



DRAFT

BSR E1.47 – 202X
Entertainment Technology—Recommended Guidelines for Entertainment
Rigging System Inspections

Approved by the ANSI Board of Standards Review on _____

Rig/2014-2003r9b

©202x Entertainment Services and Technology Association (ESTA)
All rights reserved.

NOTICE and DISCLAIMER

This document is the intellectual property of ESTA and is protected by copyright law. No parts hereof may be distributed in any manner without the explicit permission of ESTA.

ESTA does not approve, inspect, or certify any installations, procedures, equipment or materials for compliance with codes, recommended practices or standards. Compliance with an ESTA standard or recommended practice is the sole and exclusive responsibility of the manufacturer or provider and is entirely within their control and discretion. Any markings, identification or other claims of compliance do not constitute certification or approval of any type or nature whatsoever by ESTA.

ESTA neither guaranties nor warrants the accuracy or completeness of any information published herein and disclaim liability for any personal injury, property or other damage or injury of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document.

In issuing and distributing this document, ESTA does not either (a) undertake to render professional or other services for or on behalf of any person or entity, or (b) undertake any duty to any person or entity with respect to this document or its contents. Anyone using this document should rely on their own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstance.

Published by:

Entertainment Services and Technology Association (ESTA)

271 Cadman Plaza PO Box 23200

Brooklyn, NY 11202-3200

USA

Phone: +1-212-244-1505

[Email: standards@esta.org](mailto:standards@esta.org)

ESTA's Technical Standards Program

ESTA's Technical Standards Program was created to serve the ESTA membership and the entertainment industry in technical standards-related matters. The goal of the program is to take a leading role regarding technology and safety within the entertainment industry by creating recommended practices and standards, monitoring standards issues around the world on behalf of our members, and improving communications and safety within the industry. In its technical standards development activities, ESTA works closely with other industry organizations, including ESA, CITT, USITT and VPLT, in addition to representing the interests of ESTA members to ANSI, UL, ASCE, ICC, and NFPA. ESTA is an ANSI Accredited Standards Developer.

The Technical Standards Council (TSC) established by ESTA's Board of Directors to oversee and coordinate the Technical Standards Program. Made up of individuals experienced in standards development work from throughout our industry, the Committee approves all projects undertaken and assigns them to the appropriate working group. The Technical Standards Council employs a Technical Standards Manager to coordinate the work of the Committee and its working groups as well as maintaining a "Standards Watch" on behalf of members. Working groups include: Control Protocols, Electrical Power, Event Safety, Floors, Fog and Smoke, Followspot Positions, Mental Health & Well-being Management, Photometrics, Rigging, Stage Machinery, and Prop Weapons Safety.

ESTA encourages active participation in the Technical Standards Program. There are several ways to become involved. The easiest way to actively participate is to respond to any of the public reviews advertised on ESTA's [public review web page](#). The next level of participation requires completion of an application to become a working group member; applications are available from the TSP's [procedural documents web page](#). Application as an Observer with non-voting status affords access to updates on standards development documents. Application as a voting participant affords full access to a consensus voice that helps shape the industry. Voting status carries responsibilities of responding to letter ballots and attending meetings, but membership in ESTA or any other organization is not a requirement for participation in the TSP. One can also become involved by requesting that the TSC develop a standard or a recommended practice in an area of concern to them.

The Rigging Working Group, which authored this Standard, consists of a cross section of entertainment industry professionals representing a diversity of interests. ESTA is committed to developing consensus-based standards and recommended practices in an open setting.

Investors in Innovation

The Technical Standard Program (TSP) is financially supported by ESTA and by companies and individuals who make donations to the TSP. Contributing companies and individuals who have helped fund the TSP are recognized as “Investors in Innovation”. The Investors in Innovation when this standard was approved by ANSI's Board of Standards Review are gratefully acknowledged as follows:

[Insert the current Investors table here]

Memorial donor: The Estate of Ken Vannice

All donations to the Technical Standards Program benefit the entire program, and are not directed to any specific use or project within the program. Please help support the Technical Standards Program by becoming an Investor in Innovation. Visit our website at <http://tsp.esta.org/invest>, or contact the ESTA office at 1-212-244-1505 and select "TSP" from the menu.

Contact Information**Technical Standards Manager**

Richard J. Nix
ESTA
271 Cadman Plaza PO Box 23200
New York, NY 11202-3200
USA
+1-212-244-1505
richard.nix@esta.org

Technical Standards Council Co-chairpersons

Alan Rowe
I.A.T.S.E Local 728
+1-310-702-2909
amrowe@iatse728.org

Dan Culhane
Wenger Corp
+1-612-868-4769
culhane.dan@gmail.com

Rigging Working Group Co-chairpersons

Bill Sapsis
Sapsis Rigging
+1-215-228-0888 x206
bill@sapsis-rigging.com

Christine Kaiser
Syracuse Scenery & Stage Lighting Co., Inc
+1-315-453-8096
ckaiser@syracusescenery.com

Acknowledgments

The Rigging Working Group members, when this document was approved by the working group on , are gratefully acknowledged below.

Voting members:**Observer (non-voting) members:****Interest category codes:**

CP = custom-market producer DE = designer
DR = dealer rental company G = general interest
MP = mass-market producer U = user

Table of contents

NOTICE and DISCLAIMER.....	i
Investors in Innovation.....	iii
Contact Information.....	iv
Acknowledgments.....	v
Table of contents.....	vi
1 Introduction.....	1
1.1 Scope of this document.....	1
1.2 General.....	1
1.3 Exclusions.....	1
3 Definitions.....	1
4 Reference information.....	2
5 Qualifications of the inspector.....	2
6 Frequency and scope of inspections.....	2
6.1 General.....	2
6.2 Frequency of inspections.....	3
6.3 Scope of inspections.....	3
6.3.1 Level one inspection.....	4
6.3.2 Level two inspection.....	5
6.4 Inspection service variations.....	6
7 Arrangements prior to the inspection.....	6
7.1 General arrangements.....	6
7.2 Considerations for level two access.....	7
8 Site conditions during inspection.....	7
9 Rigging inspection report.....	7

1 Introduction

Entertainment rigging systems are systems used to move, lift or support scenery, luminaires, and other equipment in entertainment venues, such as theatres, video/film studios, amphitheatres, and arenas used for live performances or special events.

Routine inspections of entertainment rigging systems are required in order to provide a safe working environment and to comply with ANSI rigging standards. This document offers guidance to inform owners, users, and inspectors about the process of inspecting entertainment rigging systems. ESTA has written this recommended practice to promote proper inspection of entertainment rigging systems, to enhance safety of system users and audiences, to enhance the longevity and performance of systems and identification of potential equipment problems, to assist in regulatory compliance, and to reduce liability associated with the operation of entertainment rigging systems.

The purpose of an entertainment rigging inspection is to provide information about the condition of the systems and components at the time of the inspection. Nothing should be inferred regarding the future performance of the system as a result of this inspection.

1.1 Scope of this document

This document covers the inspection of entertainment rigging systems. The purpose of an entertainment rigging inspection is to observe, evaluate, and report the condition of the rigging system at the time of the inspection. Additional information and recommendations may be provided.

Rigging systems may be statically suspended (stationary) (dead hung) equipment, manually operated counterweight sets, manually operated hoist sets, rope and sandbag (hemp) sets, electric hoist sets (including winding drum hoists, packaged hoists, powered counterweight sets), and all other dedicated entertainment rigging systems not specifically excluded. Rigging systems frequently include combinations and variations of rigging types.

1.2 General

These guidelines include recommended inspector qualifications and responsibilities, scope and frequency of inspections, content of the rigging inspection report, and related information concerning the inspection process.

1.3 Exclusions

These guidelines do not pertain to the process of inspecting:

1.3.1 Performer flying rigging systems.

1.3.2 The building structure.

1.3.3 The building electrical infrastructure.

2.2.4 Components of a chain hoist called out in the ANSI E1.6 series.

2.2.5 Fall arrest systems.

3 Definitions

Definitions contained in this section apply to this guideline. Where terms are not defined in this section, they should be defined using their ordinarily accepted dictionary meanings within the specific context of their use.

3.1 Inspector: The person engaging in the examination and assessment of entertainment rigging systems.

3.2 Lifting media: The load carrying element attached to the counterweight carriage (arbor) or that is driven by the hoist to move the load (e.g. wire rope, roller chain, fiber rope).

3.3 Limits of use: The parameters under which the system is designed to operate (e.g. working load limit, speed of movement, duty cycle, environmental conditions, user skill level, availability of maintenance).

3.4 Owner: The legal entity which exercises control over management and record-keeping functions relating to a building and/or facility in which activities covered by this document take place.

3.5 Qualified person: A person who, by possession of a recognized degree or certificate of professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

3.6 User: Any person who operates the installed rigging equipment.

3.7 Working load limit: The maximum load the user may apply under normal operating conditions.

4 Reference information

The following are codes, regulations and standards typically used in the entertainment industry. This listing is provided as a basis of knowledge for the inspector and as background information for owners and users. Rigging inspections should be performed referencing the current edition at the time of the inspection, and the edition referenced should be noted in the inspection report.

Occupational Safety and Health Act of 1970 Section 5 – Duties

American National Standard E1.2 Entertainment Technology - Design, Manufacture and Use of Aluminum Trusses and Towers

American National Standard E1.4 suite of standards

American National Standard E1.6 suite of standards

American National Standard E1.22 Entertainment Technology - Fire Safety Curtain Systems

NFPA 80: Standard for Fire Doors and Other Opening Protectives

5 Qualifications of the inspector

5.1 The inspector should be capable of completing the work in a safe manner.

5.2 The inspector should have a minimum of 5 years or 10,000 hours of experience including a combination of entertainment rigging systems design, engineering, inspection, installation, maintenance, service, repair, modification, and functional testing.

5.2.1 This experience should provide a working knowledge in mechanical, structural, and electrical systems, and components of entertainment rigging systems.

5.2.2 This experience should provide familiarity with prevailing regulations and standards related to entertainment rigging systems.

5.2.3 This experience should provide a working knowledge of how to identify deficiencies in the specific type of rigging system to be inspected.

5.2.4 This experience should include manufacturer training, if available, in the specific rigging system to be inspected. If the manufacturer offers certification, the inspector should have received manufacturer certification for the specific system.

5.2.5 This experience should include third-party certification in the applicable discipline.

5.2.6 Experience only in system operation would typically not provide the suitable knowledge necessary to inspect entertainment rigging systems.

6 Frequency and scope of inspections

6.1 General

The frequency and scope of inspections should be as determined by the applicable standards, regulations and manufacturer's recommendations.

6.2 Frequency of inspections

Unless applicable standards, regulations, or manufacturer’s recommendations require more frequent inspections, the following FREQUENCY OF INSPECTIONS chart provides types and frequency of inspection for various types of equipment. Category levels are defined in the section following the chart.

FREQUENCY OF INSPECTIONS CHART

Equipment Type	Level One Inspection Frequency	Level Two Inspection Frequency
Manually Operated Equipment	Annually	Immediately after equipment or components have been newly installed, altered, or repaired.
		No less than every 5 years or as determined by a qualified person.
		When the last date of inspection is unknown.
Fire Safety Curtain (manually operated)	Annually	Immediately after equipment or components have been newly installed, altered, or repaired.
		No less than every 5 years or as determined by a qualified person.
		When the last date of inspection is unknown.
Motorized Equipment (including motorized Fire Safety Curtain)	Not Applicable	Immediately after equipment or components have been newly installed, altered, or repaired.
		Annually.
		When the last date of inspection is unknown.
Statically Suspended Rigging Equipment	Not Applicable	Immediately after equipment or components have been newly installed, altered, or repaired, and one year after installation.
		No less frequently than every 5 years, or more frequently as determined by a qualified person.
		When the last date of inspection is unknown.

6.3 Scope of inspections Rig/2014-2003r9b

6.3.1 Level one inspection

Level one inspection is performed from accessible positions (rigging galleries, catwalks, facility ladders and gridirons) or the stage floor where no accessible positions exist. Unless otherwise noted below, all accessible components of all sets, including lifting or suspension media, are to be inspected.

6.3.1.1 General level one items

The following items apply to all level one inspections:

6.3.1.1.1 Verify the operations manuals are available and accessible to system users.

6.3.1.1.2 Verify the operational and warning signage is in place.

6.3.1.1.3 Inspect components for proper installation, damage, loose or missing hardware visible from accessible positions.

6.3.1.1.4 Visually inspect welds for cracks and other visible defects.

6.3.1.1.5 Verify shackles, turnbuckles, and other rigging hardware are of the appropriate material and grade and are secured to resist loosening.

6.3.1.1.6 Verify the working load limits of the rigging systems are known and visible to the operators.

6.3.1.1.7 Verify documentation exists for identification of trained users and training dates.

6.3.1.1.8 Verify a maintenance log is in use and up to date.

6.3.1.2 Additional requirements for inspection of manually operated equipment:

6.3.1.2.1 For manual counterweight systems, verify each line set is in balance within 50 pounds.

6.3.1.2.2 For systems incorporating counterweight carriages/arbors, verify the counterweights required to counterbalance the pipe weight/base weight (permanent load) are clearly identified.

6.3.1.2.3 For systems incorporating counterweight carriages/arbors, verify arbor rod spreader plates and locking collars are used properly, spreader plates are properly located in weight stack, and spreader plate location labels/markings are present.

6.3.1.2.4 For systems incorporating rope locks, verify rope locks are functional and properly adjusted and rope lock components are not excessively worn.

6.3.1.2.5 Verify operating lines are appropriate material, properly terminated, and in proper operating condition.

6.3.1.2.6 For systems incorporating floor blocks, verify floor blocks are properly adjusted and attached.

6.3.1.2.7 Verify spare counterweight is appropriately located and stored and does not constitute a hazard.

6.3.1.2.8 Inspect condition and attachment of any locking rails, pin rails, and arbor stops for signs of damage.

6.3.1.3 Additional items for inspection of fire safety curtain system

6.3.1.3.1 When applicable, perform all types and methods of manual and emergency release operations.

6.3.1.3.2 Verify the rate of curtain descent is within the time allowed by applicable regulations or standards.

6.3.1.3.3 Inspect fire safety curtain rigging per 7.2.1 and 7.2.2

6.3.1.3.4 Inspect condition of the deceleration device for leaking fluid or other signs of wear or damage.

6.3.1.3.5 Inspect all components of the manual and automatic release lines and related hardware for wear or damage.

6.3.1.3.6 Verify signage, tags, and training certificates are present and properly located.

6.3.1.4 Additional items for inspection of flexible lifting media

6.3.1.4.1 Inspect samples of lifting media termination hardware, no less than 20% per set, for the correct type and installation.

6.3.1.4.2 Inspect the lifting media at all terminations for excessive wear and damage.

6.3.1.4.3 Verify all blocks are securely attached to the structure, facing the correct directions, and seated against the structure.

6.3.1.4.4 Verify sheave material does not show signs of excessive wear, cracks, or chips.

6.3.1.4.5 Verify all equipment operates smoothly throughout the available range of travel and without unusual friction, noise, or motions.

6.3.1.4.6 Verify fleet angles are within acceptable tolerances and lifting media does not make unintended contact with any objects.

6.3.1.4.7 Verify equipment guards, if required, are in place and in good condition.

6.3.2 Level two inspection

Level two inspection is performed by gaining access, typically using ladders, scaffolding, or personnel lifts, to all rigging components. All components of all sets, including lifting media, are to be inspected.

6.3.2.1 General

Level two inspection includes all Items listed under section 6.3.1 level one inspection including those requiring use of temporary equipment to gain access.

6.3.2.2 Additional items for level two inspection of motorized systems

6.3.2.2.1 Verify the direction of movement is correctly labeled on the controls.

6.3.2.2.2 Test the emergency stop(s). Verify emergency stop(s) function as designed.

6.3.2.2.3 Visually inspect the condition of controller cables, strain reliefs and junction boxes adjacent to rigging equipment.

6.3.2.2.4 Verify all indicator displays are functional.

6.3.2.2.5 Verify all user accessible fuses are the correct size and type for the applications and for the machines.

6.3.2.2.6 Verify indicators show the correct position of the load.

6.3.2.2.7 Verify brake(s) stop the machinery when the operator control device is released.

6.3.2.2.8 Verify all limit devices are functional and set properly.

6.3.2.2.9 Verify moving elements are lubricated in compliance with the manufacturer's limits of use or as determined by a qualified person. Covers and guards, designed to be removed, should be removed to inspect the state of lubrication. The condition and suitability of lubricants should be determined, based on the manufacturer's recommendations.

6.3.2.2.10 At the completion of the inspection reset any inspection reminder indicators according to the manufacturer's recommendations.

6.4 Inspection service variations

Concurrent with the inspection, inspectors may provide any additional services for which they are qualified. Additional services to be performed, or systems to be inspected, should be added to the inspector's documented scope of work. Examples of additional services include preventative maintenance, inspection of tracks, curtains, and other equipment, and adjustment of limit devices.

7 Arrangements prior to the inspection

7.1 General arrangements

7.1.1 The process of an inspection should include acceptance of written documentation specifying the scope of the inspection. It is important the parties involved in the inspection are aware of and agree to the extent of the work to be performed. This is important from the time the inspection is arranged to the time the final report is issued.

7.1.2 The person to receive the rigging inspection report, and the designated person to receive notification of any imminent hazard(s) identified during the inspection should be determined.

7.1.3 The inspector should request and obtain any available documentation relating to the installed rigging systems for review before the time of on-site inspection. Documentation that could assist the inspector includes but is not limited to:

7.1.3.1 As-built drawings.

7.1.3.2 Operation manuals.

7.1.3.3 Technical information provided to potential users of the venue.

7.1.3.4 Known modifications to the installed systems.

7.1.3.5 Reports of any known issues or incidents.

7.1.3.6 Maintenance logs.

7.1.3.7 Previous rigging inspection reports.

7.1.3.8 Records of user training.

7.1.3.9 List of authorized system users.

7.1.4 A schedule including specific inspection date(s) and times should be arranged.

7.1.5 No performances, rehearsals, sound checks, load-ins, load-outs, classes, or similar activities, should be scheduled in the venue during the rigging inspection.

7.1.6 Arrangements should be made for access to equipment and work areas (e.g. backstage support spaces, electrical rooms, ladders, staircases, catwalks, galleries, gridirons, arbor pits, etc).

7.1.7 Arrangements should be made for turning on lights and any mechanical systems required to allow the inspector to work in the space(s) to be inspected.

7.1.8 Arrangements should be made to ensure the noise level is suitable for performing the inspection.

7.1.9 Arrangements should be made for unlocking or providing required keys for rigging system operation (e.g motorized system control panels, rope lock padlocks).

7.1.10 Arrangements should be made for the work areas to be clear of items of scenery, furnishings, and equipment that could impede proper execution of the inspection.

7.2 Considerations for level two access

7.2.1 For equipment that cannot be inspected from safely accessible positions as is required for a level two inspection, arrangements should be made or coordinated to provide required access. The access equipment may include but is not limited to mobile elevating work platforms (MEWPs), or scaffolding.

7.2.2 Arrangements for access equipment should ensure floor surfaces have the structural capacity to support the loads of the equipment.

7.2.3 Establish plans for fall protection, safety and rescue, if required.

8 Site conditions during inspection

8.1 Any deficiency observed during the inspection determined by the inspector to be an immediate hazard to persons should be tagged or “locked-out” by the owner/designated person to prevent use of the equipment or system associated with the deficiency. The inspector should immediately inform the owner/designated person of the deficiency and instruct the person that the equipment associated with the deficiency should not be operated.

8.2 Any condition observed during the inspection that alters the original scope of the inspection should be noted by the inspector in the rigging inspection report.

9 Rigging inspection report

9.1 Following the inspection a rigging inspection report should be issued in a format that is agreed upon with the owner or owner’s representative.

9.2 At a minimum the rigging inspection report should include the following: name of the venue inspected, date(s) of the inspection, name of the inspector or inspectors, name of the affiliated company or firm providing inspection services if applicable, and the scope of work of the inspection performed. Any exclusions identified prior to the inspection, or discovered during the on-site inspection, should be noted specifically.

9.3 The rigging inspection report could also include: description of the systems inspected, age of the venue, system installation dates, manufacturer(s) of major system components, identification of the installing company, major or minor renovations to the systems, and modifications to the installed systems.

9.4 At a minimum the rigging inspection report should identify the standards and other guidelines used by the inspector as the basis for evaluation of the installed rigging systems. These may include relevant American National Standards, NFPA standards, OSHA laws, manufacturers’ recommended practices, operation and maintenance manuals, prevailing building codes, standard industry practices, and common sense.

9.6 The nature and location of observed deficiencies should be included in the report.

9.7 The report might include recommendations for one-time or routine testing of components or systems.

9.8 The report should include suggested timing for future inspections and might include recommendations for more in-depth inspection(s).

9.9 Other supplementary information and documentation that could be included in the report includes:

9.9.1 Generic or specific system illustration(s).

9.9.2 Glossary of terms used to describe the system(s) and operation.

9.9.3 Digital media for clarification.

9.9.4 Sample maintenance log.

9.9.5 Educational resources such as books, trusted websites, and training programs.