BS EN 17795-5:2023
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BSI Standards Publication

Entertainment technology — Codes of Practice

Part 5: Lifting and motion operations in the event industry

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Full document details: BS EN 17795-5:2023

National foreword

This British Standard is the UK implementation of EN 17795-5:2023.

The UK participation in its preparation was entrusted to Technical Committee MHE/3/13, Lifting equipment for performance, broadcast and similar applications.

A list of organizations represented on this committee can be obtained on request to its committee manager.

This standard relates in part to lifting and motion operations involving machinery covered by BS EN 17206:2020. The publication of BS EN 17206:2020, which is a design, manufacture and installation specification, led to the withdrawal of an existing code of practice covering lifting and motion operations, BS 7906-1:2005, due to partial overlaps and conflict in content.

BS EN 17206:2020 relates to safety requirements and inspections of machinery used on stages and other production areas, but it is not a code of practice and did not replace the code of practice elements of BS 7906-1:2005. Whilst this new code of practice BS EN 17795-5:2023 covers in part the scope of the withdrawn BS 7906-1:2005, there are some elements of BS 7906-1:2005 that may still have value, particularly where it goes into a greater degree of detail than the new standard.

BS EN 17795-5:2023 includes reference to a work flow structure (Clause 5) and roles and responsibilities ("work roles" throughout the normative text, and described at Annex I (informative)), which might not be reflective of established practice and references in all cases in the UK, due to long established custom and practice and development of industry-specific organizational models. Whilst a model framework might prove useful to those with no existing arrangements in place, established organizational structures and work flow processes could also be effective.

Lifting and motion operations in the UK are covered by the Lifting Operations and Lifting Equipment Regulations 1998 which require such operations to be properly planned by a competent person, appropriately supervised and carried out in a safe manner. Users should continue to take an approach to lifting operations, in accordance with national regulations, which is the most appropriate to their specific lifting and motion design.

As a code of practice, this BS EN takes the form of guidance and recommendations. It should not be quoted as if it were a specification, and particular care should be taken to ensure claims of compliance are not misleading. Employers should be free to commission work in any way that ensures the safety of the lifting and motions operation.

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30 April 2024	Additional national foreword text added

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EUROPEAN STANDARD

NORME EUROPÉENNE

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EN 17795-5

December 2023

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English Version

Entertainment technology - Codes of Practice - Part 5: Lifting and motion operations in the event industry

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

This European Standard was approved by CEN on 20 November 2023.

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European foreword

This document (EN 17795-5:2023) has been prepared by Technical Committee CEN/TC 433 "Entertainment Technology – Machinery, equipment and installations", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2024, and conflicting national standards shall be withdrawn at the latest by June 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

EN 17795 consists of the following parts, under the general title *Entertainment technology — Code of practice*:

— *Part 1: General requirements*[1]

— *Part 2: Load carrying devices*[1]

— *Part 3: Performer flying operations*[1]

— *Part 4: Temporary demountable structures*[1]

— *Part 5: Lifting and motion operations in the event industry*

— *Part 6: Load bearing equipment*[1]

— *Part 7: Lifting accessories*[1]

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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[1] Document in preparation.

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Introduction

This document has been prepared by CEN/TC 433/WG 4 with the aim to produce a code of practice for lifting and motion operations within the event industry. All references to lifting include motion.

This document intends to provide general guidelines for venues, operators, production management, technical directors, technicians, manufacturers, performers and others working in the event industry for local, national and international projects. It should facilitate a smooth process and a safe work environment when workers are involved in assembly, use and dismantling operations. This document does not provide details in regard to specific lifting and motion operations.

A project in the event industry always starts with an artistic concept that needs to be translated to a technical solution. This creates a balance between the solution and the artistic performance. To be able to achieve the artistic concept safely, this document intends to clarify the many details that need to be addressed, such as:

— skills knowledge and experience that may be appropriate for those involved;

— the structural capacity and integrity of the venue and other supporting elements;

— documentation and operation requirements;

— steps for safe assembly, use and dismantling of machinery and equipment;

— custom equipment and equipment selection.

Specifically, when selecting machinery and control systems, this document provides guidelines for the selection of equipment labelled under the references described under EN 17206:2020 *Entertainment technology — Machinery for stages and other production areas — Safety requirements and inspections* and equipment without such labels and custom built machinery.

Additionally, this document addresses details of situations that give might rise to danger, such as:

— event industry specific loads (lights, sound, set, video);

— static or moving loads above people;

— supporting structures and load distribution;

— general guidelines on moving or flying performers, rescue procedures and flight path.

Besides the technical requirements, this code of practice describes the process of selecting and using lifting machinery in the event industry and the steps that shall be considered before any lifting operations can take place.

In addition to the flowchart provided, this document includes some references that may be useful relating to:

— the requirements for all actions specified in the flowchart, see Annex A through H;

— examples of possible responsibilities of the technicians involved in the lifting operation, see Annex I.

The process and flow chart describe several preparatory phases and the lifting operation itself. Each action specifies who bears responsibility and, if applicable, the normative references.

The process description is based on a large-scale production for the event industry. Smaller productions with less complex movements can follow the same process and structure combining some of the phases.

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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.

This document is pertinent to all the machinery phases, assembly, commissioning, setting, operation and dismantling employed in the event industry including machinery defined in point j, Article 1.2 of the Machinery Directive (2006/42/EC): "*machinery intended to move performers during artistic performances*".

This document also applies to machinery and 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.

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

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

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 terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
attachment point
fixed or non-fixed structural element or component to which the load is attached

3.2
code of practice
set of written guidelines and recommendations which represent sound good practices as currently undertaken by competent and conscientious practitioners

3.3
communications protocol
system of rules and etiquette enabling orderly communication amongst multiple users of a communications system

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3.4
communications system
reliable means of communication between parties, typically utilizing duplex intercom or two-way radios

Note 1 to entry: Video can supplement audio.

3.5
commission
put into service
process of assuring that the equipment is installed and tested according to the manufacturers' specifications and the users' operational requirements

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, 3.1.1]

3.7
determinate rigging system
load system in which all loads and reactions (applied loads to the suspension points) are known

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.

EXAMPLE Above examples assume adequate support is provided. See Figure 1.

[SOURCE: EN 17206:2020, B.2]

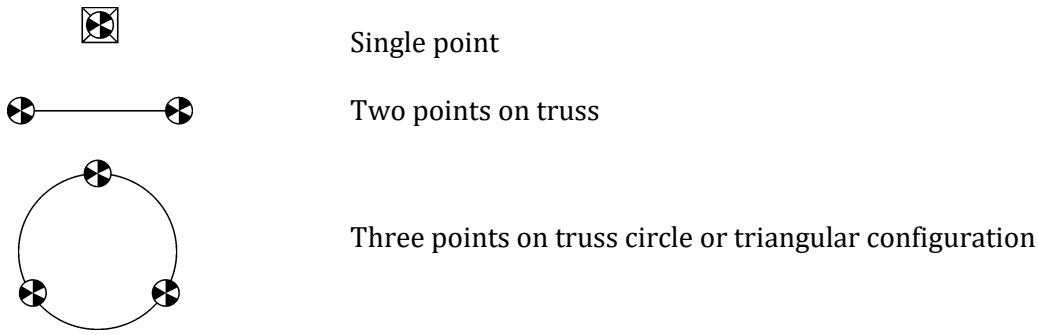

Figure 1 — Determinate load system

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3.8
entertainment load limit
ELL
maximum load that an item of lifting equipment is designed to raise, lower or sustain

Note 1 to entry: For further information see Annex J.

[SOURCE: EN 17206:2020, 3.2.4 – modified, Note added]

3.9
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.

Note 2 to entry: For further information see Annex J.

[SOURCE: EN 17206:2020, 3.2.5 – modified, Note 2 added]

3.10
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.

3.11
flight path
intended or desired path of motion of an object or person

3.12
indeterminate rigging system
load system in which the reactions (applied loads of the suspension points) cannot be fully determined

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;

— 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.

EXAMPLE See Figure 2.

[SOURCE: EN 17206:2020, B.2]

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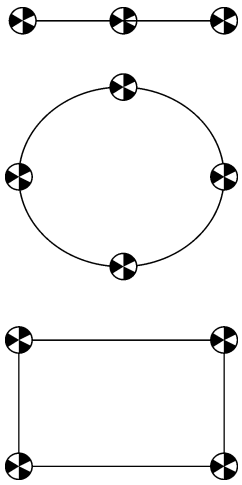

Three or more points on a truss;

Four points on truss circle grid;

Four points on truss grid

Figure 2 — Indeterminate load system

3.13
lift plan
rig plan
set of procedures, schedules, drawings, tables, and documents needed for a safe lifting operation

3.14
lifting system
system
all rigging, lifting and control equipment required to create and control movement of loads

3.15
load
object or objects to be lifted

3.16
motion equipment
lifting equipment intended to move loads (including performers) during rehearsals and shows

3.17
mousing
use of wire or other material to prevent the unintentional opening of a connector or hook

3.18
overhead obstruction
object that blocks the intended flight path of a lift

3.19
performer flying
performer being suspended, lifted or moved

3.20
point load
concentrated load applied at a single location

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3.21
primary suspension
<entertainment technology> suspension point intended to actively carry the applied load

Note 1 to entry: See also 3.28 secondary suspension.

3.22
redundancy
<entertainment technology> use of additional measures that share load to safeguard against a suspension failure

3.23
rigging
activities required to rig, remove, or secure equipment used in tension in staging, production and exhibition facilities for display, events and theatrical productions

3.24
rigging assembly
rigging hardware used in combination to perform a particular function

3.25
rigging point
connection of concentrated loads to a support structure according to the rigging plan

3.26
rigging system
rigging equipment used to support the lifting and motion system from a supporting structure

Note 1 to entry: The rigging system is part of the lifting and motion system.

3.27
risk assessment
formal process used to identify hazards and mitigate risk

3.28
risk management plan
document detailing procedures to ensure the ongoing identification of hazards and mitigation of risk

3.29
secondary suspension
additional rigging used to support the load in case of primary suspension equipment failure

Note 1 to entry: This term has historically also been referred to in the entertainment industry as “safeties”.

3.30
sling angle factor
multipliers that account for increased forces in slings when they are not vertical

3.31
suspension
equipment in the load path that supports the load

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3.32
title block
portion of a drawing that identifies the drawing contents

3.33
trim height
vertical distance from a datum to a specified point on a suspended object

3.34
working load limit
WLL
maximum allowable load to be applied to a lifting component as specified by the manufacturer

Note 1 to entry: For further information see Annex J.

3.35
safe working load
SWL
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 below WLL or the ELL, due to the load applied to the load bearing device, the self-weight of the load carrying devices (e.g. truss), normative or legal requirements, environmental conditions, or any other condition that may require any reduction in favour of greater security.

Note 2 to entry: For further information see Annex J.

3.36
work role
WR
different tasks that workers involved in the event may need to carry out during the event

Note 1 to entry: The list of functions described is only indicative and not exhaustive.

Note 2 to entry: Annex I provides some examples of skills and capabilities associated with certain activities and tasks.

Note 3 to entry: One worker can hold different and simultaneous responsibilities if they have the relevant skills, knowledge and experience to carry out all the functions safely.

4 Introduction of planning

4.1 General

Artistic designs in the event industry often 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 other structure) and environment where the lifting operation will take place;

— the lifting and or motion 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.

The larger and heavier the load, the more complex the movement, the more challenging the environmental conditions and the higher the risk, then more detailed and sophisticated the design and engineering will need to be to meet all the requirements of the artistic vision.

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

This code of practices describes the working process and some of the factors that should be considered before the lifting operation can take place. This document also describes how to act during the lifting operation and how to maintain the lifting equipment for subsequent use.

The process involves various preparatory phases and lifting or motion operations; it describes the actions and its outputs, who bears responsibility for such results and, where applicable, on which normative references they are based.

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

Productions like:

— big rock concerts in arenas;

— large musicals;

— festival stages;

— large scale operas.

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 job descriptions, safety rules, health and safety at work arrangements and a responsibility structure.

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

To ensure a safe event all content and processes are planned in detail to guarantee a safe event (applicable local laws and regulations can provide 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 large production in the event industry.

Depending on the nature of the event, organizational structures may vary, but the process remains the same.

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The project work flow is split up in 4 phases:

— design;

— installation;

— use;

— dismantling and de-rigging.

A detailed description of all steps is given in Clause 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 employed personnel and subcontractors.

In this standard, the initiator has the role of commissioning client in the sense that it is highest in rank regarding responsibility for safety and ensuring a safe work environment. Sometimes the initiator also could have the role of artistic designer or artistic director.

4.2.2.2 Venue owner/ venue management

The management may be the owner of the building/location, a management company or a lessee of the building/location. It is the legal entity that is in charge of the premises.

NOTE Hereafter referred to as venue management.

The venue can be, but is not limited to:

— A permanent building 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 management 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.

4.2.2.4 Technical production entity

The technical production entity can be one person, or a company with various persons carrying out this task together.

Its responsibilities include:

— overlaying all drawings from all departments in one set of coordinated drawings;

— foreseeing and identifying problems and conflicts and escalating them to the client and other stakeholders;

— monitoring the execution of tasks and responsibilities of others;

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— providing plans to authorities where necessary;

— organizing, chairing and making records of meetings;

— formulating agreements between parties;

— budgeting;

— planning from concept (5.1) to evaluation (5.11).

4.2.2.5 Contractors

Contractors are the third parties that carry out tasks as specified by the technical production. Contractors can be providers like lighting and rigging companies, or the self-employed. This work may alternatively be carried out by in-house departments where they exist.

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