OCCUPATIONAL RISK PREVENTION MANUAL FOR DUMPER TRUCK

FÓR-MATE
ACADEMIA DE FORMACIÓN

INDEX

The dumper truck is a piece of equipment

working mobile usually used for internal transport of materials in construction and maintenance works related to construction and also to a lesser extent in works related to gardening, forestry and others.

In this manual, reference will be made to the "construction site dumper", equipment generally provided with a box or loading hopper in its front part, without a cabin and whose nominal load rarely exceeds 10 Tm, the most common being those with a capacity of up to 4 Tm.

I. INTRODUCTION

The goal of that manual is:

- ✓ To briefly describe the characteristics of this equipment in its different versions.
- ✓ Expose the criteria to be taken into account for the selection of the same according to the operational needs of the different workplaces.
- ✓ Describe the training level of the operators of this equipment.
- ✓ Identify the risks associated with their use.
- ✓ Offer a list, which is not exhaustive, of the preventive and protective measures applicable to such risks.
- ✓ Describe the existing conditions in the event that they must occasionally be used on public roads.
- ✓ To reference and apply the legal and regulatory texts that affect them.

II. DEFINITIONS

Dumper or motor dump: self-propelled machine on wheels or chains, with an open box that transports, tips or spreads materials.

Rigid dumper: dumper with a rigid frame and steering to guide the wheels.

Articulated dumper: dumper on wheels whose steering system is effected by the articulation of frames.

Compact dumper: rigid or articulated dumper with a mass in working order of 4500 kg or less.

Rotating dumper: dumper whose hopper can rotate 180o to deposit the load laterally.

Self-loading equipment: integral support structure and bucket, permanently mounted and attached to the dumper that allows it to load its own open box.

Dumper for unloading at height: dumper that allows material to be unloaded at various heights.

Rated load: maximum permissible load specified by the manufacturer.

Rolling Over Protective Structure (ROPS): A set of structural elements whose main objective is to reduce the risk of crushing that may affect an operator, in the event of the machine overturning. They may be structures, frames or cabins.

Operator restraint system: system that keeps the operator safely in the driving position in situations of rollover, for example: safety belt.

Dumper operator: Annex I of Royal Decree 1644/2008 defines the driver of machines that present risks due to their mobility as "an operator responsible for moving a machine". According to this, he will be responsible for the correct and adequate use of the equipment, based on the information, training and instruction received. For its part, Article 2 of Royal Decree 1215/97 defines the operator as "the worker responsible for the use of work equipment" and the same article defines the use of work equipment as "any activity related to work equipment, such as starting or stopping, employment, transport, repair, transformation, maintenance and conservation, including, in particular, cleaning".

III. REGULATORY FRAMEWORK

For "placing on the market" or "putting into service" in the EU, site dumpers must comply with the Machine Safety Directive, 2006/42/EC, which has been transposed into Spanish law by Royal Decree 1644/2008. (For machines manufactured before the entry into force of this royal decree, Royal Decree 1435/1992 remains valid). Compliance with this regulation means that all units placed on the market or put into service must be accompanied by an EC declaration of conformity with the health and safety requirements drawn up by the manufacturer, and must bear the CE mark in clear view. They must also carry the Instruction Manual at least in Spanish.

For further information on the technical safety requirements applicable to these machines, it is recommended to consult the relevant harmonised European standards. These standards include the technical requirements whose compliance by the manufacturer gives you presumption of conformity to Directive 2006/42/EC.

These Harmonized European Standards applicable to dumpers are listed in the bibliography.

For the use of the dumpers, in application of RD 1215/1997 on work equipment, all dumpers that on the date of entry into force of this royal decree were available to the workers in the company or work centre must have been adapted to the minimum provisions contained in Annex I and used in accordance with the provisions of Annex II of the aforementioned royal decree.

To facilitate the correct interpretation and application of the requirements of RD 1215/1997, reference is made to the corresponding Technical Guide drawn up by the INSHT.

On the other hand, in accordance with RD 212/2002, dumpers working outdoors must also have a visible sound level label indicating the guaranteed sound level of the machine in the environment.

If the dumper must circulate on public roads (or which are considered public roads) it must comply with the requirements of the legislation in force at any given time, in terms of Traffic and Road Safety.

IV. RISKS, PREVENTION-PROTECTION MEASURES AND BASIC RECOMMENDATIONS IN THE USE OF THE DUMPER

In order to prevent risks when handling the dumper, a series of hazards, dangerous situations and events must be taken into account, which if they materialize could lead to damage, with different levels of severity for people.

Among other aspects, they must be taken into account:

- The training, experience and professional skills of the operator of the dumper.
- The presence of personnel in the work area environment.
- The type of dumper used and its suitability for the type of task carried out, its maintenance, and the availability of safety elements and whether these are suitable or not.
- The working environment, the state of the ground (muddy ground, with landslides), slopes, movements of personnel on the site, both on foot and by car.

HAZARDS AND PREVENTIVE MEASURES

The following is an indicative and non-exhaustive list of the the most characteristic hazards of the dumper and the corresponding preventive measures:

- ➡ Dump
- ➡ Crashes and Traps
- ➡ Falling Objects and/or Transported Loads
- ➡ Fire and Explosion
- ➡ Each of Staff when getting on or off the Dumper
- ➡ Full body vibration exposure in use
- ➡ Noise exposure in use

This list should in no case replace the risk assessment carried out for the specific job by a competent technician.

FLY

CONSEQUENCES: Entrapment of the operator or people in the environment under the dumper.

CAUSES:

- Circulation with the load elevated (in dumper with option of lifting loads).
- Excessive speed when turning or cornering (with or without load).
- Driving on uneven or inconsistent terrain.
- Driving on uneven ground or driving near areas of steep slope where the ground is more susceptible to collapse.
- Driving with tyres or treads in poor condition.
- Tyre blowouts or broken treads due to overloading or circulating on soils with cutting or lacerating elements.
- Drive down ramps with the vehicle loaded, especially with heavy braking.
- Pouring the load into trenches and slopes.

PREVENTION-PROTECTION MEASURES:

- ✓ Install a rollover protective structure (ROPS) on the equipment. The operator shall use a restraining device, e.g. seat belt.
- ✓ Reduce speed when taking the curve.
- ✓ Check the resistance of the ground before the dumper passes.
- ✓ Adjust speed to ground conditions.
- ✓ Do not drive faster than 10 km/h.
- ✓ Do not drive on the edge of ramps or slopes.
- ✓ Daily check of tyre pressure and condition. Replace defective tyres immediately.
- ✓ Do not exceed the load limits of the dumper.
- ✓ Remove any sharp or cutting elements from the ground.
- ✓ Move as far away from areas of high gradient or slope as possible.
- ✓ With the vehicle loaded, slowly lower the ramps in reverse, avoiding sudden braking.
- ✓ Place stops that prevent the dumper from moving forward beyond a safe distance from the edge of the slope, taking into account the natural angle of the slope.

BUMPS AND BRUISES

CONSEQUENCES: Running over and trapping people or dumper or its cargo.

CAUSES:

- Running at high speed.
- Distraction of the operator or pedestrians.
- Brake or dumper steering failure.
- Dazzling at crossings, loading/unloading, or entering and leaving premises.
- Insufficient lighting.
- Reduced space for manoeuvring.
- Lack of visibility when reversing.
- Driving with loads that limit the operator's vision.
- Driving on slippery ground.
- The dumper is driven by untrained or unauthorised personnel.
- Untimely start-up.

PREVENTION-PROTECTION MEASURES:

- ✓ The dumper must be equipped with a rotating beacon in the upper area of the safety frame, which must be permanently connected while driving.
- ✓ The operator will use a horn at crossings and when entering or leaving enclosures.
- ✓ A daily and regular check of the condition of the brakes and address.
- ✓ Study of the areas of possible glare and prevention of its appearance.
- ✓ Provide lighting for the dumper to drive in poorly lit areas.
- ✓ Daily review of dumper lighting.
- ✓ Establish large circulation areas.
- ✓ Delimit, signpost and keep pedestrian areas free.
- ✓ Avoid overloading the hopper, making it difficult for the driver to see. In exceptional cases, if the hopper is overloaded on time, reverse the vehicle taking extreme precautions and have an operator to help with the manoeuvre.
- ✓ Moderate speed in slippery areas.
- ✓ Train and retrain operators regularly. To avoid use by unauthorised personnel, the forklifts will have an ignition key in the possession of the operator or person in charge established in the company.
- ✓ Provide the dumper with a system that prevents the engine from starting up when it is running.

BUMPS AND BRUISES

CONSEQUENCES: Crashes against immovable objects

CAUSES:

- Running at high speed.
- Operator distraction.
- Brake failure or dumper steering.
- Driving on slippery ground.
- Dumper being driven by untrained or unauthorised personnel.

PREVENTION-PROTECTION MEASURES:

✓ Daily and periodic check of the state of the brakes and steering.

✓ Moderate the speed in areas with wet soils.

BUMPS AND BRUISES

CONSEQUENCES: Uncontrolled dumper manoeuvres

CAUSES:

- Driving by unauthorized or untrained personnel
- Driving in reverse loading.
- Manoeuvring with little or no visibility.
- Overloading the dumper.
- Driving on ramps or slopes.

PREVENTION-PROTECTION MEASURES:

- ✓ If you have to reverse occasionally, take extreme precautions.
- ✓ Install rear-view mirrors to facilitate manoeuvring.
- ✓ Fit the dumper with a discontinuous horn, which is activated when the vehicle is in motion back.
- ✓ Always try to have a good visibility of the way to go.
- ✓ When driving on ramps or slopes, follow the manufacturer's instructions.
- ✓ Always reverse carefully when driving down slopes.
- ✓ No turns will be made on the ramps.

FALL OF OBJECTS AND/OR TRANSPORTED LOADS

CONSEQUENCES:

Fall of materials on the operator or people in his environment.

CAUSES:

- Driving in environments with risk of falling / collapsing objects.
- Descent of steep slopes with the load in the direction of travel.
- Crossing of terrain projections at high speed. Driving with a high load (in the case of a dumper with the option of load lifting).

PREVENTION-PROTECTION MEASURES:

✓ Install a falling-object protection structure (FOPS) on the equipment.

✓ Perform descent of slopes in reverse and at reduced speed.

✓ Drive through areas with raised surfaces diagonally and at low speed.

FIRE AND EXPLOSION

CONSEQUENCES: Dumper fire

CAUSES: Fuel leaks, pipe breakage, drilling of the tank or science couplings.

PREVENTION-PROTECTION MEASURES: Daily and periodic checking of circuits, tanks, fuel couplings and battery elements and circuits.

DROP OF PERSONNEL WHEN CLIMBING OR DESCENDING FROM THE DUMPER

CONSEQUENCES: Multiple contusions

CAUSES: Inadequate dumper lift/lower systems or unsafe.

PREVENTION-PROTECTION MEASURES:

- ✓ Provide the dumper with a non-slip footboard on the chassis and handles for easy access.
- ✓ Instruct the operator on how to safely raise and lower the dumper.

EXPOSURE TO FULL-BODY VIBRATION IN THE USE UTILIZACIÓN

CONSEQUENCES: Lumbago

CAUSES: Use of dumpers with non-ergonomic seats (without suspension, regulation, without adaptation to the body, etc.).

PREVENTION-PROTECTION MEASURES: The operator's seat shall be equipped with suspension and shall be anatomical and adjustable in height and horizontally.

CONSEQUENCES: Spinal injuries

CAUSES:

- Use of dumpers with non-ergonomic seats (without suspension, regulation, without adaptation to the body, etc.).
- Circulation on floors in poor condition.

PREVENTION-PROTECTION MEASURES:

- ✓ The operator's seat will be equipped with suspension and will be anatomical and adjustable in height and horizontally.
- ✓ Instruct the worker to adjust the seat before starting work. As far as possible, vehicle circulation areas shall be as regular as possible.

EXPOSURE TO NOISE IN USE

CONSEQUENCES: Hearing loss

CAUSES: High noise level in the driver's seat.

PREVENTION-PROTECTION MEASURES:

- ✓ Evaluate according to criteria and requirements of RD. 286/2006
- ✓ Limit the exposure time to the needs resulting from the evaluation.
- ✓ Use of hearing protectors with attenuation calculated and adjusted to the results of the evaluation.

IV. PREVENTION ASPECTS TO BE HIGHLIGHTED

We will consider operator **training** and dumper **maintenance** and operation.

OPERATOR TRAINING

The operator must be specifically trained and informed to drive the *dumper* correctly and safely and to carry out the tasks assigned to him. This is explicitly required by Article 5 of RD 1215/1997, which refers to Article 19 of the LPRL. The latter requires that: *"In compliance with the duty of protection, t**he employer must ensure that each worker receives sufficient and appropriate theoretical and practical training in preventive matters**, both at the time of recruitment, whatever the mode or duration of recruitment, and when there are changes in the functions performed or new technologies or changes in work equipment are introduced.*

***The training must be specifically focused on the job or function of each worker**, adapted to the evolution of the risks and the appearance of new ones and repeated periodically, if necessary".*

With regard to the driving of the equipment, RD 1215/1997, in its Annex II, section 2.1, requires that *"the driving of self-propelled work equipment shall be reserved for workers who have received specific training for the safe driving of such work equipment".*

Also, since this manual is addressed to the construction dumper, the scope of use of this equipment, in this case the construction, must be taken into account. As regards training, Annex IV, part C, 7c. of RD 1627/1997 explicitly states: "Drivers and personnel in charge of vehicles and machinery for earthworks and material handling must receive special training". This requirement is embodied and specified in Article 161 of the Fifth General Convention of the Construction Sector, which sets out the training that must be received by the operator who handles earth-moving vehicles and machinery.

As established in the Convention, this training will have a minimum duration of 20 hours and will include the following aspects:

Definition of work:

- Types of machinery: transport machinery, (lorry, dumper), earthmoving and compacting machinery (bulldozer, loader, backhoe, motor grader, asphalt spreader / compactor, etc.)
- Risk identification: running over, machine tipping over, entrapment, electrocution, explosion, fire, particle projection, vibration, thermal stress, fatigue, etc.

Specific preventive techniques: application of the health and safety plan in the use of machinery and specific work equipment. Risk assessment in the event that there is no plan. Access for vehicles and people. Collective protections, individual protections, specific operator training. Authorization of use. Signalling. Underground pipelines (electrical, telecommunications, gas, sanitary, etc.)

Auxiliary means, equipment and tools: machine or work equipment tools, maintenance and checks, manufacturer's manual, characteristics of the main elements, safety devices, documentation, lifting systems, etc.

Verification, identification and monitoring of the workplace and its environment: risks and necessary preventive measures. Adjacent constructions. Perimeter protection. Knowledge of the workplace environment. Planning of tasks from a preventive point of view. Transit through the work site. Considerations regarding the geotechnical study.

Interferences between activities: simultaneous or successive activities Signalling and traffic.

Rights and obligations: general and specific regulatory framework. Organisation of prevention. Promotion of awareness of the importance of being involved in the prevention of occupational risks. Participation, information, consultation and proposals.

Thus, the operator must receive specific training on the characteristics of the specific job he is going to occupy, where emphasis will be placed on the specific characteristics of the machine he will be using.

This training will also take into account the personal characteristics of the worker, adapting the training to the previous experience he has, since a worker without previous experience will not need the same training as one who has experience in handling the equipment in the sector.

DUMPER MAINTENANCE

Article 3 of Royal Decree 1215/1997 states that:

"The employer shall take the necessary measures to ensure that, by means of appropriate maintenance, the work equipment is kept for the entire duration of its use in such conditions as to satisfy the provisions of the second paragraph of paragraph 1 (Note: The second paragraph of paragraph 1 of this Article does not relate to provisions concerning equipment. The reference is to the third subparagraph, as is clear from the analysis of the Directive itself). Such maintenance shall be carried out in accordance with the manufacturer's instructions or, failing these, in accordance with the characteristics of the equipment, its conditions of use and any other normal or exceptional circumstances likely to influence its deterioration or maladjustment'.

The above mandate translates into the need to ensure that the initial safety performance of the equipment is maintained throughout its life, i.e. that its characteristics do not deteriorate to the point where persons are placed in dangerous situations. Obviously, in Occupational Risk Prevention, the adequate maintenance required by RD 1215/1997 is only guaranteed by preventive maintenance, whether it is systematic, predictive or timely.

The maintenance instructions provided by the manufacturer must be adapted to each particular case, depending on the working environments in which the dumper is used, i.e. maintenance must be carried out in accordance with the requirements of art. 3 that the type of maintenance should take into account: "its conditions of use and any other normal or exceptional circumstances that may influence its deterioration or maladjustment".

It will be necessary to establish systematic preventive maintenance programmes, where components are reviewed and interventions carried out even though no incidents have occurred.

The frequency of maintenance will be determined by the information provided by the manufacturer in the Instruction Manual, adjusting to previous experience in the company related to the working environment or intended use of the equipment.

This maintenance must be carried out by qualified personnel, either from the company itself (for which they must have received adequate specific training in compliance with the requirements of art. 5.4 of the RD 1215/97) or outside of it and must be documented in a maintenance log.

Although RD 1215/1997 does not specify which equipment must have it, it is considered that these mobile machines should have a maintenance diary and this is supported by the following criteria:

- Only the documentary record of maintenance tasks will allow verification and guarantee that no deviations occur, either in terms of time or content, from what was planned.

- In application of the requirement for "periodic checks" and written documentation of the results of these checks in articles 4.2 and 4.4, 1st paragraph of RD 1215/1997, this mobile equipment should have a maintenance diary and, as the article itself says, "be kept throughout the useful life of the equipment".

- A maintenance book compiling the periodic records will provide information for future planning and inform the personnel responsible for maintenance, whether in-house or external, of the previous actions taken.

- In this respect, it should be remembered that RD 1215/1997 in its Annex 11.1.15 requires that: "when a work equipment must have a maintenance book, this shall be kept up to date".

Regardless of the type of maintenance carried out, which will be the most appropriate to the characteristics of the dumper, the characteristics of the work, the characteristics of the environment and the place of work, etc., what we could call "maintenance for use" or "daily inspection" must also be carried out. This consists of the operator carrying out a series of checks, generally visual and brief, which are carried out daily or before each work shift, to check the good functional condition of the dumper.

To be "acceptable", in preventive terms, there should be a written record of the performance of these checks and for this purpose a questionnaire should be designed and implemented with the minimum checks to be carried out, stating the date or shift of performance and the signature of the person performing the checks.

DUMPER OPERATION

Although each type of dumper must be used in accordance with the information provided in the instruction manuals and with the instructions given by the immediate supervisor, the following is a series of general recommendations that must be taken into account whenever these machines are used.

Before using a dumper for the first time, the operator must read and understand all the information in the dumper's operating instructions.

Working environment

The most complete information possible on the area of work should be available, taking into account aspects such as:

- If there is a risk of fire or explosion in the working area, either because of the goods stored or because of possible leaks of gases or fluids, it must be checked that the machine has explosion protection.

- If you are going to work in closed rooms, make sure that there is good ventilation to avoid excessive concentrations of exhaust gases. Stop the engine whenever possible.

- If the risk assessment in the work area and/or task shows that there is a risk of falling objects, the dumper, in compliance with the requirements of RD. 1215/1997, must be fitted with a protective structure for this risk. To facilitate the design and performance of such a safety component of the equipment, it is recommended to consult the ISO 3449 (FOPS) standard.

- Also, if the risk assessment of the work area and/or task indicates that there is a risk of tipping, the dumper must be fitted with, as a minimum, a structure that prevents a tipping of more than 90o and an operator restraint system. To facilitate the design and performance of such a safety component of the equipment, it is recommended to consult the ISO Standard 3471 (ROPS), to which the 2012 edition of the Harmonised European Standard UNE EN 474, part 1 and 6, refers.

- If the dumper has to circulate on public roads (or roads that are considered public), it must comply with the requirements of the legislation in force at all times, in terms of Traffic and Road Safety.

Condition of the vehicle

Before starting any work, check for oil and fuel spills. If they do occur, they must be cleaned up. Operators must degrease and clean their hands and the soles of their shoes.

In addition, a number of checks, described in the daily check sheet, must be carried out.

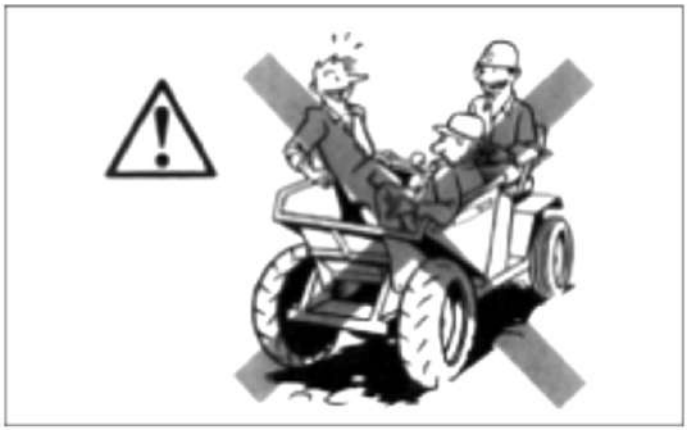
Before any operation is carried out underneath raised parts (hoppers, buckets, etc.) or between the two halves of an articulated chassis, the mechanical movement locking devices must first be fitted.

Safety recommendations while driving

- If any anomaly is observed, it should be reported directly to a superior or to the maintenance service.
- The body must be kept inside the operator's compartment.
- When working on slopes, precautions must be taken, move slowly, avoid positioning yourself transversely or operate on slopes greater than those recommended. Descent of slopes greater than 10% should be carried out in reverse, with the load in the direction of greatest stability.

In any case, it is not recommended to operate on slopes greater than 20% in wet terrain or 30% in dry terrain. Do not descend a slope with the gearshift lever in neutral.

- People should not be transported unless suitable seats are provided.



- The vehicle must not be overloaded.
- The driver must have good visibility throughout moment, if the load prevents it from circulating in reverse, taking extreme precautions. At low visibility junctions, drive at a lower speed and activate acoustic signals.
- The speed of the dumper must be adapted to the working conditions at all times.
- Before driving on a site, especially on bridges, embankments or slabs, check that the site is stable enough to support the weight of the dumper and its load.
- Do not drive with the hopper raised. If the dumper is equipped with a self-loading shovel, depending on the type of design, it must be placed in the position that allows adequate visibility, either with the shovel picked up on the hopper, with the shovel about 50 cm from the ground at the front of the machine, or picked up on the operator as the case may be
- You should not transport loads that protrude from the hopper, especially if they are unstable.

- If the dumper is not fitted with a windscreen, there is a risk that particles of the transported material will be blown into the operator's eyes.

Loading and unloading operations

- The contents of a hopper should not be dumped near an unconsolidated slope without a safety stop for the wheels at a sufficient distance from the edge. The height of the stop should not be less than 1/3 of the wheel diameter.

- When loading the dumper with a shovel, crane or similar external means, the driver must leave the driving position.
- With hydraulically controlled dumping hoppers, dumping must be done progressively to maintain the stability of the vehicle.
- With gravity hoppers, materials which stick, for example clayey mud, or get stuck in the hopper must be avoided, as the dumping operation will be difficult to control and the stability of the equipment will be endangered.
- If the dumper is equipped with a self-loading device, the loading operation should be carried out on stable and level ground.
- The hopper must be loaded with a volume of material that does not prevent the operator from having an acceptable visibility of the working area.

At the end of the day

✓ Park the dumper in the areas arranged for this purpose, avoiding it to hinder the circulation of the rest of the vehicles or blocking exits or access to stairs.

✓ Place the hopper horizontally and in the rest position. If the dumper has a self-loading shovel, it must be placed at ground level.

✓ The ignition key must be removed from the ignition circuit, as well as blocking the mechanism that prevents the machine from being used by an unauthorised person.

It should be remembered that depending on the results of the risk assessment, the specific risks of the workplace where the use of personal protective equipment is required will be taken into account. Where necessary, safety boots, helmets, reflective aprons, gloves, hearing protection, safety goggles, etc. should be used.

VI. NORMATIVE

Legal

Law 31/1995, of 8 November, on the Prevention of Occupational Risks.

RD. 773/1997, of 30 May, on minimum health and safety provisions regarding the use by workers of personal protective equipment.

RD. 1215/1997, of 18 July, establishing the minimum health and safety provisions for the use of work equipment by workers.

RD. 1627/1997, of 24 October, by which the minimum health and safety provisions in construction works are established.

RD. 1644/2008, of 10 October, which establishes the rules for the marketing and commissioning of machinery.

Resolution of 28 February 2012, of the General Directorate of Employment, by which the V Collective Agreement of the construction sector is registered and published.

Technique

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Earth moving machinery. Protection structures against falling objects. Laboratory tests and performance requirements. (ISO 3449:2005)

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UNE 115413:1991
Earth moving machinery. Dumpers boxes. Volumetric evaluation.

UNE-EN 474-1:2007 + A1:2009
Earth-moving machinery. Earthmoving machinery. Part 1

UNE-EN 474-6:2007+A1:2009
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Technical Guide for the evaluation and prevention of risks related to the use of work equipment.

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