



# SLOVENSKI STANDARD

## oSIST prEN 17795-5:2022

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**Razvedrilna tehnologija - Kodeks ravnanja - 5. del: Dvigovanje in premikanje pri dejavnostih v prireditveni industriji**

Entertainment Technology – Codes of Practice - Part 5: Lifting and motion Operations in the Event Industry

Veranstaltungstechnik - Verfahrensregeln - Teil 5: Hub- und Bewegungsvorgänge in der Veranstaltungsindustrie

Technologies du spectacle - Codes de bonnes pratiques - Partie 5: Opérations de levage et de mouvement dans l'industrie de l'événementiel

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**ICS:**

97.200.10	Gledališka, odrska in studijska oprema ter delovne postaje	Theatre, stage and studio equipment
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## Entertainment Technology - Codes of Practice - Part 5: Lifting and motion Operations in the Event Industry

Technologies du spectacle - Codes de bonnes pratique -  
Partie 5: Opérations de levage et de mouvement dans  
l'industrie de l'événementiel

Veranstaltungstechnik - Verfahrensregeln - Teil 5:  
Hub- und Bewegungsvorgänge in der  
Veranstaltungsindustrie

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 433.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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## European foreword

This document (prEN 17795-5:2021) has been prepared by Technical Committee CEN/TC 433 “Entertainment Technology - Machinery, equipment and installations”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

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## Introduction

This document has been prepared by CEN/TC433/WG4 Codes of practice with the aim to produce a code of practice for rigging, lifting and motion operations within the event industry.

It is intended to provide general guidelines on planning and the process of lifting and motion operations, to production management, technical directors, technicians, manufacturers, performers and others working in local, national and international projects. It should facilitate a smooth process and a safe work environment when involved in such operations. This standard does not provide specific details in regard to any lifting and motion operations as described in the scope.

A project always starts with a concept, small or large, and often put forward by a person with an artistic mind and, above all, not hindered by gravity. This creates the technical challenge questioning: “Can we do it, can we do it safe?”

To be able to answer this question, many smaller and larger details need to be addressed, such as:

- Loads (lights, sound, set, video);
- The spatial ordering of all loads and structures carrying it;
- Is the equipment in rest or in motion?
- What are the effects of the motion: acceleration, deceleration?
- What are the effects of a possible e-stop?
- Will there be performer flying?
- And if so: where do they start and where do they land?
- What are the demands on all types of equipment?
- What skills are needed to put it in, and operate it?
- What are the time schedules?
- What is the structure of the venue like where the lifting will take place?
- What is the structural capacity and integrity?

The more complex the concept, the more questions, the more planning and complex engineering is needed.

CEN/TC433 has published EN 17206:2020 *Entertainment technology - Machinery for stages and other production areas - Safety requirements and inspections*. This standard provides guidelines for determining the ‘use case’ of a lifting appliance and clarifies the safety requirements for lifting machinery that come with each use case.

Typical lifting and motion operations may include but are not limited to the following:

- Auditorium elevators;
- Compensating elevators;
- Fly bar systems (manual and motor driven);

- Lighting bars;
- Movable lighting towers;
- Movable stage platforms (stage wagons);
- Movable proscenium arches;
- Orchestra elevators;
- Point hoists;
- Chain hoist
- Projection screens (manual or motor-driven);
- Scenery storage elevators;
- Side stage and rear stage shutters;
- Stage elevators;
- Tilttable stage floors;
- Trap elevators.

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Besides the engineering, the management process required for a safe rigging and lifting operations shall be robust.

This code of practices describes the process of working and the issues that shall be considered operations can take place. If, somewhere in this process, changes have to be made, some of the previous phases may have to be repeated. Figure 3 shows a flowchart.

Aside of the process and flowchart (see Figure 3), this document states the requirements to be met of all actions in the flowchart, see Annex A through H.

Furthermore, this standard describes several functions of technicians involved in the rigging and lifting operations. This can be helpful when organising the crew.

The process and flow chart describe several preparatory phases and the lifting operation itself. It's a description of actions that leads to results, who bears responsibility for that result and, if applicable, on which normative references it is based.

The whole process description (see chapter 5) is based on a large-scale production in the event industry, e.g.

- Big rock concerts in arenas;
- Large musicals;
- Festivals with several stages;
- Big operas.

Smaller productions with less complex rigging and lifting movements can follow the same process and structure. However, they may combine several phases.

## 1 Scope

This code of practice provides a set of guidelines for lifting and motion operations related to machinery and machinery installations used in staging and production facilities for events. Such facilities may include, but not exclusively, theatres, multipurpose halls, studios, production facilities for film, television or radio, concert halls, congress centres, schools, exhibition centres, trade-fair centres, museums, discotheques, amusement parks, sports facilities and open-air-theatres.

Events are, for example, concerts, shows, congresses, exhibitions, presentations, demonstrations, film or television recordings, etc.

This document covers the use of machinery employed in the event industry including machinery defined in point j Article 1.2 of Machinery Directive (2006/42/EC): “*machinery intended to move performers during artistic performances*”

For the purposes of this document, machinery installations are all technical installations and equipment used for operations in stage and production facilities in the event industry. Such installations are used to lift, lower, suspend and move loads which may include but not exclusively, scenery or objects, truss systems, lighting, audio-visual, sound equipment or performers.

The guidelines in this document also apply to machinery installations based on new technologies or specially designed installations which are not expressly mentioned here but which nevertheless operate in a similar manner or are meant for similar purposes to those listed above. This document does not provide specific details but is intended to provide **general guidelines** on planning and the process of lifting and motion operations.

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## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 12100, *Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100)*

EN 17206, *Entertainment technology - Machinery for stages and other production areas - Safety requirements and inspections*

EN 17115, *Entertainment technology - Specifications for design and manufacture of aluminium and steel trusses*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 17206, EN 17115 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

### 3.1 attachment points

facility provided to enable the load to be connected to the lifting machine, usually by use of a lifting accessory



**3.2****code of practice**

set of written guidelines that explains how people working in a particular profession should plan, manage and execute their work

**3.3****communications protocol**

system of rules and etiquette enabling orderly communication amongst multiple users of a communications system

**3.4****communications system**

reliable means of communication between parties, typically utilizing wired intercom or two way radios. Video can supplement audio

**3.5****commissioning****taking into service**

final phase in the installation of equipment, when it is demonstrated to be compliant with all the specified criteria and to be fully operationa

**3.6****competent person**

person with sufficient practical and theoretical knowledge and experience to carry out the person's duties, and who is aware of the limits of the person's competency, expertise and knowledge

[SOURCE: EN 17206:2020, 3.11]

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**3.7****Worker with role(s)****WR**

competent person with function(s) assumed in a particular situation

Note 1 to entry: See Annex A

**3.8****regulatory inspection**

evaluation by observation and judgement accompanied as appropriate by measurement, testing, gauging and documentation

**3.9****Pre-use Inspection**

visual examination of equipment thereof to verify that it appears to be in operating condition and is free of physical damage

**3.10****Functional responsibilities**

different tasks that all workers involved in the event shall do during the event. The list of functions described is only indicative and not exhaustive. In Annex I is explained in detail the role tasks of each worker with role

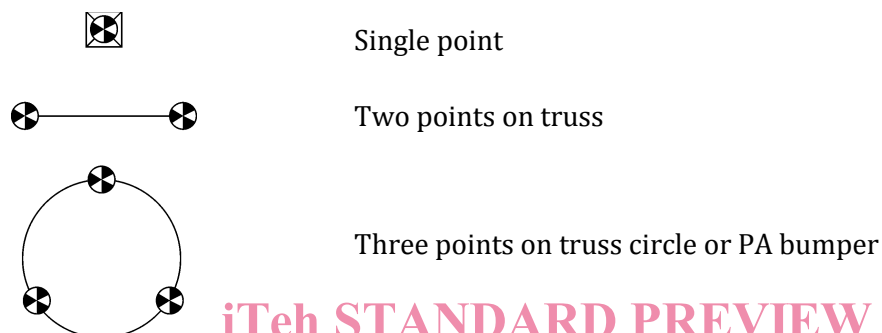
**prEN 17795:2021 (E)****3.11****determinate load System**

system which has the minimum number of primary suspension points required to support the load

Note 1 to entry: Characteristics are

- Reaction forces are predictable and can be calculated using basic mathematical equations.
- By definition and for purposes of calculation they do not have redundant suspensions.
- Variations in an object's lift height caused by operating one or more hoists in a group will not result in unpredictable or large changes in reaction forces.

Examples: Above examples assume adequate support is provided. See Figure 1.



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**Figure 1 — Determinate load system**

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**3.12****indeterminate load System**

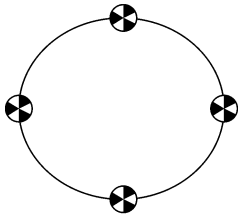
system which has more primary suspensions than required to support the load

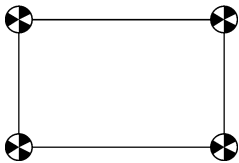
Note 1 to entry: Characteristics are:

- Reaction forces can only be calculated using complex analytical methods.
- Small variations in lift height can produce potentially dangerous variations in reaction forces.
- Reaction forces shall be verified on site using load monitoring equipment.
- The number of suspensions in an indeterminate system can provide redundancy, making it possible for a suspension failure to occur without causing collapse of the system. Shock loads shall be considered.

Examples: See Figure 2.

 Three or more points on a truss;

 Four points on truss circle grid

 Four points on truss grid

Note: In the examples above, it may be theoretically possible to remove one suspension and have the objects remain stable. In practice, adequate support shall be provided to ensure stability

**Figure 2 — Determinate load system**

### 3.13 lifting plan rigging plan

Set of procedures, schedules, drawings, tables, and documents needed for a safe Lifting Operation

### 3.14 load

Load refers to the object or objects to be lifted

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### 3.15 mousing

use of wire or other material to prevent the unintentional opening of a connector or hook

### 3.16 overhead obstruction

object that blocks the intended flight path of a lift

### 3.17 performer flying

suspending, lifting or moving a performer

### 3.18 point load

concentrated load applied at a single location

### 3.19 primary suspension

minimum number of suspension points required to support the load as dictated by the rigging design

Note 1 to entry: See also 3.21 “Redundancy.”

**prEN 17795:2021 (E)****3.20****qualified person**

person who has the professional credentials required to solve or resolve problems relating to the subject matter

**3.21****redundancy**

use of additional measures that share load to safeguard against a suspension failure

**3.22****rigging**

installation, removal or other activity using lifting or suspension equipment or accessories used in tension for lifting or supporting display, production, performance or event technical requirements

**3.23****rigging assembly**

combination of hardware that is connected together

**3.24****rigging points**

connection of concentrated loads to a support structure according to the rigging plan

**3.25****rigging system**

any equipment used for suspension below the supporting structure

**3.26****risk assessment**

formal process used to identify hazards and mitigate risk

**3.27****risk management plan**

document detailing procedures to ensure the ongoing identification of hazards and mitigation of risk

**3.28****secondary suspension****safeties****safety points**

additional rigging used to support the load in case of equipment failure

**3.29****sling angle factors**

multipliers that account for increased forces in slings when they are not vertical

**3.30****suspension**

equipment in the load path that supports the load

**3.31****title block**

portion of a drawing that identifies the drawing contents

**3.32****trim height**

vertical distance from a datum to a specified point on a suspended object

**3.33****working load limit (WLL)**

maximum allowable load to be applied to a lifting component as specified by the manufacturer

**3.34****safe working load (SWL)**

useful load which is borne by the load carrying or securing device, or directly by the load bearing equipment

Note 1 to entry: SWL is defined by the user according to the reduction of the WLL or the ELL, due to the load applied to the load bearing device, the self-weight of the load carrying devices (p. ej truss), normative o legal requirements, environmental conditions, or any other condition that may require any reduction in favour of greater security.

**3.35****entertainment load limit (ELL)**

maximum load that an item of lifting equipment is designed to raise, lower or sustain.

[SOURCE: EN 17206:2020, 3.2.4]

**3.36****entertainment load limit at rest (ELL/R)**

maximum load that an item of lifting equipment is designed to sustain at rest

Note 1 to entry: Due to additional measures (such as locking pins in elevators), the Entertainment Load Limit at Rest could be higher than the entertainment load limit that the machine is capable of moving.

[SOURCE: EN 17206:2020, 3.2.5]

**3.37****equipment failure**

termination of the ability of an equipment to perform a required function

Note 1 to entry: After failure the equipment has a fault

Note 2 to entry: "Failure is an event, as distinguished from "fault", which is a state

**4 Introduction of planning****4.1 General**

Artistical designs in the event industry generally involve lifting operations to fulfil the design. Planning lifting operations start with the question: "How can this operation be done in a safe way?"

The "safe way" is dependent on:

- The building or structure where the lifting will take place
- The lifting equipment intended use
- The Use Case according to EN 17206 (if applicable)
- The load

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- The movement
- The technical skills of the responsible persons.

It is evident that in case the loads are bigger and heavier, the movements of the loads are more complex and risk full and with possible environmental conditions that have an impact on the situation, the more complex the engineering will be, to meet all the requirements in the artistic plan.

Besides the engineering the management process required for a safe lifting operation shall be robust.

This code of practices will describe the process of working and some of the issues that shall be considered before the lifting operation can take place. If somewhere in this process changes have to be made some of the previous phases have to be repeated. See Figure 1. This code of practices will also describe how to act during the lifting operation and how to maintain the lifting equipment for subsequent use.

The process describes several preparatory phases and the lifting operation itself. It's a description of actions that leads to results, who bears responsibility for that result and, if applicable, on which normative references it's based.

The whole process description (see chapter 5) is based on a very large production in the event industry.

Productions like:

- Big rock concerts in arenas;
- Large musicals;
- Festival with several stages;
- Big operas.

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Smaller productions or simple lifting movements follow much the same process and structure, however they may combine several phases.

Depending on the kind of event the organizational structure will be different. The employer is responsible for setting up an organizational structure with work descriptions, safety rules, employment protection regulations and a responsibility structure.

The employer can assign duties to other employees. When assigning duties, these should be detailed defined in writing.

To ensure a safe event all content and processes is planned in detail to guarantee a safe event (see applicable local laws and regulations for additional information).

Risks shall be assessed and adequate measures for control of the risks shall be recorded in writing. A risk assessment shall assess the risks of subcontractors and other people that may be affected. When a risk assessment includes machinery hazards during lifting and motion operations, it should follow EN ISO 12100 guidelines and EN 17206.

An evaluation after the event will help with future planning, estimating risks and to optimize the process.

## 4.2 Project workflow and stakeholders

### 4.2.1 Project workflow

The project workflow is a schematic process description (see Figure 1), based on a very large production in the event industry.

Depending on the kind of event the organizational structure can be less comprehensive but remains basically the same.

The project work flow is time-wise split up in 4 phases:

- Design;
- Installation;
- Use;
- Dismantling and de-rigging

A detailed description of all steps is given in chapter 5.

### 4.2.2 Stakeholders

#### 4.2.2.1 Initiator

The initiator of a project could be a private person, persons or company initiating a project and hiring all staff and the venue only for this project; or it could be the director / employer at a particular venue like an opera house with a mix of fixed employed personnel and sub-contractors.

In this standard, the initiator has the role of employer in the sense that it is highest in rank regarding safety and safe work environment. Sometimes the initiator also could have the role of artistic designer.

#### 4.2.2.2 Venue owner

The venue owner is a legal person or a legal entity owning the venue where the production takes place. This can be, but is not limited to:

- A permanent building made of e.g. concrete and bricks with a permanent stage, stages or production areas
- A permanent location that is temporarily used for staging or production purposes, like an old factory;
- Temporary demountable structures.

The venue owner shall provide documentation of the building's structural capacity and operational code of practice.

#### 4.2.2.3 Artistic designer

The artistic designer shall cooperate with the production staff to achieve a safe and creative solution to the task at hand.