *Works Trucks: A brief guide.*

C & U also defines a Works Trailer as *"a trailer designed for use in private premises and used on a road only in delivering goods from or to such premises to or from a vehicle on a road in the immediate neighbourhood, or in passing from one part of any such premises to another or to other private premises in the immediate neighbourhood or in connection with road works while at or in the immediate neighbourhood of the site of such works."*

Advice from the Department for Transport states that *"There is nothing to say that a works truck is no longer an exempted goods vehicle if towing a trailer."* Indicating that a works truck towing a works trailer can also be driven by a person holding a full car (Category B) licence.

12.0 Maintenance and Inspection

12.1 General

The effective maintenance of a dumper is an essential part of safe operation. As with all machines a dumper wears, deteriorates and can suffer damage over time. The maintenance process, including checks and inspections, monitors, prevents and rectifies this deterioration. It is important that the personnel asked to carry out these tasks have the necessary machine-specific training, experience and competence in both periodic and breakdown maintenance. If operators are authorised to carry out pre-use checks, they must be trained and assessed as competent to do this.

Both the user and owner of the dumper have a responsibility to ensure that they are maintained in a safe working condition. In practice the maintenance, other than pre-use checks, is normally undertaken by the dumper owner.

Dumpers require the manufacturer's preventative maintenance instructions to be strictly complied with if safety is to be maintained in use. Checks and inspections should be carried out taking account of the frequency of use of the dumper and the environmental conditions in which it regularly works. If the operator is competent to carry out routine pre-use and weekly checks, they may be authorised to do so.

The employer of the person carrying out these checks should ensure that the machine is taken out of use for the period required to carry them out. Also, the employer or authorised person carrying out the checks should ensure that a safe system of work is in place to prevent personnel from being exposed to risk, for example from the inadvertent operation of the equipment.

Basic checks and inspections should be carried out in accordance with company instructions and the manufacturer's recommendations:

- Pre-use Checks - these are carried out prior to each use of the machine and include checks for damage and correct functioning of the dumper (See sample checklist in **Annex F**);
- Shutdown Checks - these are carried out at the end of each shift and are an opportunity to report defects which may have developed during the shift;
- Weekly Inspections - these are additional inspections to the pre-use checks.

Weekly inspections should be recorded.

If there is a defect that affects the immediate safe operation of the dumper, it must be reported, and the machine taken out of service immediately.

An Example of a Maintenance Related Dumper Incident

A site dumper was parked at a slight incline on a heap of excavated soil, adjacent to a partially back-filled trench. The dumper was unattended with the engine running when 'failure' of the vehicle parking brake caused the dumper to roll forward into the trench.

The truck pinned a workman against stacked concrete blocks causing broken ribs, a collapsed lung, multiple arm fractures and a broken nose.

12.2 Reporting of Defects

There must be provision for the operator of the dumper to make written reports of defects or observations immediately they are identified. If a defect is safety critical, the machine should not be used until the defect has been rectified. In this case the machine should be left in a safe place, a suitable sign put on the machine indicating that it must not be used, and the ignition key removed.

The written report should be to a pre-defined format, (a company pro-forma, a section on the daily time sheet, etc.), which requests details of the defect or observation and supporting information such as date, time, dumper identification, circumstances, etc., and must be reported at least daily. 'nil reports' must also be submitted at least weekly.

All the defect reports, including the 'nil reports', should be forwarded to the dumper owner, (or the delegated person), who is in a position to make an informed decision about a planned response to the report. A copy of the original report should be retained by the operator.

Once the defect / observation has been responded to and cleared, this should then be recorded with supporting information on the original defect report.

The 'un-cleared' and 'cleared' reports should be securely lodged within the dumper-owning company's maintenance management system and must be made accessible on demand to the operators of the dumper as well as other authorised bodies.

12.3 Precautions

Extreme care must be taken when carrying out maintenance procedures on dumpers. The machine's power and other systems should be isolated to the extent possible by nature of the task to be carried out. Maintenance personnel should never stand under raised equipment as the equipment could fall or tip. If work must be carried out under a raised skip, the manufacturer's designated propping device must be put in place before accessing the area under the skip.

Care should be taken when working on the hydraulic system to ensure that hydraulic systems are depressurised. Even with the dumper's engine switched off, the hydraulic system may still be pressurised, consequently the replacement or repair of hydraulic hoses or fittings should be approached with extreme caution.

Repairs and maintenance should always be carried out on a firm level area away from other activities including working or travelling machines. The area should be segregated from other activities by both physical barriers and appropriate signs.

12.4 Modifications

Dumpers should not be modified without the express written permission of the dumper manufacturer. Unauthorised modifications will affect the warranty, invalidate the CE marking and may compromise safety.

12.5 Scheduled Lubrication

Operators may be required to carry out lubrication of certain items, such as the greasing of sliding parts, at specified intervals. They should only undertake such tasks if they are competent to do so and should be provided with the necessary equipment and instructions to carry this out safely.

12.6 Scheduled Maintenance

It is the responsibility of the site management to ensure that all dumpers are adequately maintained in efficient working order and in a state of good repair.

A scheduled preventative maintenance program helps to meet these requirements. The frequency at which the maintenance activities are carried out must consider the machine usage and the working environment. A record of maintenance should be kept for each dumper.

Where a dumper is hired out on the basis that the owner is responsible for carrying out maintenance, the owner should inform the hirer, at the start of the hire, that their maintenance staff will require access to the machine at specified intervals.

The hirer should be advised of the frequency and length of time required for maintenance operations.

12.7 Breakdowns

Breakdowns should be minimised by adequate inspection and preparation of the dumper prior to delivery on site. Repairs on site should only be undertaken following a thorough work and site-specific risk assessment and the implementation of a safe system of work, including inspection of the work following completion.

12.8 Maintenance Records

Comprehensive maintenance records are essential to the safe, efficient and economical operation of a dumper. They provide a complete “cradle to grave” history of the individual dumper giving the following benefits:

- evidence of adequate maintenance as part of the management system;
- establishing breakdown trends over time and providing information for the review of maintenance frequency;
- identification of component failure trends for feedback to the manufacturer;
- evidence of adequate maintenance to the Enforcing Authorities in the event of an incident;
- enabling the performance of the dumper to be reviewed over time to inform future purchases.

12.9 Maintenance Record Format

Maintenance records can be kept in either paper or electronic format. Paper records are often easier to update as the input will often be in paper format such as inspection reports or work sheets. Electronic records are, however, more secure against loss and damage, and the data is more readily analysed. There are many maintenance record software packages on the market, but care should be taken when considering purchase to ensure that the system is flexible enough to accommodate changes in types of input and output.

12.10 Replacement Components

Replacement components should be in accordance with the dumper manufacturer's specifications.

12.11 Tyre Maintenance, Repair and Replacement

Tyre pressure and condition should be checked regularly and in accordance with manufacturer's instructions. Consideration should be given to the use of pressure indicating tyre valve caps. An assessment of some of these is given at <http://www.autoexpress.co.uk/accessories-tyres/35980/pressure-valve-caps>

Additional advice on tyre maintenance, repair and replacement is given in **Annex G**.

12.12 Actions in the Event of Defects and Breakdowns

All defects that make the dumper unsafe for use should be recorded and reported immediately to both the dumper owner and site's appropriate representative (such as service manager, site manager, or supervisor), and the dumper should be taken out of service. Steps such as removal of the isolator key and 'locking off' if possible, should be taken to ensure that the dumper cannot be used before repairs have been completed. All other defects should be recorded and reported as soon as possible.

It is essential that repairs or adjustments are only carried out by authorised persons. Once any defects and breakdowns have been rectified, the person carrying out the work should sign the defect report to indicate that rectification has taken place.

Annex A - Legal Framework

A.1 Introduction

The law places duties on persons concerned with the setting up and use of construction plant on construction sites. This Section outlines those legal duties and points the reader towards further relevant guidance material.

***NOTE:** Northern Ireland has its own set of regulations which tend to mirror those in Great Britain, but may have minor differences. Employers should ensure that they are aware of the regulations in the jurisdiction in the which they are working.*

A.2 The Law Outlined

Legislation relating to the use of construction plant at work includes the:

- Health & Safety at Work etc. Act 1974
- The Construction (Design and Management) Regulations 2015
- Management of Health & Safety at Work Regulations 1999
- Provision & Use of Work Equipment Regulations 1998
- Lifting Operations & Lifting Equipment Regulations 1998
- Supply of Machinery (Safety) Regulations 2008.

A.3 Health & Safety at Work etc Act 1974 (HSWA)

HSWA places a duty on employers to ensure the health and safety of employees and others who may be affected by their work activities. Similar duties are placed on the self-employed and persons in control of premises. Employees, managers and directors also have responsibilities. The HSWA also places a duty on construction plant owners and users, where their work activity involves plant being used where it could affect the general public.

A.4 The Construction (Design and Management) Regulations 2015 (CDM 2015)

CDM 2015 is divided into five parts:

- Part 1 deals with the application of CDM 2015 and definitions;
- Part 2 covers the duties of clients for all construction projects. These duties apply in full for commercial clients. However, the duties for domestic clients normally pass to other duty holders;
- Part 3 covers the health and safety duties and roles of other duty holders, including:
 - Designers;
 - Principal designers;
 - Principal contractors;
 - Contractors.
- Part 4 contains general requirements for all construction sites;
- Part 5 contains transitional arrangements and revocations.

HSE has published Legal Series guidance L153 which supports CDM 2015 and provides further explanation.

Of significance to dumper operations are Regulation 27 on traffic routes and Regulation 28 on vehicles.

A.5 Management of Health & Safety at Work Regulations 1999 (MHSWR)

Under MHSWR, employers and self-employed people are required to assess risks to health and safety from their undertaking. This includes risks from the setting up and use of construction plant on their premises. The risk assessment should identify what measures are needed to comply with health and safety requirements and control risk. The duty holder should then put in place the organisation and arrangements to ensure that those measures are properly implemented. MHSWR also requires employers on multi occupancy sites to co-operate with each other to ensure that all statutory provisions are complied with.

A.6 The Provision & Use of Work Equipment Regulations 1998 (PUWER)

PUWER is concerned with such matters as selection of appropriate work equipment, safeguarding of dangerous parts of machinery, provision of appropriate controls, and maintenance of work equipment including construction plant.

PUWER places duties on any person who has control to any extent of:

- work equipment;
- a person at work who uses, supervises or manages the use of work equipment; or
- the way in which work equipment is used at work (including maintenance).

PUWER applies to employers in respect of work equipment provided for, or used by, their employees, self-employed persons in respect of work equipment they use and other persons, e.g. visitors.

A.7 The Lifting Operations & Lifting Equipment Regulations 1998 (LOLER)

LOLER deals with the specific risks arising from the use of work equipment (including lifting accessories) to lift loads. It builds upon PUWER and applies to the same groups of people. LOLER also introduces requirements for lifting equipment which is used to lift people, and a requirement for the thorough examination and reporting of thorough examination of lifting equipment.

A.8 Supply of Machinery (Safety) Regulations 2008 (SMSR)

The Supply of Machinery (Safety) Regulations are the UK's implementation of European Union Directive 2006/42/EC, the "*Machinery Directive*" which requires that all machinery (including lifting accessories) supplied into the European Union, meets the Essential Health and Safety Requirements detailed in Schedule 2 Part 1 of the Regulations. This includes the provision of information for use, including loads imposed on the ground. Each machine must be accompanied at time of supply by an "*EC Declaration of Conformity*" declaring that the machinery fulfils all the relevant provisions of the Regulations.

A.9 British, European and ISO Standards

Standards do not generally have the force of law: the application of a standard is almost always voluntary, although standards are very often used in support of legislation, and compliance with a standard is sometimes quoted in legislation as offering a route to discharging legal obligations.

European (BS EN) standards cover requirements for basic principles (Type A), common product requirements (Type B) and specific product requirements (Type C) e.g. EN 474-6:2006+A1:2009, *Earth-moving machinery. Safety. Requirements for dumpers*.

International Standards (ISO) cover both the safe use and specification of earth-moving equipment and components. They do not have any legal status by themselves but are often taken as good practice and when cited as normative references in some EN product standards have the same force as EN standards.

Annex B - Case Studies

Item	Description
1.	<p>A dumper overturned when the operator was reversing across an incline. They were not wearing the seat belt. The operator was thrown from the machine and crushed by the machine's ROPS frame, causing fatal injuries.</p> 
2.	<p>A dumper was being driven loaded down a steep slope when it rolled over in a forward direction. Several factors caused the incident including:</p> <ul style="list-style-type: none"> • No site survey had been undertaken; • The ground was uncompacted; • The slope angle was 19 degrees; • The machine was limited to 14 degrees; • The machine was being driven in the incorrect direction; • The machine was unsuitable for the task. <p>The operator was not wearing the seat belt and suffered severe injuries.</p> 

Item	Description
<p>3.</p>	<p>A 6 tonne forward tipping dumper over-turned on site when it left the hardstanding area and entered a 500mm reduced level area.</p> <p>At the time of the incident, the dumper was being utilised to transport material over short distances as part of a fill and compact operation. The dumper encroached too close to the road edge whilst transporting materials. The operator had stated that on approach to the tipping point, the dumper brake had failed to engage which resulted in the dumper entering a reduced level area, causing it to overturn.</p> <p>Prior to the accident, the dumper was being loaded with recycled concrete materials; it is believed that this material may have caused the failure of the braking mechanism, by becoming lodged underneath. The Roll Over Protection Structure (ROPS) and seat belt prevented the operator from sustaining any injury.</p> 
<p>4.</p>	<p>An operator was driving a forward tipping dumper which became stuck on a spoil heap. The operator jumped off the dumper which then flipped over and caused serious head injuries to the operator, who subsequently died from their injuries.</p> <p>The investigation showed that there were no barriers in place to prevent over-running. It further found that an excavator had removed some of the spoil heap which created a sheer face. The employer, a construction company was fined £200,000 and also ordered to pay costs of £5,565.</p>

Item	Description
5.	<p>A delivery driver was delivering a mortar silo to a site and was hit by a 9 tonne dumper when crossing the site on his way back to his lorry despite wearing high-visibility clothing. The site was a building project of 159 new builds and deemed a very busy site.</p> <p>The investigation into the accident found that there was no safe and segregated area for pedestrians to cross parts of the site and had no traffic management plan in place detailing a safe unloading place for delivery vehicles.</p> <p>The delivery driver was severely injured and suffered life changing injuries which included a severe brain injury, with their quality of life changed forever. The construction company was found guilty of failing to adequately manage and control workplace transport and was fined £100,000 and ordered to pay legal costs of £100,000.</p>
6.	 <p>A dumper operator was killed when his five-tonne dumper fell into a pit, rolled over and landed on him. He was killed instantly.</p> <p>The operator was working at ground level while others were working to excavate a basement for a swimming pool at a new-build property. The HSE investigation found that despite operations being underway for some three weeks at the site, there were no measures in place to prevent people or vehicles falling into the excavation, or to prevent any collapse of the excavation faces onto those working below ground.</p> <p>Additionally, none of the five workers on site were used to operating excavators and dumpers as large as those they were asked to use on this work. Neither did they have relevant construction experience despite being tasked with digging such a large excavation.</p> <p>The seat belt on the machine the operator was driving was not operational at the time of the incident, and his colleagues also stated they would not usually wear seat belts when operating the machines.</p> <p>The contractor in charge of the site was fined £150,000.</p>
7.	<p>An operator driving a 2.5 tonne dumper drove into a 5 foot deep excavation in a churchyard. The dumper operator was involved in excavation of a sump and on approaching the sump the dumper failed to stop and drove into the excavation tipping the operator from the dumper and trapping him, causing a shattered ankle, sheared tibia and fibula and head injuries.</p>

Item	Description
8.	 <p>A 14 year old boy suffered serious leg and foot injuries when the one tonne dumper he was driving overturned when driving down a slope. He was not wearing a seat belt and had been illegally employed by the contractor in charge of the site who was fined £2,000 and ordered to pay costs of £4,052.</p> <p>A Health & Safety Executive (HSE) investigation found that other untrained employees on the site had also driven the dumper truck on steep slopes, often without wearing seat belts.</p>
9.	 <p>An untrained dumper operator was tipping material from an excavation alongside a barn at the top of an embankment. The dumper became stuck on a corner and when the dumper was reversed it fell over the edge of the embankment. The operator jumped from the dumper which landed on top of him at the bottom of the embankment, trapping him and causing fractures to his right thigh, hip socket and vertebrae.</p> <p>HSE investigators found the company had failed to provide the operator with appropriate training for operating a dumper. In addition, the site manager was not suitably trained to manage a site and to ensuring that those responsible to him were doing so safely. No measures were in place to prevent dumpers from approaching or overrunning the edge of the embankment.</p> <p>The contractor in charge of the site was fined £26,667 with costs of £3,659.</p>

Item	Description
10.	<p>A dumper operator was driving his fully loaded machine down an incline when it overturned.</p> <p>The operator, who had not been wearing a seat belt, was thrown from the dumper, which landed on his legs and crushed him. He was airlifted to hospital where surgeons amputated both his legs at about the knee.</p> <p>The HSE investigation found that there were several failings that led to the incident. The specific type of truck being used was not appropriate for the task and the limitations of the equipment had not be assessed and recognised. The contractor had also not “<i>carried out an assessment for any of their drivers or their competence</i>” in using the equipment.</p> <p>The contractor was fined £200,000 and ordered to pay costs of £12,312.56.</p>
11.	<p style="text-align: center;">Domestic Incident</p>  <p>A young mother of four was killed when the dumper she was operating on a slope in her garden overturned, trapping her underneath the machine.</p> <p><i>This sad incident is a reminder to all those that hire plant and equipment to domestic users of the need to ensure that these users are provided with suitable and comprehensive information and instruction. As they are likely be unaware of the causes, dangers and implications of incorrect use, this information and instruction should particularly highlight the dangers of incorrect use and the likely consequences.</i></p>

Annex C - Sample Training Syllabus

C.1 Typical Training Requirements

Learning Outcome <i>On the completion of training, the trainee will have learnt:</i>	Topics for Training		knowledge	Skill	Key Safety message
1. The purpose of principal components, the basic construction, controls and terminology	<ul style="list-style-type: none"> • Differing Types • Functions and applications • Power units • Hydraulic systems • Transmissions • Chassis / steering / tyres 	<ul style="list-style-type: none"> • Stability / ground pressure • Carrying capacities • Types of skips • Side tipping • Attachments • ROPS 	X		Appreciation of centres of gravity
2. How to conform with manufacturer's requirements as per the operator's handbook, other types of information source and relevant regulations and legislation	<ul style="list-style-type: none"> • Operator's Manual • Machine decals • Health and Safety at Work etc. Act 1974 • PPE • Codes of Practice • Site plans / drawings 	<ul style="list-style-type: none"> • Method statements • Load / tare sheets • Risk assessments / COSHH • Inspection and reporting forms / procedures 	X		
3. How to undertake all pre-use checks	<ul style="list-style-type: none"> • Regular and non-scheduled maintenance procedures 	<ul style="list-style-type: none"> • Sequence of pre-use checks • Defect reporting 	X	X	
4. How to configure and ready for travel (site and highway)	<ul style="list-style-type: none"> • Driving controls • Attachments • Security • Driving position 	<ul style="list-style-type: none"> • Visibility • Body position • Road Traffic Act 	X	X	Correct procedures for connecting and adjusting a seat belt for effect and comfort and the consequences of not wearing a seat belt during operations. Being aware of all blind spots and ensuring that all personnel are clear of the dumper before movement occurs, particularly to the front of the machine.
5. Travel over rough, undulating ground, steep inclines and level surfaces – loaded and unloaded	<ul style="list-style-type: none"> • Driving controls • Ground conditions • Traction / aids • Starting / travelling on inclines • Hazards • Working area 	<ul style="list-style-type: none"> • Site travel • Stability / C of G • Road travel • Environment protection / minimise damage 	X	X	Travelling and steering up, down and across inclines. Travelling on stockpiles only when suitable ground checks have been carried out by a competent person and authorisation has been given.

Learning Outcome <i>On the completion of training, the trainee will have learnt:</i>	Topics for Training		knowledge	Skill	Key Safety message
6. Manoeuvre in confined spaces	<ul style="list-style-type: none"> • <i>Visibility / aids</i> • <i>Limitations of vision</i> • <i>Articulating chassis requirements</i> • <i>Personnel</i> 	<ul style="list-style-type: none"> • <i>Protection of ground / tight turns</i> • <i>Environmental / noise / fumes</i> • <i>Hazards</i> 	X	X	The need for full and effective vision, and marshalling support where needed
7. To ensure that the tipping and loading areas are safe and suitable	<ul style="list-style-type: none"> • <i>Access / egress routes</i> • <i>Ground type / condition</i> • <i>Zonal working/segregation</i> 	<ul style="list-style-type: none"> • <i>Site markings</i> • <i>Turning areas</i> • <i>Hazards</i> 	X		Use of edge protection
8. The actions required for hazards, underground and overhead services	<ul style="list-style-type: none"> • <i>Types of typical services</i> • <i>Warning / identification systems</i> 	<ul style="list-style-type: none"> • <i>Reporting procedures for damage to services</i> • <i>Minimum distances and clearances</i> 	X	X	
9. How to position to receive loads	<ul style="list-style-type: none"> • <i>Types of loading vehicles / machines</i> • <i>Types / densities of material</i> • <i>Stability</i> 	<ul style="list-style-type: none"> • <i>Machine suitability</i> • <i>Machine capacity</i> • <i>Visibility</i> • <i>Environmental conditions</i> 	X	X	Not approaching a machine with a raised bucket
10. How to comply with loading procedures	<ul style="list-style-type: none"> • <i>Signalling / following instructions</i> • <i>Driver protection</i> • <i>Stability</i> • <i>Techniques</i> • <i>Hazards</i> 	<ul style="list-style-type: none"> • <i>Regulations / legislation</i> • <i>Carrying capacity</i> • <i>Weight distribution</i> • <i>Visibility</i> • <i>Being in a safe place during loading</i> 	X	X	Being in a safe place during the loading activity away from the dumper or (where allowed), remained seated in a cabbed version having appropriate protection systems
11. The means of ensuring load integrity and security	<ul style="list-style-type: none"> • <i>Load types</i> • <i>Minimising excess</i> 	<ul style="list-style-type: none"> • <i>Projecting loads</i> 	X	X	Appropriate speed in proportion to the conditions, particularly when carrying a load
12. How to transfer loads to different locations	<ul style="list-style-type: none"> • <i>Travel routes</i> • <i>Ground types</i> • <i>Haul route procedures</i> • <i>Materials / vehicle protection</i> • <i>Hazards</i> 	<ul style="list-style-type: none"> • <i>Signalling / following instructions</i> • <i>Efficiency</i> • <i>Visibility</i> • <i>Speed limits</i> • <i>Environmental conditions</i> 	X	X	Travel speeds around corners and on uneven ground. Compliance with traffic routing requirements and exclusion zoning
13. How to discharge loads into trenches and over edges	<ul style="list-style-type: none"> • <i>Types of discharge areas</i> • <i>Edge and machine protection / wheel stops / spotting logs etc.</i> • <i>Ground</i> • <i>Stability / C of G (raised skips)</i> • <i>Material jams</i> 	<ul style="list-style-type: none"> • <i>Discharging on inclines</i> • <i>Side discharging</i> • <i>Signalling / following instructions</i> • <i>Fully emptying skips</i> • <i>Visibility</i> • <i>Hazards</i> 	X	X	Checking ground prior to tipping – tipping skip slowly (weight transfer). Procedure for tipping on inclines, changing centres of gravity,
14. The need to maintain safe and tidy working areas	<ul style="list-style-type: none"> • <i>Spoil heap security</i> 	<ul style="list-style-type: none"> • <i>Minimising spillage</i> 	X		

Learning Outcome <i>On the completion of training, the trainee will have learnt:</i>	Topics for Training		knowledge	Skill	Key Safety message
15. How to carry out shut down and securing procedures	<ul style="list-style-type: none"> • <i>Skip cleanliness</i> • <i>Shut down procedures</i> 	<ul style="list-style-type: none"> • <i>Security</i> • <i>Parking and positioning</i> 	X	X	
16. The loading and unloading procedures for machine transporting	<ul style="list-style-type: none"> • <i>Compatibility</i> • <i>Positioning</i> 	<ul style="list-style-type: none"> • <i>Types of transporter</i> • <i>Security</i> 	X		

C.2 Additional Learning

In addition to the listed technical training, trainees should have the learnt the requisite knowledge of the following:

- The health, safety and welfare regulations and requirements of the construction or their sector;
- The nature of the sector of industry, their role and responsibilities as a plant operator;
- The causes of typical site incidents;
- The type of Industry they are working in;
- Typical customer and client needs;
- The contribution of their sector to society;
- Their legal requirements as an employee in the sector;
- Their role and their responsibilities to their employer, co-workers and the general public;
- The reporting structures within their organisation and on site;
- Their Social responsibilities in terms of their activities;
- The environmental aspects of their work activities;
- The communication methods with colleagues / management / other trades;
- The requirements for work briefings and tool-box talks;
- The reasons for developing lifelong skills;
- Health and Safety at Work etc. Act 1974;
- How other trades interact with their work;
- The types and uses of typical PPE for the role.

C.3 Training Attributes

To operate an item of plant requires a certain number of personal attributes to aid candidates through the process of gaining the necessary skills, knowledge and understanding of dumper operations. It would therefore be helpful if they have one or more of the following attributes:

- Experience of the Construction or similar sectors;
- Hold a car driving licence or have a level of driving experience;
- Ability to undertake basic mathematical calculations;
- Ability to communicate verbally and/or written information;
- Ability to understand written data;
- A degree of eye to hand co-ordination;
- An element of mechanical knowledge or understanding.

C.4 Medical Requirements

Those selected for training should be medically able to operate dumpers for which the following factors may affect an individual's ability to carry out the working activities on site:

- Sufficient eyesight for driving and able to spot hazards at reasonable distances;
- Ascending and descending the operating area which requires negotiation of steps and hand holds;
- Exposure to environmental conditions such as cold, damp, heat and dusts;
- Continual levels of noise, vibration and body jolts;
- Limb dexterity to carry out activities such as machine checks;
- Long periods of concentration and continual routine of activities.

NOTE: Lack of any of these attributes or medical does not prevent anyone from being trained for dumper operations, only that support, control measures and safeguards may need to be actioned by employers and training providers.

NOTE: Guidance on medical fitness of operators is given in the Plant Safety Group publication "Medical Fitness to Operate Construction Plant - Good Practice Guide" (see **Annex H**).

C.5 Training Durations and Ratios

To ensure that suitable and sufficient learning has taken place, the following training times are recommended for dumpers and based on potential prior experience of construction activities and plant operations. Trainees should be profiled to establish their learning needs. Durations should be of a length to ensure the learning outcomes are met.

Typical Experience	Suggested training times (hrs)
New operators with no previous site or plant operating experience	24
New operators with site experience but no plant operating experience	16
Operators with other forms of plant operating experience (not dumpers)	14
To ensure that effective learning including sufficient practical training will take place on the training programme along with ensuring effective supervision and control by instructors, the following trainee/dumper/instructor ratio is the maximum recommended for dumper technical training: 3 trainees to 1 dumper to 1 instructor	

Annex D - Example of a Course for Safe Working Practices Around Construction Plant Equipment

Intended for delegates wishing to plan or work within close proximity to mobile construction plant machinery including all earthmoving and lifting appliances commonly found on construction sites. Training further incorporates excavation awareness and traffic/vehicle movements within site activities. The aim of the course is to provide delegates with theoretical knowledge and understanding of common Construction plant vehicles and their individual specific hazard, ensuring compliance with current legislation and good practice, helping them to ensure the safe collaboration between the direct support personnel and of a variety of common-place construction site vehicles and site-based situations and tasks.

Learning Outcomes

At the end of the course, delegates will know and understand:

- Suitable PPE relevant to the work role;
- Close proximity hazards, including machinery work areas, safe direct support personnel work operating zones, operator blind spots and operator safety devices;
- Manufacturers requirements as per the operator's handbook/manual within specific aspects of hazardous areas;
- Regulations and legislation in respect to quick hitch and attachment devices;
- Essential relevance of a standard permit to dig/break ground form and the necessity for its use;
- Understand various types of commonplace spoils and the angle of repose tolerances;
- Various underground services including warning marker tapes used commonplace on construction sites and wider industries including materials used in services construction;
- Positioning of an excavator cab safety mechanisms to render the operating levers inactive which provides a safe zone for direct support personnel and other personnel;
- Hazards associated within machine travel/working on slopes/gradients and best practice within siting the machine for excavating operations;
- On-site vehicle hazards and guided movements via recognised signs and signals, including personnel/pedestrian crossing points and segregation for pedestrians from vehicle movements, confined spaces/entrapment hazards during direction/guidance;
- Potential hazards during loading/unloading of plant related vehicles onto road going transporters;
- Noise/decibel levels commonly faced by supporting ground worker operatives in close conjunction with machinery general site operations;
- Best practice requirements during lifting with excavator activities including specific lifting points that must be utilised;
- Specific excavator attachments and their individual traits including grabs, breakers, piling equipment etc;
- Open excavations and the potential hazards this pose including working at height issues, and guarding, safe access and egress issues;

- Protection of the environment from fuel and/or oil spillages; additionally, understand advancements made within bio fuels;
- Individual site inductions and the necessity for emergency plans and procedures to be both fully in place and fully explained to all site personnel;
- Powers and general role of an HSE inspector and the levels of sanctions that can be administered;
- Various types of asbestos found commonly within construction sites;
- Loading machinery onto trailers for transporting on the public highway;
- Responsibilities under the Health and Safety at Work etc. Act 1974 and relevant regulations including Provision Use of Work Equipment, Lifting Operations and Lifting Equipment, Work at Height regulations etc;
- Acceptable and poor practices when carrying out lifting operations with excavators.

This course programme was kindly supplied by the National Construction College who are the largest provider of plant training for the construction industry. A course based on this programme can be booked on 0344 994 4433.

Annex E - Example of a Checklist for Familiarisation

Dumper Familiarisation Handover Checklist		No.	
Issuing Depot:		Date:	
Handover By:		Fleet No.	
Dumper Make/model:			
Customer:			
Operation of controls	✓	Maintenance	✓
Switches/gauges/warning lights	<input type="checkbox"/>	Daily and weekly checks as manual	<input type="checkbox"/>
Engine starting/stopping inc. cold start	<input type="checkbox"/>	Location of items to be checked inc.	<input type="checkbox"/>
Gear selection	<input type="checkbox"/>	• Fuel	<input type="checkbox"/>
Travel direction selection/neutral	<input type="checkbox"/>	• Hydraulic oil	<input type="checkbox"/>
Engine isolation switch and key	<input type="checkbox"/>	• Engine oil	<input type="checkbox"/>
Access/egress equipment	<input type="checkbox"/>	• Coolant	<input type="checkbox"/>
Lights (where fitted)	<input type="checkbox"/>	• Screen wash reservoir	<input type="checkbox"/>
Horn	<input type="checkbox"/>	• Battery security	<input type="checkbox"/>
Indicators (where fitted)	<input type="checkbox"/>	• Tyres (condition & pressure)	<input type="checkbox"/>
Parking brake	<input type="checkbox"/>	• Lubrication/grease points	<input type="checkbox"/>
Skip tilt (discharge) and lower	<input type="checkbox"/>	Exhaust emission procedures	<input type="checkbox"/>
Skip raise/lowering (where fitted)	<input type="checkbox"/>	Documentation/other equipment	
Skip slew (where fitted)	<input type="checkbox"/>	Manufacturer's operating manual	<input type="checkbox"/>
Traction aids (where fitted)	<input type="checkbox"/>	Grease gun/tyre pressure gauge	<input type="checkbox"/>
Seat positioning/weight setting/seat belt	<input type="checkbox"/>	EC conformity certificate	<input type="checkbox"/>
Service brakes	<input type="checkbox"/>	Operator's record book	<input type="checkbox"/>
Visual aid equipment/movement alarms	<input type="checkbox"/>	Seat belt function/security	<input type="checkbox"/>
Beacon engagement	<input type="checkbox"/>	Maintenance access panels	<input type="checkbox"/>
Cab temperature control (if fitted)	<input type="checkbox"/>	Comments	
Wiper (if fitted)	<input type="checkbox"/>		
I, the undersigned, acknowledge that I have been familiarised with the above controls and checks.			
Name (print)		Signature	
Company		Date	

Annex F - Example of Daily (pre-use) Checks

Operator's Dumper Pre-Use Check Sheet

Operator's Name:	Date:
Dumper Make:	Model:
Operator's Signature:	

<i>Item</i>		OK (✓)	N/A (✓)	Defect Reported
Pre-start Checks and 'walk-around'				
1.	Verify location of handbook and confirm machine has a current report of weekly inspections			
2.	General condition and cleanliness, including cab (if fitted)			
3.	Evidence of any oil leaks (include hydraulic cylinders, fittings, valves, axles, wheel hubs and gearbox)			
4.	Wheels (bent rims and nut security) & tyres (worn tread, cuts and damage to side walls and tread)			
5.	Tyre pressures (check using gauge)			
6.	Hydraulic rams and hoses/pipe condition and security			
7.	ROPS bar condition			
8.	Operator station/cab condition, ROPS/FOPS mounting			
9.	Cab windows to be clean.			
10.	Cracked/unauthorised welding			
11.	Guards, cowlings and fasteners			
12.	Decals/labels, including manufacturer's rating plate			
13.	Lights/Mirrors /CCTV/other vision aids			
Checks of lubricants and fluids (wearing relevant PPE)				
20.	Engine oil level			
21.	Transmission oil level			
14.	Coolant level			
15.	Battery(ies)			
16.	Brake fluid level			
17.	Hydraulic oil level			
18.	Fuel inc. additives (AdBlue etc.)			

<i>Item</i>		<i>OK</i> (✓)	<i>N/A</i> (✓)	<i>Defect Reported</i>
Other checks				
19.	Fan belt deflection			
20.	Air filter indicator			
21.	Visual check of all engine components			
Running Checks				
22.	Parking brake function			
23.	Footbrake function			
24.	Steering function			
25.	Skip tipping function			
26.	Transmission function			
27.	All gauges and instruments including horn, hour meter etc.			
28.	All lights/indicators including beacon(s)			
29.	Heater, defroster and wipers for correct function (if fitted)			
30.	Verify seat position and seat belt function			
31.	Any unusual noises			
32.	All warning devices must be operational			
NOTE: All pre-use checks must be carried out in accordance with the specific instructions published in the relevant manufacturer's operating handbook.				

Annex G - Tyre Maintenance, Repair and Replacement

This section applies to pneumatic tyres only. Foam filled tyres are not user serviceable.

G.1 Tyre Pressure Check

- Tyre pressures should be marked on the dumper chassis adjacent to each wheel;
NOTE: Tyre pressure may be given in different units - pounds per square inch (psi), bar or kilo Pascals (kPa). Conversion factors are given in Table G.1.
- Pressures should be checked daily when the tyres are cold;
- Tyre pressures should be the same for all tyres on the dumper and should be within +5% -0% of the manufacturer's specified pressure, unless a different tolerance is specified by the manufacturer;
- Tyre pressure gauges should be of known accuracy (within +/- 1%);
- Remote tyre pressure monitoring systems are available. Before fitting third party monitoring systems it is advisable to consult the dumper manufacturer;
- Where a tyre is found to be significantly under pressure (> 20%), no attempt should be made to re-inflate it and return the machine to use. It is essential that the cause is investigated by a competent tyre specialist, as this may well be an indication of imminent tyre failure;
- Where tyres are frequently found to be under pressure the cause should be investigated by a competent tyre specialist, as this may well be an indication of potential tyre failure.

	psi	bar	kPa
psi	1	0.0689	6.89
bar	14.5	1	100
kPa	0.145	0.01	1

Table G.1 - Pressure Conversion Factors

G.2 Tyre Inflation

The information in this sub-clause applies to tyres fitted on single piece wheels.

- Air should be added, if required, inflating to the pressure specified in the manufacturer's manual;
- Before starting inflation, a personnel exclusion zone of at least 3m around the machine should be established by the use of barriers, cones etc. (See **Figure G.1**);
- Personnel inflating tyres should stand a minimum of 3 metres away from the tyre and outside the likely explosion trajectory to avoid injury in the event of a failure. This will require at least 3m of airline between the nozzle and airline trigger mechanism (See **Figure G.1**);
- A form of tyre restraint system such as a cage or an inflation bag-type restraint should be considered at all times. For multi-piece and divided rims, a cage must be used. Inflation bags are not suitable for these types of rims.

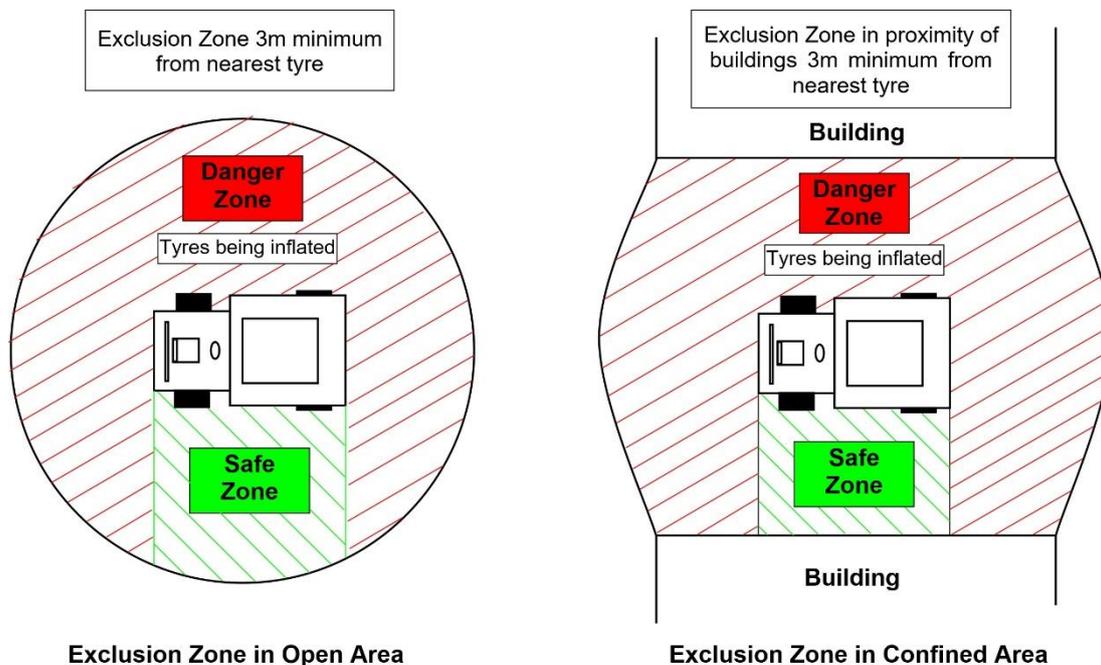


Figure G.1 - Tyre Inflation Safe Zones and Exclusion Zones

- Personnel should ensure that they stand on the other side of the dumper when inflating (See **Figure G.1**);
- Where possible the use of a restraint, such as a strong secured inflation cage, should be used if a safe exclusion zone cannot be established;
- Tyre valves should be checked to ensure that they are not leaking. Valve stem caps should always be replaced.

Further detailed guidance on the safe inflation of tyres is given in HSE Publication INDG 433, *Safety during tyre inflation in motor vehicle repair*.

A Real Life Example of Tyre Issues

A dumper operator had been checking the tyre pressures on his machine. Having completed the checks, he was walking away from the machine and one of the front tyres exploded. Subsequent investigation revealed that the tyre, which had recently been replaced, had a lower number of ply's and load rating than the manufacturer's specification.

The contractor also found that the tyre had been ordered from their approved supplier by asking for a tyre for a particular model of dumper, without any mention of ply or load rating. A subsequent check of other machines found that 30% were fitted with incorrect tyres.

G.3 Tyre Damage

All tyres should be inspected daily as follows:

- The tread and side walls should be checked for bulges and separation;
- The tread and side walls should be checked for cuts.

When any cut, rip or tear is discovered that exposes sidewall or tread area cords in a pneumatic tyre, steps should be taken to remove the tyre from service immediately. Arrangements must be made for replacement of the tyre or tyre and wheel assembly.

G.4 Tyre Repairs

In the course of a tyre's life, a tyre may be subject to an enormous amount of use and can be damaged in many ways. Tyres which require repair OR which appear to require repair, should be removed from the associated wheel and thoroughly inspected because a penetrating object could damage the inside of the carcass, or excessive deflection could cause dislocation of the carcass cords. Plugs inserted from outside the tyre should only be used as a short-term temporary repair until the tyre can be removed from its wheel, the tyre inspected, and a permanent repair made.

It is essential that any tyre repairs are carried out by a competent tyre specialist to BS AU 159g: 2013. The repairs should be **permanent**, allowing the tyre to operate at its original speed, load and inflation pressure.

Clause 9 of BS AU 159g:2013, *Specification for repairs to tyres for motor vehicles used on the public highway* specifies that liquid sealant introduced into inner tubes or tubeless tyres to aid air retention properties shall **not** be considered to be a permanent repair.

G.5 Liquid Tyre Sealants

A liquid tyre sealant or gel introduced into inner tubes or tubeless tyres will help improve the air retention properties of a tyre due to punctures or slow leaks. It is, however, essential that the operator carries out a visual inspection of the tyres at the beginning of each working period. Any noticeable defects in a tyre will require the tyre to be removed from the wheel and thoroughly inspected by a competent tyre specialist for any internal damage. Repairs should be carried out to BS AU 159g: 2013 to allow the tyre to operate at its original speed, load and inflation pressure.

NOTE: *Due to the varying nature of the chemical compositions of different tyre sealants, care should be taken when selecting a suitable tyre sealant for the task the machine is being asked to perform.*

G.6 Tyre Replacement

Dumper manufacturers generally list a range of approved tyres in the parts manual for a specific machine. If not using tyres from this list, the replacement tyres must have the following characteristics:

- Same physical size as the original;
- Equal or greater ply and load rating as the original;
- Tyre tread contact width equal or greater than original;
- Equivalent performance specification.

It is essential that either the dumper manufacturer or a competent tyre specialist is consulted.

When a tyre is being replaced, it is essential that the condition of the other tyres on the machine is assessed by a competent tyre specialist and appropriate action taken. This may include moving part worn tyres around to ensure that the dumper is substantially level when standing on a flat level surface.

G.7 Wheel Replacement

It is essential that replacement wheels have the same diameter, width and offset dimensions as the originals.

Annex H - Further Information and Guidance

Legislation

Health and Safety at Work etc. Act 1974

Provision and Use of Work Equipment Regulations 1998

L22 *Safe use of work equipment*, HSE Books

Lifting Operations and Lifting Equipment Regulations 1998

L113 *Safe Use of Lifting Equipment - Lifting Operations and Lifting Equipment Regulations 1998 Approved Code of Practice and Guidance (Second Edition) Published 2014* - ISBN 978 0 7176 6586 0 HSE Books

Management of Health and Safety at Work Regulations 1999 as amended

Workplace (Health, Safety and Welfare) Regulations 1992

Work at Height Regulations 2005

Supply of Machinery (Safety) Regulations 2008

Construction (Design and Management) Regulations 2015

Personal Protective Equipment at Work Regulations 1992

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013

Control of Vibration at Work Regulations 2005

Confined Spaces Regulations 1997

Health and Safety (Safety Signs and Signal) Regulations 1996

Control of Noise at Work Regulations 2005

Standards

BS EN 474-1:2006, *Earth-moving machinery. Safety - Part 1: General requirements*

BS EN 474-3:2006, *Earth-moving machinery. Safety - Part 3: Requirements for loaders*

BS EN 474-4:2006, *Earth-moving machinery. Safety - Part 4: Requirements for backhoe loaders*

BS EN 474-5:2006, *Earth-moving machinery. Safety - Part 5: Requirements for hydraulic excavators.*

BS EN 474-6:2006, *Earth-moving machinery. Safety - Part 6: Requirements for dumpers*

BS AU 159g:2013, *Specification for repairs to tyres for motor vehicles used on the public highway*

BS 5975: 2008 – *Code of practice for temporary works procedures*

Other Publications

HSE Leaflet INDG218 – *Guide to Risk Assessment*

HSE Leaflet INDG163 – *Five Steps to Risk Assessment*

HSE Publication L73 - *A guide to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995*, Fourth edition 2012, HSE Books

HSE Publications L101 - *Safe work in confined spaces*

HSE Publication GS6 - *Avoidance of Danger from Overhead Electric Power Lines 2013*, HSE Books

HSE Publication HSG 47 - *Avoiding Danger from Underground Services*, Third Edition 2014, HSE Books

HSE Publication HSG 136 – *Workplace transport safety*

HSE Publication HSG 144 - *The safe use of vehicles on construction sites 2009*, HSE Books.

HSG Publication HSG150 – *Health and safety in construction*

HSG Publication HSG187 – *Control of diesel engine exhaust emissions in the workplace*

HSE Publication INDG 433, *Safety during tyre inflation in motor vehicle repair*

HSE Research Report RR1066, *Use and non-use of seat belts in the operation of dumpers*

HSE Research Report RR1078, *The use of vehicle structure in load securing on heavy goods vehicles*

HSE Research Report RR1079, *Access to and work on flatbed vehicles*

HSE Research Report RR1088, *Multi-site delivery issues for heavy goods vehicles*

HSE Safety Notice FOD 1-2015 - *Earth Moving Machinery – changes to visibility requirements*

HSE Sector Information Minute No. 02/2007/02 *Assessing Field of Vision for Operators of Earth Moving Machinery on Construction Sites*

HSE Information sheet, *Safe use of site dumpers*

Department of Transport: Chapter 8 - *Traffic Signs Manual 2009 Parts 1 and 2*

Department for Transport Information Sheet - *Works Trucks: A brief guide*, Government website

DVLA Information Sheet INF 52 - *Large Vehicles you can drive using your car or lorry licence*, Government website

Safe Use of Quick Hitches on Excavators - Best Practice Guide. Strategic Forum for Construction - Plant Safety Group (free download from www.cpa.uk.net)

Safe Use of Telehandlers in Construction - Good Practice Guide. Strategic Forum for Construction - Plant Safety Group (free download from www.cpa.uk.net)

Competence to Operate Construction Plant - Good Practice Guide. Strategic Forum for Construction - Plant Safety Group (free download from www.cpa.uk.net)

Medical Fitness to Operate Construction Plant - Good Practice Guide. Strategic Forum for Construction - Plant Safety Group (free download from www.cpa.uk.net)

Ground Conditions for Construction Plant - Good Practice Guide. Strategic Forum for Construction - Plant Safety Group (free download from www.cpa.uk.net)

Reducing Unintended Movement of Plant - Good Practice Guide. Strategic Forum for Construction - Plant Safety Group (free download from www.cpa.uk.net)

CECE guidance on the classification of attachments to construction equipment for the machinery directive 2006/42/EC, Committee for European Construction Equipment

BITA Publication GN 67, *Multi-Piece Pneumatic Tyred Wheels - Inspection, Maintenance & Repairs* – British Industrial Truck Association

Design of granular working platforms for construction plant – A guide to good practice – Temporary Works Forum

The Safe Operation of Articulated Dump Trucks (ADTs) in Quarries and Surface Mining Operations - Quarries National Joint Advisory Committee (QNJAC) (free download from <http://qnjac.co.uk/qnjac-guidance/plant-fixed-and-mobile/the-safe-operation-of-articulated-dump-trucks-adts-in-quarries-and-surface-mining-operations/>)

Useful Websites

Build UK	www.builduk.org
Construction Equipment Association	www.thecea.org.uk
Civil Engineering Contractors Association	www.ceca.co.uk
Construction Plant-hire Association	www.cpa.uk.net
Health and Safety Executive	www.hse.gov.uk
Home Builders Federation	www.hbf.co.uk
Strategic Forum for Construction	www.strategicforum.org.uk

Annex I - Working Group Membership

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NOTE: The above list includes all those who have kindly given freely of their time and expertise to work on any of the versions of the guidance document and does not necessarily reflect the current membership of the Working Group.

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