Public review comment summary
BSR E1.4-2, Entertainment Technology—Statically Suspended Rigging Systems
Entertainment Services and Technology Association

Referenced document: BSR E1.4-2, Entertainment Technology - Statically Suspended Rigging Systems (document Rig/2015-2023r3)

ANSI public review period: 10 November through 25 December 2017

Question: Do you recommend that the standards committee accept BSR E1.4-1, Entertainment Technology - Statically Suspended Rigging Systems (document Rig/2015-2023r3), as an American National Standard, that its requirements are not too lax, too onerous, or too vague, nor that it would unreasonably negatively impact materially affected parties in the entertainment industry? Please indicate "Yes" (accept it), "Yes with comments," or "No with reasons" (don't accept it).

Name	Representing	Yes	Yes with comments	No with reasons	Comments only
Brad Dittmer	Stage Labor of the Ozarks (SLO)	X			
Bruce Darden	InterAmerica Stage, Inc. (IAS)			X	
William Bradburn	Aerial Arts, Inc. (AAI)			X	
Steve A. Walker	Steve A Walker & Associates (SAW)			X	X
Tim Hansen	Oasis Stage Werks (OSW)				X

(Comments, sorted by referenced clause)

#	Commenter	Clause	Comment or reason	Proposed Resolution
1.	SAW	General	This draft standard is poorly organized, repetitive, and omits critical requirements.	Accept in principal: See other SAW comments.
2.	SAW	1.1	1.1 Delete “(equipment and components)” and “where not otherwise covered by other E1 standards”. These clauses are unneeded and obscure the meaning.	Accept in principal: Deleted “(equipment and components)” Change verbiage on “where not otherwise covered by other E1 standards”

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3.	IAS	1.1	1.1 Scope **"...**where not otherwise covered by other E1 standards." Problem: Although the intent is clear to me, a member of the RWG, it is not clear to non-members. I can find no reference to ANSI E1 on the internet or the ESTA website. Reworded: **"...**where not otherwise covered by other ANSI Entertainment Rigging standards."	Accept in principal: Reworded to “where not covered by other ANSI Entertainment Technology standards.”
4.	SAW	1.2	1.2 Revise This standard is intended to establish minimum requirements for statically suspended rigging systems to safeguard health safety and general welfare.	Accept: The section has been revised.
5.	IAS	1.2	1.2 Purpose **"....**and to promote general safety of the public and personnel. " Problem: Fluff Reworded: Strike all	Accept in principal: See comment 4
6.	OSW	1.4	1) Section 1.4 change the phrase “not specifically prescribed by this standard” to “not specifically prohibited by this standard”. The current wording is confusing.	Accept in principal: See comment 7

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7.	AAI	1.4	1.4 Suggest breaking up this very long sentence to make it more comprehensible in a first or second reading. Something such as: At the end of the second line, end a new first sentence after "...standard". At the beginning of the third line, delete "provided that" and start a new sentence at "Any...". In the third line, change "is" to "shall be". In the fourth line, change "complies" to "comply". End this new sentence after "standard". The final sentence could be; "Quality, strength, and effectiveness of any alternative materials, methods or work shall be at least the equivalent of those prescribed in this standard."	Accept in principal: Copied from E1.4-1 “This standard is not intended to prevent alternative designs, materials, or technology. Alternative designs, materials or technology shall comply with the intent of this standard, as deemed applicable by a qualified person.”
8.	AAI	1.4	1.4 In the second line, change "prescribed" to "proscribed". To prescribe is to order the use of something. To proscribe is to exclude the use of something. While "prescribe" might work in the sentence; it seems that "proscribe" would be the appropriate word.	Accept in principal: See comment 7
9.	SAW	1.5	1.5 Revise and number sub-paragraphs. 1.5.1 This standard does not apply to the building or other structure from which the rigging system is suspended. 1.5.2 This standard does not apply to rigging systems intended to support dynamic loads such as powered hoist systems or aerial performers.	Accept: Revised sub-paragraph
10.	SAW	1.6	1.6 Add references ASME B30.26 Rigging Hardware National Association of Chain Manufacturers, Welded Steel Chain Specifications	Accept: References added

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11.	SAW	2	2 Add definitions Competent person: A person who is capable of identifying existing and predictable hazards in the workplace, and who is authorized to take prompt corrective measures to eliminate them. Design factor: The ratio between the working load limit and the ultimate strength of a product Load carrying device: the component(s) of the suspension system that connect a suspended load to the suspension media (e.g. batten, truss, hook). 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. Static load: the maximum force applied to a component of a suspension system resulting from normal intended operating conditions while the system is at rest. This includes the apportioned fractions of the working load limit (WLL) and self-weight, including that due to load carrying devices and lifting media. Working load limit (WLL): The maximum load the user may apply under normal operating conditions.	Accept in principal: Added definitions for Design Factor, Load carrying device, Qualified person, Static load and Working load limit. Competent person was not added because it is not used in this standard.
12.	SAW	2.1	2.1 Delete “Device Attachment” This definition is unneeded since it defines an arbitrary component.	Accept: Deleted definition
13.	SAW	2.4	2.4 Delete “Structural Attachment” This definition is unneeded since it defines an arbitrary component.	Accept: Deleted definition
14.	SAW	2.5	2.5 Revise to “Supplemental Framing: Secondary structural framing spanning between the primary building framing used to support a suspended rigging system.	Accept: Revised definition

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15.	SAW	3	3 Design This section is missing critical requirements, including the following: •The system designed shall identify the working load limit (WLL) for the suspension system and its components. •The suspension system shall form a continuous load path from the suspended object to the building or other supporting structure. •The distribution of loads between the system components shall be determined following rational engineering analysis considering the effects of deflections of the load carrying device and supplemental framing members. •Components shall be made of materials having ductile properties that will deform plastically without fracturing.	Accept: Revised section 3
16.	SAW	3.1	3.1 Revise “All equipment shall comply with the standards listed within, and any applicable recognized codes (or any applicable jurisdictional regulation, where the requirements of such regulation are more stringent).” Manufacture is not a design function.	Accept: Changed in comment 15
17.	IAS	3.1	**3.1** All equipment shall be manufactured to comply with the standards listed herein, and any applicable recognized codes (or any applicable jurisdictional regulation, where the requirements of such regulation are more stringent) Problem: Clarity Reworded: All equipment shall be manufactured to comply with the standards listed herein, and any applicable recognized codes or any applicable jurisdictional regulation.	Accept: See comment 15
18.	SAW	3.10	3.10 Delete “local” since applicable building codes may not be just local. Delete “building” since the applicable codes (fire, maintenance, life-safety, etc.) may not be a building code. For clarity revise to “Statically suspended rigging systems shall comply with all applicable codes.”	Accept: “local” deleted
19.	SAW	3.11	3.11 Revise “Low clearance obstructions and protruding hazards shall be marked.	Accept in principal: See comment 20

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20.	IAS	3.11	**3.11** In areas without adequate headroom, low clearance obstructions and protrusion hazards should be marked for the safety of the public and/or personnel. Problem: Areas without adequate headroom, have low clearance obstructions and protrusion hazards SHALL not occur in public areas. Suggestion: In areas without adequate headroom, low clearance obstructions and protrusion hazards should be marked for the safety of personnel. a) Post signage at the access points to these hazards b) Mark specific hazards with reflective tape c) Apply softeners of non-combustible compressible material to soften edges	Accept in principal: **See added annex note A3.11** Low clearance obstructions and protrusion hazards shall be marked for the safety of personnel. Protrusion hazards shall not occur in public areas. Examples of marking protrusion hazards. a) Post signage at the access points to these hazards b) Mark specific hazards with reflective tape c) Apply softeners of non-combustible compressible material to soften edges
21.	IAS	3.2	**3.2** Statically suspended systems shall be designed by a qualified person. The qualified person shall determine when a registered design professional is required to specify the rigging system and/or analyze the impact of the rigging system to the supporting structure. Style: and / or Reworded: **3.2** Statically suspended systems shall be designed by a qualified person. The qualified person shall determine when a registered design professional is required to analyze the rigging system and its impact of the rigging system to the supporting structure.	Accept: Section 3.2 has been revised
22.	SAW	3.3	3.3Limiting pre-engineered components to 75% of the capacity (strength) published by the manufacturer is excessive, especially when combined with the factors in	Accept in principal: Moved to 3.5 Pre-Engineered components intended for use as a beam (such as Strut channel and Truss) shall be limited to the capacities in the component manufacturer’s published load tables.

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23.	IAS	3.3	**3.3** Pre-Engineered components intended for use as a beam (such as Strut channel and Truss) shall be limited to 75% of the capacities in the component manufacturer's published load tables. Problems: Addressing strut channel and truss in the same clause is not appropriate, and the two should be divided. Strut channel is designed and manufactured as a standard product in accordance with MFMA-4 (Metal Framing Manufacturer's Association). Strut loading tables are for uniform distributed load. They are to be de-rated to 75% for point loads, and further de-rated based on the spacing of lateral bracing. There are additional de-rates ranging from 70% to 95% based on the type of holes pierced in the channel. Is the statement above to be interpreted that after all truss tables and appropriate notes have been incorporated, the product must be de-rated again to 75%? It should be noted that strut channel is a commodity worked with by all construction trades and the properties of same are well known to all design professionals. Truss is designed and manufactured as a custom product in accordance with ANSI E1.2-2012. Most published engineering tables are based on reports for simple beams, and frequently allowable deflection is more of a limitation than load. The criteria for selecting and supporting an aluminum truss is less familiar to a design professional that is not specialized in the entertainment field. How is the 75% de-rate to be applied to a typical load table?	Accept in principal: Moved to 3.5 Pre-Engineered components intended for use as a beam (such as Strut channel and Truss) shall be limited to the capacities in the component manufacturer’s published load tables.

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24.	SAW	3.4	3.4 This paragraph should be combined with the requirement for rational engineering analysis. The design factors should be moved to the component sections since these will vary with the component (design factors for the suspension media need to be higher than the load carrying device.)	Reject: 3.3 This is the design factor for the overall system.
25.	SAW	3.6	3.6 Revise “Component selection shall consider the anticipated environmental conditions of the installation; including but is not limited, seismic, temperature, humidity, wind, snow, ice, ultraviolet exposure, and harsh/corrosive environments.”	Accept: See section 3.7
26.	IAS	3.6	3.6 Selection “…and harsh/corrosive environments.” Style: and / or Reworded: “…and harsh or corrosive environments.”	Accept: See section 3.7
27.	SAW	3.7	3.7 As currently worded and described in the annex note, this paragraph is beyond the scope of this standard. Revise “Supporting structure shall have adequate strength to support the intended loads from the rigging system.” Add an annex note to recommend a Licensed Design Professional verify the structure.	Accept: See section 3.2
28.	SAW	3.8	3.8 Move “Single point suspensions shall be visually inspected not less than every 90 days.” To its own paragraph since it is a separate requirement from a backup or redundant point.	Accept in principal: See comment 29
29.	IAS	3.8	**3.8** All single point suspensions (from structural attachment through device attachment) shall incorporate a backup or redundant point as an additional safety feature unless otherwise determined in a Risk Assessment by a qualified person considering the single point failure hazard. See section 7 for inspection criteria. (Single point suspensions shall be visually inspected not less than every 90 days.) Problem: This standard is for permanently installed equipment. I am unfamiliar with any structural element that is being inspected on a 90 day interval.	Accept in principal: Removed 90 day requirement and modified 7.3.1 to be less prescriptive and leave the inspection frequency up to a qualified person.
30.	SAW	3.9	3.9 Revise “Suspension media shall not contact any part of the building structure, adjacent systems, or other equipment not intended for contact.”	Accept: See section 3.9

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31.	AAI	3.9	3.9 Delete the parenthesis around the final sentence or make it a separate paragraph of section 3. Stating a requirement as a parenthetical statement does not seem appropriate; especially a requirement with such an impact on maintenance.	Accept in principal: Reference to 3.8 see comment 29 for resolution.
32.	SAW	4	4 The structural attachment and device attachments categories should be combined. This division causes repetition and confusion. For example, the current draft indicates shackles may be used to attach to the suspended device, but not the building structure. Also, there needs to be a section for supplemental framing and load carrying devices.	Accept: Changed section 4 to include supplemental framing and load carrying devices. Also removed structural attachment and device attachment.
33.	SAW	4.1	4.1 This paragraph is overly wordy. Revise “Component assemblies shall withstand all design loads without deformation or damage.	Accept: The wording has been changed.

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34.	IAS	4.1.1	**4.1.1** Unless specifically noted otherwise, fasteners shall have a minimum SAE J429 Grade 5 or hardware appropriately rated for the intended application. Bolts shall have nuts of equivalent rating. Fasteners shall be self-locking or secured by alternate means to prevent loosening. Fasteners shall be installed in accordance with manufacturer's instructions. Attachments made through slotted, elongated, or oversized holes (more than 1/16” over the fastener diameter), shall use flat washers. (more than 1/16” over the fastener diameter), shall use flat washers. Problem(s): This is a major clause with several sub-clauses that can be addressed individually. a) Unless specifically noted otherwise, fasteners shall have a minimum SAE J429 Grade 5 or hardware appropriately rated for the intended application. b) Bolts shall have nuts of equivalent rating. c) Fasteners shall be self-locking or secured by alternate means to prevent loosening. d) Fasteners shall be installed in accordance with manufacturer's instructions. e) Attachments made through slotted, elongated, or oversized holes (more than 1/16” over the fastener diameter), shall use flat washers. Problem with “a”: Unistrut, the de facto standard of metal framing channel provides SAE J429 GR2 fasteners. Problem with “c”: Strike all because no instructions exist.	Accept in principal: This paragraph has been restructured. A) allows for the use of alternate hardware as written. C) Task group feels this statement is clear to any person reading this document. See comment 49 change b) to “Threaded fasteners shall have nuts of equivalent rating.”
35.	SAW	4.1.2	4.1.2This requirement is excessive and should be deleted.	Accept in principal: Changed the requirement to 4.1.2 “Any custom fabricated component shall be designed by a qualified person. The qualified person shall determine when a registered design professional’s review is required.”

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36.	IAS	4.1.2	4.1.2 Any custom fabricated component shall be reviewed and approved by a registered design professional. Problem: Onerous. Per section 3.2, a qualified person can design the system, and certainly should be able to direct the fabrication of a custom bracket.	Accept in principal: See comment 35
37.	SAW	4.1.3	4.1.3 Replace “AWS” with “American Welding Society” for clarity.	Accept.
38.	SAW	4.2	4.2 Combine sections 4.2 and 4.4 into one Attachments section to reduce repetition and provide clarity.	Accept in principal: Relabeled 4.2 & 4.4 to Attachments and Load carrying devices to provide less repetition and add clarity.
39.	AAI	4.2.1.2	4.2.1.2 Change the sentence to read: "Cast couplers, elbows, flanges, etc. not designed for rigging applications shall not be used in the tension load path." Add: "Such items may be permitted when used solely to stabilize movement such as horizontal sway. Any such use shall be reviewed by a qualified person." Add a definition for tension load path if necessary.	Accept in principal: Cast couplers, elbows, flanges, etc. not designed for rigging applications may be permitted when used solely to stabilize movement such as horizontal sway. Such items shall not be used in the tension load path. Any such use shall be reviewed by a qualified person.
40.	IAS	4.2.1.2	4.2.1.2 Cast couplers, elbows, flanges, etc. not designed for rigging applications are not permissible. Suggest: Cast couplers, elbows, flanges, etc. not designed for rigging applications require design review.	Accept in principal: See comment 39
41.	SAW	4.2.2.1	4.2.2.1 Revise “Beam clamps should be mechanically secured to beam flanges to prevent slipping. The slip resistance of beam clamps shall not be solely dependent on friction.	Accept in principal: Added sub sections to 4.2.2.2 and included verbiage to 4.2.2.2.2
42.	SAW	4.3	4.3 Suspension Media Add a General requirements section General Suspension media shall be loaded in tension only. Suspension media shall not contact any part of the building structure, adjacent systems, or other equipment not intended for contact.	Accept in principal: Language will be added to each rigid suspension media (supplemental structure, threaded rod, Turnbuckles) to address loading in tension only. Also noted in design 3.9 Suspension media shall not contact any part of the building structure, adjacent systems, or other equipment not intended for contact.

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43.	SAW	4.3.1.1	4.3.1.1 Replace “minimum breaking strength” with nominal strength” since this is the term used in the Wire Rope Users Manual and other standards. Add “Wire rope suspension media shall have a minimum design factor of 8.”	Accept in principal: Minimum breaking strength is used in E1.4-1 under wire rope (8.2 design factors table 1) so for consistency between standards, minimum breaking strength will be used. Section 3.3 allows for a registered design professional to change the design factor as needed. A consensus has been reached between SAW and Bill Gorlin on design factors. The solution was to have two levels of design factors. See section 3.3
44.	SAW	4.3.1.4	4.3.1.4.4 Delete “copper” since other materials, in particular steel, may be used for swage fittings.	Accept: Removed the word copper
45.	SAW	4.3.2	4.3.2 Add “chain suspension media shall have a minimum design factor of 8.”	Accept in principal: See comment 43
46.	SAW	4.3.2.5	4.3.2.5 The NACM specification should be added to the reference section.	Accept: See comment 10
47.	SAW	4.3.3	4.3.3 Add “Threaded rod used as suspension media shall have a minimum design factor of 5.	Accept in principal: See comment 43
48.	SAW	4.3.3.1	4.3.3.1 Compliance with section 4.1.1 requires threaded rod to be A1995 grade B7 which is excessive and contrary to standard practices.	Accept in principal: Section 4.1.1.1 allows for hardware that is “appropriately rated for the intended application.”

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49.	IAS	4.3.3.1	**4.3.3.1** Threaded rod shall comply with section 4.1.1 of this standard. Problem: Onerous, cannot be visually inspected Threaded rod is a headless fastener, and is not covered by the standard referenced in section 4.1.1 Solution: Threaded rods of all sizes, metals and alloys shall have a yield strength at least 5X the minor diameter.	Accept in principal: See Comment 34 Threaded rod is covered in the SAE J429 standard 1. **SCOPE** This SAE standard covers the mechanical and material requirements for inch-series steel bolts, screws, studs, screws for sems, and U-bolts used in automotive and related industries in sizes to 1-1/2 in. inclusive. The term "stud" as referred to herein applies to a cylindrical rod of moderate length threaded on either one or both ends or throughout its entire length. It does not apply to headed, collared, or similar products which are more closely characterized by requirements shown herein for bolts. 4.1.1 has been reworded to remove the reference to bolts
50.	IAS	4.3.4.2	4.3.4.2 In architecturally sensitive applications and where design may necessitate fiber rope aesthetics, fiber rope may be used as a cover concealing a load bearing wire rope core. Add for clarity of intent: Only the strength of the wire rope shall be considered in sizing the rope.	Accept in principal: Rewording. Only the strength of the wire rope shall be considered in the design.
51.	IAS	4.3.5.2	**4.3.5.2** The structural component(s) shall be rated with a minimum design factor of 3:1 based upon the intended design load against ultimate breaking strength and a design factor of 2:1 shall be used based upon the intended design load against yield, if applicable. Problem: I believe the design factors are too low. Suggested: The structural component(s) shall be rated with a minimum design factor of 5:1 based upon the intended design load against ultimate breaking strength and a design factor of 3:1 shall be used based upon the intended design load against yield, if applicable.	Accept in principal: See comment 43

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52.	OSW	4.3.6.4	2) Section 4.3.6.4 Revise to read “Turnbuckles shall be provided with a redundant fixing means to ensure they hold position. The fixing method shall be performed in accordance with the manufacturer’s recommendations.” This is consistent with the wording for screw pin shackles in 4.4.2.2. and allows for several methods other than those listed.	Accept: Section 4.3.6.4 has been changed
53.	SAW	4.4.1	4.4.1 Add “Clamps shall be used in accordance with the manufacturer’s recommendations.”	Accept in principal: Added and section moved to 4.2.4.3
54.	SAW	4.4.1	4.4.1 This section should be combined with 4.2 Structural Attachments. There is no significant difference between attaching to the supporting structure and attaching to a suspended device and this leads to unnecessary repetition.	Accept in principal: Sections were moved starting with 4.2.4 under attachments
55.	SAW	4.4.1	4.4.1 This paragraph contains a number of separate requirements that should be in separate paragraphs. •Bolts shall be a minimum of SAE J429 Grade 5. Bolts shall have nuts of equivalent rating. •Fasteners shall be self-locking, or secured by alternate means to prevent loosening •Attachments made through slotted, elongated, or oversized holes (more than 1/16” over the fastener diameter), shall use flat washers. •Fasteners shall be appropriate for the intended application and installed in accordance with manufacturer’s instructions. •Attachments made through slotted, elongated, or oversized holes (more than 1/16” over the fastener diameter), shall use flat washers.	Accept in principal: Reference to 4.1.1 see comment 34
56.	SAW	4.4.1.1	4.4.1.1 This clause is ambiguous, either the clamps shall be permanently marked which many currently are not, or the clause should be deleted.	Accept: 4.4.1.1 moved to 4.2.4.1 has been reworded to allow unmarked clamps to be indicated in the system reference documents.

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57.	OSW	4.4.3	3) Section 4.4.3 Add new section 4.4.3.1 “All quick links shall be load rated.” This will clearly indicate that quick links require a load rating. Renumber following sections as needed.	Reject: Moved to 4.2.6 Load rating is already required to be marked on the Quick Link indicating they are load rated.
58.	SAW	4.4.5.1	4.4.5.1 This paragraph contains a number of separate unrelated requirements that should be separated into separate paragraphs.	Accept in principal: See comment 59
59.	IAS	4.4.5.1	4.4.5.1 All bolted connections shall be secured by through bolting unless reviewed and approved by a registered design professional. Pre-engineered products (e.g. strut systems) shall not require engineering review providing that design loads are within the product's specifications and hardware is assembled in accordance with the manufacturer's specifications. Building structure (beams, braces, purlins, angles, tube, et cetera) shall not be drilled for through bolting unless reviewed and approved by a registered design professional. Problem: Should be divided into two sections and with edits: First Section: Bolted connections shall be secured by through bolting unless reviewed and approved by a qualified person. Pre-engineered products (e.g. strut systems) shall not require engineering review providing that design loads are within the product's specifications and hardware is assembled in accordance with the manufacturer's specifications. Second Section (no edits): Building structure (beams, braces, purlins, angles, tube, et cetera) shall not be drilled for through bolting unless reviewed and approved by a registered design professional.	Accept: Edit has been made. Sections have been renumbered 4.2.8.1 & 4.2.8.2
60.	SAW	4.4.5.2	4.4.5.2 This section should be deleted. Lag bolts and wood and sheet metal screws are often used for incidental and lightly loaded connections, it is excessive to require a registered design professional.	Reject: See comment 61
61.	IAS	4.4.5.2	**4.4.5.2** Lag bolts, Wood screws, and Sheet Metal screws shall only be used under the specification of a registered design professional. Problem: Onerous Qualified person	Accept: Edit has been made see section 4.2.8.3

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62.	SAW	4.4.5.3	4.4.5.3 Delete “and using the proper pilot hole”. The hole size and type of drill bit are part of the manufacturer’s instructions. It would also be cleared to refer to the “instructions” as “recommendations”. For clarity, “masonry anchors” should be “concrete and masonry anchors”.	Accept in principal: Moved to 4.2.8.4, the new sentence will read “Installation and use of concrete and masonry anchors shall be done in accordance with manufacturer’s instructions and specifications.”
63.	SAW	4.4.5.4	4.4.5.4 This requirement is excessive; these anchors are often used for incidental and lightly loaded connections. A better option would be to require anchors supporting more than 500 pounds (or similar limit) be approved by a registered design professional.	Accept in principal: See comment 64. A qualified person shall know when to involve a registered design professional according to the design section.
64.	IAS	4.4.5.4	**4.4.5.4** Masonry Anchors shall only be installed under the specification of a registered design professional. Problem: Onerous Qualified person	Accept: Moved to 4.2.8.5, the new sentence will read “Concrete and masonry anchors shall only be installed under the recommendation and supervision of a qualified person.”
65.	SAW	4.5	4.5 “Devices” is not a component as listed in part 4.	Accept in principal: Reworked Section 4 to include different types of devices.
66.	IAS	4.5.1.2	**4.5.1.2** Battens exceeding one ~~contiguous~~ pipe length shall be joined Continuous	Accept in principal: Moved to 4.4.1.2 This section has been reworked to be more harmonized with E1.4-1.
67.	SAW	4.5.1.3	a) 4.5.1.3 This is a design criterion and should be moved to the Design section. This loading also affects the selection of the suspension media and attachments. b) This section should also have an annex note to explain the reason for this loading. It often happens that the total batten load exceeds the allowable live load capacity for the building. c) “The 45 kg/m (30 lbs/ft) uniformly distributed load and the deflection limits are serviceability criteria intended to assure adequate strength and stiffness for equipment such as lights that are adversely affected by vibrations. This loading may occur over portions of the batten or grid, but will seldom occur over the entire length or system. The supporting structure should be capable of supporting concentrated loads equivalent to the hanger or suspension loads resulting from this load and have adequate strength to support the total anticipated load as determined by the anticipated use.	Accept in principal: a) Moved to 4.4.1.4 This section has been harmonized with E1.4-1. b) 3.2 in the design section requires the qualified person shall determine when a registered design professional is required to specify the rigging system and its impact to the supporting structure. c) 3.4 has been amended to meet the intent of this comment

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68.	SAW	4.5.1.4	4.5.1.4 Delete “considering the single point failure hazard.”	Accept: Phrase deleted
69.	IAS	4.5.2	4.5.2 Alternate batten construction **4.5.3.2** Cross pipes shall be installed above supporting pipes. Problem: Onerous Strike clause.	Accept in principal: 4.4.3.2 Cross pipes shall be installed above the supporting pipes where possible. If cross pipes must be installed below supporting pipes appropriately rated hardware shall be used.
70.	SAW	4.5.3.1	4.5.3.1 There should be a minimum lateral force specified that the grid must resist, otherwise this requirement is subjective and meaningless. I suggest “Pipe grids shall be adequately braced against lateral movement to resist incidental side loads from normal equipment and maintenance operations and seismic forces. The lateral load shall be a minimum of 200 Lbs or one-fourth of the grid dead load. Acceptable bracing includes direct anchorage to side structures or vertical bracing to the supporting structure.	Accept in principal: Comment has been updated sans “one fourth of the grid dead load” and adding in verbiage about diagonal bracing.
71.	SAW	4.5.3.2	4.5.3.2 This requirement is excessive and does not ensure proper grid performance. It also is not applicable to grids that are supported at every other pipe. A better requirement would be to move is after 4.5.3.3 and require “Pipe intersection hardware shall be capable of transferring the intended vertical and horizontal loads between the pipes.”	Accept: Will be added to 4.4.3.4
72.	SAW	4.5.3.3	4.5.3.3 Change “Pipe intersection” to “Pipe intersections”.	Accept: 4.4.3.3 Changed and movement clarified as “lateral and rotational”.
73.	SAW	4.5.4	4.5.4 Add “Individual track supports and anchors shall be capable of supporting a minimum load of 150 pound.” This would fit best following 4.5.4.2.	Accept in Principal: Renumbered to 4.4.4. Annex note A4.4.4.2 has been added.
74.	SAW	4.5.4.2	4.5.4.2 Revise, operation is vague and requiring a qualified person is redundant with section 3.2. “Traverse tracks shall be adequately supported to carry intended loads including operating forces.”	Accept: 4.4.4.2 Changed wording
75.	SAW	4.5.4.3	4.5.4.3 Combine this sentence with 4.5.4.4 and revise for clarity. “Traverse tracks shall have end stops or alternate means to prevent carriers becoming dislodged from the track. End stops shall be secured against unintentional loosening by lock washers, lock nuts, or similar means.”	Accept in principal: General fastener requirements are now addressed in 4.4.4.4

#	Commenter	Clause	Comment or reason	Proposed Resolution
76.	IAS	4.5.4.4	**4.5.4.4** End stops shall use lock washers, lock nuts, or other means to prevent unintentional loosening Problem: Not in current practice. Is this a real problem?	Accept in principal: Edited see comment for 75
77.	IAS	4.5.4.5	**4.5.4.5** Tracks shall be suspended in a manner where the failure of any single suspension shall not allow for any part of the track to come into contact with any other objects below or above the track. Problem: I really don't understand what is being described.	Accept: 4.4.4.5 Track shall be supported to avoid single catastrophic failure.
78.	SAW	4.5.5.3	4.5.5.3 This sentence is confusing. Revise “Enclosures using carry handles as the primary means of attachment shall not be permitted unless the carry handles designed, tested, and documented as lifting points by the enclosure manufacturer.”	Accept in principal: Moved to 4.4.6.3 New statement reads “Enclosures using carry handles as the primary means of suspension shall not be permitted unless the carry handles are designed, tested, and documented as rigging points by the enclosure manufacturer.”
79.	SAW	4.5.5.4	4.5.5.4 “Purpose built” is vague and unclear. Revise “Brackets, fly bars, frames, or other support structures for audio enclosure groupings shall be designed and manufactured for the intended use.	Accept: Moved to 4.4.6.4 Section has been revised.
80.	OSW	4.5.6	4) Section 4.5.6 Delete section 4.5.6.3.3 and 4.5.6.4.2 These are not needed as they are covered by the earlier section 4.5.6.2	Accept: A general requirements section has been created as 4.4.7.1 and the repeated lines have been removed.
81.	OSW	4.5.6.3.1	6) Section 4.5.6.3.1 Add the statement “Vertical mounts relying entirely on set screws to suspend the projector shall not be permitted without a safety line or backup means of securing the load.” This ensures that a safety line will be used, even if it is not pipe being used for suspension of the projector mount.	Accept in principal: Document has been edited so the requirements are the same for 4.4.7.2.1 & 4.4.7.3.1
82.	SAW	4.5.6.3.1	4.5.6.3.1 Revise for clarity “Suspended projectors shall incorporate an appropriately rated and attached safety line.”	Accept in principal: Section has been revised. See 4.4.7.2.1
83.	SAW	4.5.6.3.2	4.5.6.3.2 Delete “is held in compression and”. This is less specific as to the solution and clearer.	Accept: Phase revised See 4.4.7.2.2

#	Commenter	Clause	Comment or reason	Proposed Resolution
84.	OSW	4.5.6.3.3	5) Add a new 4.5.6.3.3 as follows “Brackets, fly bars, frames, or other support structures for projectors shall be purpose built.” This makes it consistent with other requirements in the standard.	Accept in principal: This has been added and moved to the new 4.4.7.1.3 as a general requirement for video equipment.
85.	SAW	4.5.6.3.3	4.5.6.3.3 This is not only a design requirement. Replace “designed” with “installed”.	Accept: This has been edited in the new general requirements section for video equipment. See resolution for comment 84.
86.	SAW	4.5.6.4	4.5.6.4 Delete this section, these items are covered by E1-50.	Reject: E1.50 specifically refers to temporary video tile displays and this standard is intended to address permanent installations. See 4.4.7.3
87.	OSW	4.5.6.4.1	7) Section 4.5.6.4.1 Delete the phrase “threaded schedule 40 or other”. The standard does not allow threaded pipe anywhere else in the document. It should not be allowed here either.	Reject: Many manufacturers utilize threaded connection for video equipment mounts. This document will not exclude manufacturer’s standard products.
88.	IAS	4.5.6.4.1	4.5.6.4.1 Video Displays suspended from a mount utilizing threaded schedule 40 or other pipe shall incorporate an appropriately rated and attached safety line. Vertical pipe mounts relying entirely on set screws to suspend the display shall not be permitted without a safety line or backup means of securing the load. Problem(s): The description of suspension could be a video display, speaker or other object. Sections 4.2.1.1 and Sections 4.2.1.2 specifically forbid the use of threaded pipe connections in the load path.	Reject: See resolution for comment 87.
89.	SAW	4.5.6.5.1	4.5.6.5.1 This section repeats 4.4.4.	Reject: Moved to 4.4.7.4.1 This refers to more hardware than s-hooks. This is intended to also include other open hook terminations such as open hook turnbuckles.

#	Commenter	Clause	Comment or reason	Proposed Resolution
90.	SAW	5.2	5.2 Revise “Threaded hardware and fasteners (e.g. bolts, wire rope clips, quick links, clamps) shall be installed in accordance with the designer’s or manufacturer’s recommendations and tightened to meet appropriate torque requirements.	Accept: The section has been revised.
91.	SAW	6.2	6.2 Delete “Chain and” from the second sentence. The NACM specification requires embossing the chain for identification.	Accept: The section has been revised.
92.	SAW	6.3.2	6.3.2 Revise to clarify “The system manual shall contain contact information providing the name, address and phone number of the primary system contractor and manufacturers of the system equipment.” 7The inspection section needs to be revised to include inspection recommendations.	Accept: Document will be revised in section 6.3.2 Accept: Section 7 will be updated to include recommendations for E1.47 and ASME B30.26
93.	OSW	7	8) Section 7. Add a section that states “Inspections shall comply with ANSI E1.47 – 2017, Entertainment Technology – Recommended Guidelines for Entertainment Rigging System Inspections.”	Accept in principal: Section 7 will be revised to recommend E1.47 with a “should” statement instead of “shall”.
94.	SAW	7.3.2	7.3.2 Delete “fully”. This is subjective and ambiguous.	Accept: The section has been revised.
95.	OSW	A.4.4.4	9) Annex A section A4.4.4 refers to “traveler track”. Everywhere else in the document it is referred to as “traverse track”. Change the word “traveler” to “traverse” to make it consistent with the rest of the document.	Accept: The section has been revised.

Change summary for BSRE 1.4-2DRAFT_Rig2015-2023r4e 3/4/2019

2.2 Revised definition to match E1.4-3: "**2.2 Design factor.** (a) A ratio of the design load limit to the yield strength of a material or component; (b) A ratio of the design load limit to the ultimate strength of a material or component where the material does not plastically deform prior to failure."

2.3 Included a new definition from E1.4-3 to replace the phrases planned load, intended design load, and working load throughout the document: "**2.3 Design load.** The maximum anticipated load that will govern design parameters."

2.9 Revised wording to "**2.10 Suspension media.** Any component(s) used in tension to extend distance between the structure and the load.

3.3 Revised the paragraph since we have a better definition of design factor. Also reworded 3.3 to include wording from 4.3.5.2.

3.4 Change "system designed" to "system designer".

3.5 Revised the paragraph from "Pre-engineered components intended for use as a beam (such as strut channel and truss) shall be limited to the capacities in the component manufacturer's load tables." to "The allowable load on pre-engineered components intended for use as a beam (such as strut channel and truss) shall be determined from the component manufacturer's published load tables and design factors."

3.11 Added "See Annex Reference"

4.2.4 Changed the title to "Other Clamps"

4.3.5.2 Revised some wording in the paragraph. Changed "if applicable" to "as applicable" and removed "intended" in from the phrase "Intended design load"

6.2 Revised the paragraph and removed "Wire rope shall be exempt from this requirement." and added "(e.g. wire rope)"