

DOI 10.26886/2414-634X.2(54)2022.2

UDC 791.83 / 792 / 7.091

**THE SPECIFICS OF CIRCUS COMPLEX TECHNICAL TRAINING  
WHEN WORKING WITH CIRCUS PROPS AND APPARATUS TODAY**

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*The article analyzes and defines the specifics of circus complex technical training when working with contemporary circus props and apparatus. Safety rules in the circus structure, as well as general technical requirements when working with circus apparatus and special props are being specified. Provides a clear description of technological devices and grids. Also, it is specified of production, technical and auxiliary premises. The conclusions of the study testify to the importance and clarity of knowledge of the specifics of circus complex and technical training for circus performers in specific structures in this area.*

*Keywords: circus, contemporary circus props and apparatus, circus technical equipment, safety equipment in the circus.*

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### **Introduction**

The article contains unique and specific characteristics and definitions for circus special, as well as complex technical training in working with circus apparatus and props in the structure of the relevant profiles and areas.

### **Formulation of the problem**

Determine the components and specifics of working with circus apparatus and props, as well as clarify the safety precautions when interacting with them.

### **Analysis of studies and publications on this issue**

Scientific research on this issue was carried out and scientific and methodological research of the Kyiv Municipal Academy of Circus and Performing Arts, scientific and pedagogical staff of the Department of Circus Genres of the Faculty of Performing Arts – Vladimir Kashevarov, Lyudmila Shevchenko, Dmitry Orel, Yuri Kashuba, Irina Pitsur, Alexandra Gorkovenko, as well as undergraduate students – Yegor Gaevsky, Anastasia Parkhomenko, Vladimir Fedyna, Andrey Maslov, Evgeny Pakhalovich.

### **Purpose of the article and tasks**

The purpose and tasks of the article is to disclose and define the specifics of circus complex technical training when working with circus props and apparatus today

### **Presentation of the main material of the article**

For a better understanding of the specifics of circus complex and technical training in circus and air genres, as well as the safety features

when working with props and circus apparatus, it is necessary to analyze and define specific terms and concepts. Namely.

*Aerial gymnastics* is a circus genre, one of the types of circus gymnastics, which demonstrates the skills of circus artists working on special apparatuses. Many elements of gymnastics have been known since ancient times in various countries of the East, but the basics of modern technique used in aerial gymnastics were formed and consolidated by circus artists during the XX century. Aerial (circus) gymnastics includes tricks performed on apparatuses suspended from the circus ceiling such as trapeze, corde de volant, straps, silks, cord de parille; bamboo [2, p. 17–20].

*Apparatus* (borrowed from Latin language "apparatus" – equipment, gear) is a special mechanical structure which includes a system of electric winches and motors. These structures are suspended under the ceiling or installed on the ring (behind the ring) and are designed to enhance the spectacular effect of the circus performance. This is achieved due to the technical features of the circus apparatus: rotating, lifting, swinging, descending, a combination of several apparatuses used in one circus act. For example, an apparatus for aerial gymnastics consists of bridges, trapeze, trapeze bar (stammbord), catch traps.

*Pulley* is a circus device for moving cables and ropes without bends on rollers, which is attached to the circus ceiling. There are different types of pulleys – a single pulley is used for a manual lounge and also for use of the winch; double and triple pulleys are used to tension the apparatuses and equipment (horizontal bars, catch traps).

*Bamboo* (borrowed from the Malayan language bambu – a kind of a tropical plant) is a variety and apparatus of aerial gymnastics, a metal pole, 3-4 meters long, suspended vertically, on which the tricks are performed by two gymnasts.

*Rope* – an object in the circus, made of several wires into a single unit used for the suspension of circus apparatus and equipment in circus acts (aerial gymnastics). Ropes can be steel, made of organic materials e.g. cotton and inorganic ones synthetics.

*Chinese pole* is a vertical pole on which circus gymnasts climb and hold poses. It reminds pretty much of a pole designed for pole dance. The difference between the Chinese suspended pole and a regular pole is that the Chinese pole is covered with the special material (rubber) that prevents slipping. Aerial rings – a kind and an apparatus of aerial gymnastics. Another name for this apparatus is Roman rings. Aerial rings have a lot in common with rings for gymnastics. Today it is very difficult to meet this genre in circus performances. This is partly due to the emergence of such apparatuses and subgenres as aerial straps.

*Rules for rigging apparatuses.* There are two options for rigging apparatuses: *static* (attachment to the grids), or *a specially installed winch*, the cable is passed through the pulleys to the winch to change the height. Lifting is done manually; to lift one person at least 3 people are required – 1 assistant, 2 ring attendants). A hoisting tackle is used to facilitate manual lifting (polyspast).

*Corddeparille* (borrowed from the French language Cord-de-parille, "corde perilleuse" – a dangerous, risky rope) – a kind and an apparatus of aerial gymnastics. An aerial gymnastics apparatus is a tightly stretched vertical rope on which the artist performs tricks similar to the tricks on perches or bamboo ("flag", blanche, somersault)[10].

The upper end is attached to the ceiling; the lower end is pulled by an assistant; the top of it is provided with loops. The trick, which is shown on the cord deparille, is performed by one or two circus artists.

*Grids (rafters)* – the upper part of the circus, located above the ring, the place of rigging of circus apparatuses, longe. *Winch* – a device for lifting a circus performer (air gymnast, acrobat); used for lifting loads, equipment.

*Longe* (borrowed from the French language longe – rope,) in the circus this device ensures safety of circus artists during the performance of dangerous tricks; a rope attached to the belt of a gymnast or an acrobat when performing particularly complex and dangerous acts to prevent falls. An acrobat or a gymnast fastens a belt at their waist, two spotters help him taking the ropes in their hands. Performers use a longe with a pulley that has several rotating rollers. Vault acrobats, trapeze aerial gymnasts, cord de frills, cord-de-parille, and matte ladder balancers often use a "local longe" – a thin rope that connects the artist's belt to the apparatus.

*Ring (manege/arena)* – (in French language "manege" – a place for training horseback riding) – a round platform in the center of the circus, which is 13 meters in diameter, where the circus shows take place.

*Swivel* – a device used to prevent twisting of the cable, used for a variety of aerial gymnastics. *Rigging* – in the circus it means rigging circus apparatuses under the grids of the circus ring, as well as the theater stage. *Suspended ropes* – steel ropes or synthetic slings. *Ring space (arena space)* – the part of the circus under the ring, used for the genre of illusion and magic tricks.

***Auditorium and stage.*** The first row of seats for spectators should be located no closer than 1.2 m to the ring barrier. The floor of the auditorium (including the stage) must be smooth, without potholes, thresholds and cracks. Installation of ramps is allowed. The part of the floor around the ring (see Glossary "Ring"), from the barrier to the first row of spectator seats should be wooden.

The floor of the ring entrance is made of boards laid across the entrance. The floor of the main and side entrances can be covered with

concrete with a rough or corrugated surface. The orchestra box must have two exits and a balustrade on the side of the hall and be at least 60 cm high. The floor of the orchestra box to the sound canopy must be at least 2 m high. A lobby for musicians and a room for storing notes and instruments should be located next to the orchestra box.

The stage, located in front of the orchestra box, should have convenient access to the backstage and two exits towards the ring. A special *pull-out ladder* is sometimes installed to get the circus artists out of this platform to the ring. Slope of this ladder of more than 45° is not allowed. It is forbidden to install safety net fences at the edge of the lighting balconies of the galleries, as well as under the lighting equipment located above the auditorium or ring and under the spotlight rings at the grids [5, p. 139].

***Technological devices and grids.*** Technological devices for mounting circus apparatuses must be reliable and easy to operate. Their strength is justified by technical calculations. Inscriptions about the maximum allowable workloads are posted in the places of fastening. The number, type, location and regulatory loads of technological devices for mounting circus apparatuses in a stationary circus must comply with the layout and drawings of parts of these devices and special standards in a stationary circus.

The applied forces to technological devices should not exceed the maximum admissible sizes specified in the scheme of an arrangement of technological devices and marked in places of fastenings. It is necessary to close the floor hatches tightly with wooden lids. It is not permissible for the lids and handles to protrude above the floor and for the extensions of the devices to touch the sides of the hatch (Glossary "Ring space").

It is necessary to provide devices for fixing winches in the ring entrance and on the stage. Fastening and rigging devices installed in the

lower and top tiers should not obstruct the aisles. They are installed above 1.8 m from the floor level or placed at one level with the side walls of the aisles. It is necessary to have reliable devices for temporarily tying animals in the arena entrance. In stationary circuses, such devices are installed in the main aisle[7, p. 138–143].

Circuses must be equipped with grids. In newly built circuses, the grids are made with a diameter of 13–14 m and a height of 18 m from the level of the ring. The passage to the grid must be insulated, at least 1.2 m wide. The passage from the grid to the circus ceiling must be at least 1.9 m tall. Metal vertical stairs are attached at a distance of 150 mm from the wall. If the height of such stairs is higher than 2.5 m, a protective net is placed. The gap in the light between the bars of the grid should be 70 mm. It is necessary to secure each bar to the load-bearing structure. When checking the grid, the standard evenly distributed load is assumed to be equal to 100 kg / m<sup>2</sup> with an overload factor of 1.3.

The standard load on the grid should equal to 3 tons, and the total load is taken according to the executive drawings of the project and test reports. Grid elements are fastened so as to avoid residual deformations. Deflection of decking elements are allowed no more than 1/200 of the calculated span. Weakening of a grid and bearing structures (gouging, drilling or cutting of separate elements) is not allowed. Grid hatches must be closed with hinged lids. Two or three concentrically arranged rings of pipes with a diameter of at least 150 mm, or other metal structure used for rigging and mounting of circus apparatus are arranged at a height of 30-50 cm from the grid are. Internal stairs leading to the grids or rafters, in addition to handrails, must have fences made of metal net. It is necessary to have a reliable ladder or a ladder with double-sided fences 0.8 m high, with racks every 1.2 m to access the roof.

***Production, technical and auxiliary premises.*** *Rehearsal halls* (small arena) must be at least 6 meters tall. The hall must be equipped with wall bars and devices for rigging and mounting of circus equipment. A warm-up spot should be at least 4.5 meterstalland close to the ring entrance. The rehearsal hall and the warm-up spot should be equipped with rings, trapeze, cord-parel and safety devices (mats, rugs).

The ringmaster's office should be located near the ring entrance. Artists' wardrobes should be at least 3.25 m<sup>2</sup> per person and provided with make-up tables, hangers, chairs, table lamps, trashcans, decanters for water. The medical center should consist of two rooms with a total area of at least 24 m<sup>2</sup>. It should be located at the level of the ring and have a convenient passage to the ambulance for the evacuation of patients. The location and size of the doors should be suitable for transportation of patients on a stretcher. There should be a list telephone numbers of the nearest ambulance and emergency services at the medical center. There should be a special, isolated room for the sound director.

Warehouses must be at least 3 meters high. Doorways should be no less than 1.5 m wide and 2.5 m high. If the outer or inner door is located above or below the floor level, a ramp is made along the width of the slot (plus 30 cm to the side). Thresholds in doorways are not allowed. Lifting device (cantilever, stationary, rotary cranes) for loading and unloading boxes with circus devices and artistic props, cages with animals should be located in the circus backyard.

Foodcourts should be located in isolated rooms equipped with refrigerators, provided with hot and cold water supply. Showers should be located on the same floor withtoilets and should be at least 1.8 by 0.9 m<sup>2</sup>. The cabins are divided from each other by partitions made of moisture-resistant materials 1.6 m tall. Restrooms should be arranged on each floor in stationary circuses. The cabins should be separated from each other by

partitions at least 1.8 m high that do not reach the floor by 0.2 m. The restrooms should be equipped with ozonators, sanitizers and clothes hangers. *Restrooms* should be equipped with washbasins, towel holders, soap dispensers and hand dryers.

**Circus apparatuses. Devices.** Circus apparatuses, with lifting capacity, equipment and rigging equipment must meet the standards of technical design and the requirements of state standards. They must be reliable, durable, stable, easy to use and accessible for inspection and repair.

It is allowed to use parts of circus apparatuses made by free forging or hot stamping with the subsequent normalization, and also the details made by milling from the whole piece of metal. It is forbidden to use bent or cast fasteners or rigging parts. Metal parts must have a clean and smooth surface. Torn or worn threads, nuts and other defects are not allowed. The outer and inner surfaces of the pipes must be smooth and even. The curvature of straight pipes may not exceed 1.5 mm per 1 m of the pipe. There must be certificates for the supporting pipes. Reliable locking measures are taken to avoid self-unscrewing threaded connections operating in the conditions of shocks, vibrations or shakes.

Circus apparatuses and hardware should not have sharp protruding angles, corners and burrs. Sharp edges (boards) of apparatuses and separate details should be rounded or have facets, except for technically justified cases. Hand-operated winches designed for lifting people are provided with safe handles that allow lifting and lowering only during continuous rotation. Lowering speed above 20 m / min is prohibited. Winch handles must be mounted on the drive shaft. The force applied to the handle must not exceed 15 kg[5, p. 134–141].

Horizontal bars of the traditional type must meet special requirements. The height from the ring to the upper edge of the crossbar is set in the

range from 245 to 255 cm, the rod between the centers of the hinges must be 240 cm long. Crossbeams of horizontal bars and trapezes are made with a diameter of 25–30 mm from heat-treated steel or alloy steel without heat treatment or steel with high quality, hardness, not less than 140 kgf / mm<sup>2</sup> and an elongation of at least 5%.

Rigging systems can be made of steel ropes and chains. Traditional folding trampolines must meet special requirements. Net must be at least 1.2 m wide. Trampoline frames must have soft trim around the perimeter. The central part of the net must be visible to the circus artists and it should be made of cords of brighter color. The net should be stretched evenly on all sides[9].

In apparatuses that have tubular structure (bamboo, perch), it is necessary to weave a safety steel rope where it is possible. Parts of these apparatuses that support the legs or arms of artists should be wrapped with ribbon or tape. When installing rigging racks, it is necessary to take into account special requirements to the apparatuses.

The mutual movement of parts in telescopic joints should not have unnecessary backlash. At considerable dimensions it is necessary to make apparatuses disassemblable and foldable. Ropes for lifting and taking down, as well as cor de parel are made of cotton or synthetic ropes with a diameter of 25–28 mm. Swivel must be strong, reliable, easy to manufacture and accessible for inspection. They must provide free and silent rotation around the axis. Rope ladders for climbing on circus apparatuses must be made of cotton or sisal rope with a circumference of at least 60 mm, balusters must be made of oak, maple or ash[4, p. 124–132].

***Chains, ropes, rigging devices.*** Chains used in circus apparatuses and safety devices must meet certain requirements. The chains are allowed

to be connected only by using electric welding of new links or by means of special connecting links.

Steel ropes must meet certain requirements as well. For lifting and taking down people six-or eight-row untwisting ropes of cargo and human purpose, twice twisted with an organic core, are used for lifting and taking down circus performers. For transportation of cargoes, devices of mast cables and stationary extensions it is allowed to apply non-untwisting ropes of cargo purpose, double or single perm with an organic core.

*Organic ropes*, in addition to second-rate and resin ones, can be used as slings, braces and bangs. Organic steel ropes used in circus equipment and apparatuses, as well as in hoisting mechanisms must be tested before their use. The following table can be used to select the diameter of the steel rope.

Due to the possibility of stretching the ropes to the measures given in the table, the ropes must be pre-stretched[2, p. 38–39].

Statistical reinforcement of steel ropes – 30% of the breaking force of the rope as a whole, and being under load should not exceed 5 hours. Cotton ropes (for example, for cord-de-parille) are stretched under load for 12 hours.

It is possible to cut steel ropes with a gas burner, a thin scissor wheel or a circular saw. To prevent loosening and untwisting of the cross-sections of the ends of the ropes, stamps must be applied to them. The mark on steel ropes is made by an overlay of 12–15 hoses from cords of a soft steel wire. Depending on the dimensions of the organic ropes, stamps made of thin cords or cord thread of 2.5 cm length are applied to them.

The final fastenings of steel ropes can be performed in the following way:

- the formation of a loop on the clamps;
- pressing in a cast or forged sleeve;

- installation of wedge locks.

The strength of any of these joints will be below the nominal breaking force of the rope by 15–25%. The use of thimbles when setting fire is mandatory. When arranging a loop of steel rope around pipes or rods with a diameter of more than four diameters of the rope, thimbles can be placed[3, p. 120–123].

The diameter of the axis for attaching the loop of the rope at the point of its connection to the equipment or apparatuses must be no less than 0.8 of the inner diameter of the thimble. Choosing and testing of thimbles is given in the appendix. Ropes are used as cargo, cable, load-bearing (for rigging of apparatuses, longes). It is forbidden to spit (splice) ropes into the hoisting tackle.

The only exception make universal slings. When producing and connecting the ropes of the same cross-section, a short braiding is made, the length of which must be at least 40 diameters of the rope. Splices and loops should be braided (steel ropes with soft benzene wire, organic with ropes) to give them more strength, comfort and use, to prevent abrasion and the harmful effects of moisture. When making a loop made of hemp or cotton ropes, the braid should have at least two full and two half punches, and then edged. The connection of steel ropes with organic ones can be done only "loop to loop". If the connection of the ropes passes through the blocks, a splice is formed. Three or more ropes can be connected in one using *spider-shaped beams*[1, p. 56–59].

For lifting heavy loads (rigging and dismantling of support masts, loading and unloading of containers, cages with animals, boxes with heavy apparatuses) chain slings, universal or light slings made of steel ropes, inventory mounting slings are used. The management of the circus is obliged to provide the slingers with both tested and marked slings of proper carrying capacity.

*Slings* are assigned with individual numbers and recorded in the journal of technical inspection. Metal tags are firmly attached to the slings, indicating the number, load capacity and test date. Angles of inclination of sling branches within  $45^{\circ}$ – $60^{\circ}$  are allowed only in exceptional situations, and inclination over  $60^{\circ}$  is forbidden.

### **Conclusions.**

Thus, summing up all of the above, it is important for the smooth functioning of the circus structure that a serious approach to conducting circus complex technical training is important. A clear study of circus artists on safety when working with props and apparatus. The administration of the structure without fail must monitor the conduct and familiarization of performers with complex technical training in the circus.

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Citation: Denys Sharykov, Inessa Lvova (2022). THE SPECIFICS OF CIRCUS COMPLEX TECHNICAL TRAINING WHEN WORKING WITH CIRCUS PROPS AND APPARATUS TODAY. New York. TK Meganom LLC. *Innovative Solutions in Modern Science*. 2(54). doi: 10.26886/2414-634X.2(54)2022.2

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