E1.42 – 2018
Entertainment Technology—Design, Installation, and Use of Orchestra Pit Lifts

Approved by the ANSI Board of Standards Review on 06 November 2018

SL/2013-10010r44

© 2018 The Entertainment Services and Technology Association (ESTA)
Notice and Disclaimer

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)
630 Ninth Ave., Suite 609
New York, NY 10036
USA
Phone: +1-212-244-1505
Fax: +1-212-244-1502
Email: standards@esta.org
The ESTA 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 within the entertainment industry by creating recommended practices and standards, monitoring standards issues around the world on benefit of our members, and improving communications and safety within the industry. ESTA works closely with the technical standards efforts of other organizations within our industry including USITT and VPLT as well as representing the interests of ESTA members to ANSI, UL and the NFPA. The Technical Standards Program is accredited by the American National Standards Institute.

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 making 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, Photometrics, Rigging, and Stage Machinery.

ESTA encourages active participation in the Technical Standards Program. There are several ways to become involved. If you would like to become a member of an existing working group, as have over two hundred people, you must complete an application which is available from the ESTA website. Your application is subject to approval by the working group and you will be required to actively participate in the work of the group. This includes responding to letter ballots and attending meetings. Membership in ESTA or any other organization is not a requirement for participation in the TSP. You can also become involved by requesting that the TSC develop a standard or a recommended practice in an area of concern to you.

The Stage Lifts Working Group, which authored this standard, consists of a cross section of entertainment industry professionals representing manufacturers, consultants, dealers, and end-users. ESTA is committed to developing consensus-based standards and recommended practices in an open setting. Future Stage Lift Working Group projects will include (a) increasing the scope of this standard to include other forms of orchestra pit and stage lift (b) updating this publication as changes in technology and experience warrant.
Investors in Innovation
The Technical Standard Program (TSP) is financially supported by ESTA and by companies and individuals who make undirected 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 include these companies and individuals:

VISIONARY LEADERS ($50,000 & up)
ETC
ProSight Specialty Insurance

VISIONARY ($10,000 & up; >100 employees/members)
Chauvet Professional
Cisco
Columbus McKinnon Entertainment Technology
Martin by Harman
Robe
Walt Disney Parks and Resorts

VISIONARY ($5,000 & up; 20–100 employees/members)
Altman Lighting, Inc.
German Light Products
JR Clancy
McLaren Engineering Group
Rose Brand
Stage Rigging
TMB
Tyler Truss Systems, Inc.

VISIONARY ($500 & up; <20 employees/members)
About the Stage
B-Hive Industries, Inc.
Scott Blair
Boston Illumination Group
Louis Bradfield
Candela Controls Inc.
Clark Reder Engineering
Tracey Cosgrove & Mark McKinney
Doug Fleenor Design
EGI Event Production Services
Entertainment Project Services
Neil Huff
Hughston Engineering Inc.
Interactive Technologies
Lankey & Limey Ltd.
Jules Lauve
Brian Lawlor
Limelight Productions, Inc.
John T. McGraw
Mike Garl Consulting
Mike Wood Consulting
Power Gems
Reed Rigging
Reliable Design Services
Alan Rowe
David Saltiel
Sapsis Rigging Inc.
Stageworks
Dana Taylor
Steve Terry
Theatre Projects
Theatre Safety Programs
Vertigo
Steve A. Walker & Associates
Westview Productions
WNP Services

INVESTOR ($3,000–$9,999; >100 employees/members)
Actors’ Equity Association
Barbizon Lighting Company
Golden Sea Professional Equipment Limited
IATSE Local 728
IATSE Local 891
Lex
NAMM
Rosco Laboratories
Texas Scenic Company

INVESTOR ($1,500–$4,999; 20–100 employees/members)
American Society of Theatre Consultants
Area Four Industries
BMI Supply
City Theatrical Inc.
InterAmerica Stage, Inc.
Lycian Stage Lighting
Morpherus Lights
Niscon Inc.
Syracuse Scenery and Stage Lighting
Tomcat
XSF Xtreme Structures and Fabrication

© 2018 ESTA
<table>
<thead>
<tr>
<th>Level</th>
<th>Name</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVESTOR ($200–$499; &lt;20 employees/members)</td>
<td>Benjamin Cohen</td>
<td>Bright Ideas Custom Electronics Inc.</td>
</tr>
<tr>
<td></td>
<td>Bruce Darden</td>
<td>Guangzhou Ming Jing lighting Equipment Co.</td>
</tr>
<tr>
<td></td>
<td>Robert Scales</td>
<td>K5600, Inc.</td>
</tr>
<tr>
<td></td>
<td>Stephen Vanciel</td>
<td>Indianapolis Stage Sales &amp; Rentals, Inc.</td>
</tr>
<tr>
<td></td>
<td>Suga Koubou Co., Ltd.</td>
<td>Xpro Light</td>
</tr>
<tr>
<td>SUPPORTER (&lt;$3,000; &gt;100 employees/members)</td>
<td>Ian Foulds, IATSE Local 873</td>
<td>Harlequin Floors</td>
</tr>
<tr>
<td></td>
<td>Geiger Engineers</td>
<td>H&amp;H Specialties</td>
</tr>
<tr>
<td></td>
<td>Stage Equipment &amp; Lighting</td>
<td>High Output</td>
</tr>
<tr>
<td></td>
<td>Stagemaker</td>
<td>InCord</td>
</tr>
<tr>
<td></td>
<td>Vincent Lighting Systems</td>
<td>iWeiss</td>
</tr>
<tr>
<td></td>
<td>Thermotex Industries, Inc.</td>
<td>Oasis Stage Werks</td>
</tr>
<tr>
<td></td>
<td>Skjonberg Controls Inc.</td>
<td>Stage Equipment &amp; Lighting</td>
</tr>
<tr>
<td></td>
<td>Stage Labor of the Ozarks</td>
<td>Stagemaker</td>
</tr>
<tr>
<td>SUPPORTER (&lt;$1,500; 20–100 employees/members)</td>
<td>Roy Bickel</td>
<td>Michael Lay</td>
</tr>
<tr>
<td></td>
<td>Tony Giovannetti</td>
<td>Lizz Pittsley</td>
</tr>
<tr>
<td></td>
<td>Pat Grenfell</td>
<td>Michael Skinner</td>
</tr>
<tr>
<td></td>
<td>Mitch Hefter</td>
<td>Skjonberg Controls Inc.</td>
</tr>
<tr>
<td></td>
<td>John Huntington</td>
<td>Stage Labor of the Ozarks</td>
</tr>
<tr>
<td></td>
<td>Beverly and Tom Inglesby</td>
<td>Tracy Underhill</td>
</tr>
<tr>
<td></td>
<td>Eddie Kramer</td>
<td>Charlie Weiner</td>
</tr>
<tr>
<td></td>
<td>Jason Kyle</td>
<td>Zhuhai Shengchang Electronics Co.</td>
</tr>
</tbody>
</table>

Planned Giving donor: Ken Vannice

All donations to the Technical Standards Program support the TSP in general, and are not directed to, or for, the benefit of any particular technical standard project, or any Working Group working on any particular standard or project. If you would like to help support the Technical Standards Program in its work, please consider becoming an Investor in Innovation by visiting our website at http://tsp.esta.org/invest or by contacting the ESTA office at 1-212-244-1505 and selecting “TSP” from the menu.
Contact Information

Technical Standards Manager
Karl G. Ruling
ESTA
630 Ninth Avenue, Suite 609
New York, NY 10036
USA
+1-212-244-1505
karl.ruling@esta.org

Assistant Technical Standards Manager
Richard J. Nix
ESTA
630 Ninth Avenue, Suite 609
New York, NY 10036
USA
+1-212-244-1505
richard.nix@esta.org

Technical Standards Council Chairpersons
Mike Garl
Mike Garl Consulting LLC
+1-865-389-4371
mike@mikegarlconsulting.com

Mike Wood
Mike Wood Consulting LLC
+1-512-288-4916
mike@mikewoodconsulting.com

Stage Lifts Working Group Co-chairpersons
Dan Culhane
Wenger
+1-763-506-8800
culhane.dan@gmail.com

Joseph Jeremy
Niscon, Inc.
+1-905-331-5779
jjeremy@niscon.com
Acknowledgments
The Stage Lifts Working Group members when this document was approved by the working group on 18 September 2018 are shown below.

Voting members:
Daniel Brinker; USITT; G
Joseph Champelli; Entertainment Project Services, LLC; DE
Gareth Conner; Creative Conners, Inc.; MP
Dan Culhane; Wenger Corp.; MP
Bruce Darden; InterAmerica Stage, Inc.; CP
Bruce Downer; SERAPID, Inc.; CP
Sarah Gascoine; PSAV Presentation Services; DR
Sanford P. Gilzow; Shur-Rig LLC; DR
Jerry Gorrell; Theatre Safety Programs; G
Steve Hnath; Creative Conners, Inc.; MP
Jeremy Hodgson; Cirque Du Soleil, Inc.; U
Joseph Jeremy; Show Distribution Group, Inc.; CP
Bill McIntyre; Show Distribution Group, Inc.; CP
Rick Montgomery; Motion Laboratories, Inc.; MP
Jim Niesel; Theatre Projects Consultants, Inc.; DE
Michael Nishball; Theatre Projects Consultants, Inc.; DE
Richard J. Nix; Richard J. Nix; G
Peter A. Scheu; Amer. Society of Theatre Consultants; DE
Steven Serafin; Chubb Group of Insurance Companies; G
Zachary Stevenson; University of North Carolina School of the Arts; U
Peter V. Svitasky; Wenger Corp.; MP
Christopher B. Tilton; About the Stage, LLC; DE
James Tomlinson; Team Tomlinson; G
Michael Wade; Creative Conners, Inc.; MP
Steve Walker; Steve A. Walker & Associates; DE
R. Duane Wilson; Amer. Society of Theatre Consultants; DE

Observer (non-voting) members:
William Bradburn; Aerial Arts, Inc.; U
Louis Bradfield; Louis Bradfield; U
Jim Digby; Event Safety Alliance; U
Robert Haycock; UC Berkeley; U
Phil Heid; Creative Stage Lighting Co., Inc.; DR
Edwin S. Kramer; 1501; U
Wendy Manson; Cirque Du Soleil, Inc.; U
Kurt Pragman; Pragman Associates, LLC; G
Kevin Taylor; Tait Towers Manufacturing LLC; CP
Jeong Sik Yoo; Ghost LX; DE

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: An asterisk (*) indicates that explanatory material on the text can be found in Annex A.

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notice and Disclaimer</td>
<td>ii</td>
</tr>
<tr>
<td>Investors in Innovation</td>
<td>iv</td>
</tr>
<tr>
<td>Contact Information</td>
<td>vi</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>vii</td>
</tr>
<tr>
<td>Chapter 1 Administration</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Scope*</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Purpose</td>
<td>1</td>
</tr>
<tr>
<td>1.3 Units</td>
<td>2</td>
</tr>
<tr>
<td>1.4 Hydraulic mechanisms</td>
<td>2</td>
</tr>
<tr>
<td>Chapter 2 Referenced publications*</td>
<td>2</td>
</tr>
<tr>
<td>2.1 General</td>
<td>2</td>
</tr>
<tr>
<td>2.2 Publications</td>
<td>2</td>
</tr>
<tr>
<td>Chapter 3 Definitions</td>
<td>2</td>
</tr>
<tr>
<td>3.1 General</td>
<td>2</td>
</tr>
<tr>
<td>3.2 Definitions</td>
<td>2</td>
</tr>
<tr>
<td>3.3 General definitions</td>
<td>2</td>
</tr>
<tr>
<td>Chapter 4 Mechanical Design and Manufacturing Requirements</td>
<td>4</td>
</tr>
<tr>
<td>4.1 Design criteria</td>
<td>4</td>
</tr>
<tr>
<td>4.2 Lift platform</td>
<td>5</td>
</tr>
<tr>
<td>4.3 Functionality and clearances</td>
<td>5</td>
</tr>
<tr>
<td>4.4 Guides</td>
<td>6</td>
</tr>
<tr>
<td>4.5 Welding*</td>
<td>6</td>
</tr>
<tr>
<td>4.6 Lighting</td>
<td>6</td>
</tr>
<tr>
<td>4.7 Conflicting equipment</td>
<td>6</td>
</tr>
<tr>
<td>Chapter 5 Control Systems</td>
<td>6</td>
</tr>
<tr>
<td>5.1 General</td>
<td>6</td>
</tr>
<tr>
<td>5.2 Control stations</td>
<td>7</td>
</tr>
<tr>
<td>5.3 Enable stations</td>
<td>7</td>
</tr>
<tr>
<td>5.4 E-stop stations</td>
<td>7</td>
</tr>
<tr>
<td>5.5 Control system parameters*</td>
<td>7</td>
</tr>
<tr>
<td>5.6 Constraining lift travel</td>
<td>8</td>
</tr>
<tr>
<td>5.7 Motor control centers</td>
<td>10</td>
</tr>
<tr>
<td>5.8 Multiple motor/actuator systems</td>
<td>11</td>
</tr>
<tr>
<td>Chapter 6 Safety Systems</td>
<td>11</td>
</tr>
<tr>
<td>6.1 Safety devices*</td>
<td>11</td>
</tr>
<tr>
<td>6.2 E-stops*</td>
<td>11</td>
</tr>
<tr>
<td>6.3 Shear and crushing protection</td>
<td>12</td>
</tr>
<tr>
<td>6.4 Guarding lift enclosure and machinery</td>
<td>12</td>
</tr>
<tr>
<td>Chapter 7 Installation and commissioning</td>
<td>13</td>
</tr>
<tr>
<td>7.1 Installation</td>
<td>13</td>
</tr>
<tr>
<td>7.2 Compliance testing</td>
<td>14</td>
</tr>
<tr>
<td>7.3 Mechanical inspection*</td>
<td>14</td>
</tr>
<tr>
<td>7.4 Electrical inspection*</td>
<td>15</td>
</tr>
<tr>
<td>7.5 Operation and controls tests</td>
<td>15</td>
</tr>
<tr>
<td>7.6 Positioning accuracy tests</td>
<td>16</td>
</tr>
<tr>
<td>7.7 E-stop tests</td>
<td>16</td>
</tr>
<tr>
<td>7.8 Pressure sensitive safety edge tests*</td>
<td>16</td>
</tr>
<tr>
<td>7.9 Dynamic load tests</td>
<td>16</td>
</tr>
<tr>
<td>7.10 Guarded access portal tests</td>
<td>17</td>
</tr>
</tbody>
</table>
Foreword

The purpose of this orchestra pit lift standard is to address single-platform, low-speed orchestra pit lifts installed in performance venues.

At the time of this standard’s publication, there are no North American elevator standards that address orchestra pit lift design, construction, operation, or inspection.

Therefore, the hope is that this document will serve as the reference standard for the design, manufacture, installation, and inspection of orchestra pit lifts.

This standard does not address the fall hazard presented at the stage edge when the lift platform is lower than stage floor level. An example of a stage edge fall protection plan is included in Annex B.
Chapter 1 Administration

1.1 Scope*

1.1.1 Scope. This standard covers the design, construction, operation, inspection, testing, maintenance, alteration and repair of permanently installed orchestra pit lifts and their associated parts, rooms, spaces, enclosures and hoistways, where located in a theatre or a similar place of public entertainment.

1.1.1.1 Subsequent inspections* after installation are not covered in this standard.

1.1.2 Equipment covered by this standard. This standard covers the design, construction, operation, inspection, testing, maintenance, alteration and repair of orchestra pit lift equipment and its associated parts, rooms, spaces, and hoistways:

1.1.2.1 operating at a speed of 15 feet (4.6 meters) per minute or less;

1.1.2.2 not designed for passenger use;

1.1.2.3 not for moving during performances;

1.1.2.4 providing an orchestra pit performance location on the audience side of a proscenium arch;

1.1.2.5 providing an extension of the stage as a forestage;

1.1.2.6 providing an extension of the auditorium floor over the pit.

1.1.3 Existing equipment* Existing orchestra pit lifts that do not comply with the provisions of this standard shall be permitted to be continued in service, provided that the lack of conformity with these documents does not present a serious hazard as determined by the Authority Having Jurisdiction.

1.1.4 Equipment not covered by this standard. Equipment not covered by this standard includes, but is not limited to, the following:

1.1.4.1* Integrated payloads, such as chair-wagons, whose design is integrated with the design of the orchestra pit lift.

1.1.4.2 Orchestra pit lifts designed to work at speeds greater than 15 feet (4.6 meters) per minute.

1.1.4.3 Orchestra pit lifts with more than one separately movable part.

1.1.4.4 Permanent stage lifts other than orchestra pit lifts such as piano and organ lifts, sound control cockpit lifts, on-stage lifts, orchestra and choral riser lifts.

1.1.4.5 Lifts temporarily installed, for example for a single production.

1.2 Purpose

1.2.1 Purpose. The purpose of this standard is to establish the minimum requirements to safeguard health, safety, and general welfare.

1.2.2 Alternative designs. The provisions of this standard are not intended to restrict or prevent the use of alternative designs not specifically described herein, provided that such designs meet or exceed the intent of this standard's requirements.