



ANSI ES1.19-2020, Safety Requirements for Special Event Structures

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Interest category codes

DE = Designer of Events
DR = Equipment Dealer or Rental Company
EQP = Equipment Producer
INS = Event Insurance Company
EVP = Event Producer
G = General interest
PA = Performing Artist
EW = Event Worker

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Foreword

The Event Safety Guide was first published by the Event Safety Alliance in 2014, as a guideline for discourse regarding the many aspects of special event safety. It originated in the UK Health and Safety Executive's *HSG195 "The event safety guide (Second edition) A guide to health, safety and welfare at music and similar events."* where its purple cover subsequently led to its reference as, simply, "*The Purple Guide*". In 2016 the Event Safety Working Group was established within ESTA's Technical Standards Program for the purpose of converting the Event Safety Guide chapters into formally recognized, consensus-based standards that could be universally referenced across special events organizers, producers, enforcement agencies and user-groups. This document is one of many such chapters, intended to be used in conjunction with each other, as a collection of standards, which are used to establish minimum standards for care and public safety for special events. Because event technology and requirements constantly evolve, so too will this collection of standards change and evolve to accommodate industry needs.

It has been assumed in the drafting of this standard that the execution of any design provision is entrusted to appropriately qualified and experienced people, and that any fabrication and use provision is carried out by competent, suitably experienced people and organizations.

This standard presents a coordinated set of rules that may serve as a guide to government and other regulatory bodies and municipal authorities responsible for the guarding and inspection of the equipment within its scope. The suggestions leading to accident prevention are given both as mandatory and advisory provisions; compliance with both types may be required by employers of their employees. Compliance with this Standard does not of itself confer immunity from legal obligations.

This standard is equally applicable in any circumstance where temporary special event structures are used. The risks associated with temporary structures—particularly those installed outdoors—stem directly from basic principles of physics with respects to how the structures are used.

This document uses annex notes to provide additional reference information about certain specific section requirements, concepts, or intent. Subject matter with a corresponding annex note reference is identified by the asterisk (*) symbol, and the associated reference text is found in Appendix A, Commentary, identified with the referring text section number – e.g. an annex note to section 3.2 will be identified in Appendix A, Commentary as A.3.2. The annex notes are informational only, and do not add or subtract from the mandatory requirements of this standard.

Introduction

Many events require temporary structures such as grandstands, stages, scaffold, tent and roof structures. Managing the hazards connected with these structures is just as important as managing other event related hazards, such as fire or electrical shock.

The failure of any temporary structure can have devastating effects. Therefore, it is essential to design and erect structures to suit the specific intended purpose and to recognize that the key to the safety of these structures is largely in the:

- Choice of appropriate design and materials;
- Consultation with design professionals, if necessary
- Correct positioning;
- Proper planning and control of work practices; and
- Careful inspection of the finished product.

This standard provides guidance on principles of safety for temporary structures. It starts with the preliminary decisions that need to be made—choosing the site and appropriate type of structure—and continues beyond to give general guidance on:

- The safety requirements for temporary structures;

- The documentation required (for example, guidance on temporary structure safety requirement listed in Annex C, *Requirements for Outdoor Event Structures, Preparation Checklist*) to ensure that the essential safety requirements are provided; and,
- Advice on operations management of temporary structures for the end user(s).

This standard provides recommendations and guidance useful during planning, procurement, installation/dismantle and operation of the structure.

1 Scope, purpose and application

The scope of this standard covers any temporary structure used for special events ("temporary special event structures"), where such structures are used for presentation, performance, structural support of entertainment technology equipment, audience seating or viewing in conjunction with the event, and regardless if the event is indoor or outdoor.

The scope of this standard covers any such structure not otherwise addressed by existing standards, codes or legislation, and to the extent that such other standards, codes or legislation do not already address conditional use of those temporary structures within existing structures.

1.1 Purpose

The purpose of this document is to identify design, fabrication, operation and use, inspection and maintenance requirements for the structures included in its scope. This document provides general guidelines for structures. It is not meant to replace the advice of a professional engineer or the requirements dictated by the authorities having jurisdiction for the event site.

1.2 Intent

This document is intended for use by both users and enforcement officials in order to help establish and maintain minimum standards for care and public safety during special events. It is not intended for use as a design manual.

1.3 Application

This document is one part of a larger collection of standards relating to special event safety. The requirements of the complete collection shall be considered in relation to the application of this standard, where necessary to coordinate and correlate all related requirements into the scope of a special event.

This document provides guidance and general structural design requirements, but should not be construed as a design manual for the complete structural requirements for any given structure. The application of this standard is relevant to three primary phases of event production*: design, installation/dismantle, and operational use. Applicability of this standard may vary based upon the risks associated with each phase.

1.4 Normative references

The following documents contain requirements relating to the scope of this standard. They are provided for guidance only, unless otherwise referenced specifically elsewhere within this standard. Where a specific version is not given, the version applicable to the event jurisdiction shall be used. European standards are also recommended for review, as they are considered useful references where recognized national standards do not already exist.

- International Fire Code as applicable to the state, local or municipal jurisdiction
- International Building Code as applicable to the state, local or municipal jurisdiction
- ICC 300 (current published edition), *Standard for Bleachers, Folding and Telescopic Seating, and Grandstands*
- NFPA 101 *Life Safety Code, 2015 edition*
- NFPA 102 *Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures, 2016 edition*
- NFPA 140 *Standard on Motion Picture and Television Production Studio Soundstages, Approved Production Facilities, and Production Locations*

- ASCE/SEI 55-16 *Tensile Membrane Structures*
- Euronorm EN13782-2015, *Temporary structures - Tents - Safety* (not applicable to structures smaller than 50 m²)
- *IstructE Temporary Demountable Structures, 4th Edition*
- *Event Safety Guide (v1.1)*
- *ANSI E1.21 (current published edition)*

1.5 Exceptions

Barricades, bollards, security barriers, and other similar devices, whether used for pedestrian or traffic flow control, or for crowd management and security purposes, are excluded from the scope of the standard.

2 Definitions

2.1 anchorage: something that provides a secure hold; to resist a vertical uplift force, a horizontal or lateral force, or combination of forces. The term anchorage shall be construed to include any type of earth-embedded anchor, ballast in the form of dead-weight placed on the erection surface or any fixed point, such as a building or other structure.

2.2 Authority Having Jurisdiction (AHJ): The regulatory agency responsible for enforcement, administration and compliance with any law, rule, code, standard or regulation applicable to the site, structure or event.

2.3 barricade: any barrier or similar boundary demarcation device that is also intended to withstand the forces due to a pedestrian or vehicular load.

2.4 canopy: any open-sided frame having rigid supports, over which a fabric or membrane covering is placed to provide overhead weather protection, branding identity or decoration.

2.5 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 hazards.

2.6 lateral force resisting system (LFRS): that part of a structural system designed to prevent collapse by resisting sideways or horizontal forces applied to the structure.

2.7 membrane structure*: any structure covered with, or comprised primarily of fabric or flexible membrane, whether self-supported by air pressure or supported by a frame of any type, that does not rely on tension in the covering for any part of the lateral force resisting system.

2.8 membrane structure, tensioned: a membrane structure that relies on tension in a fabric or flexible membrane covering for any part of the lateral force resisting system.

2.9 occupancy load: The maximum number of occupants permissible on, within or under the structure during its use.

2.10 platform (stage): any structurally framed surface used to support equipment, scenery or performers, whether for storage or for live performance.

2.11 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.

2.12 registered design professional: An individual who is registered or licensed to practice within their respective design profession as defined by the statutory requirements of the professional registration laws or jurisdiction in which the project is to be constructed.

2.13 shall: denotes a mandatory requirement.

2.14 should: denotes a recommendation.

2.15 stage: see **platform**

2.16 temporary* special events structure: Any structure used for a special event, installed specifically for the event and installed for a period of time not exceeding 180 days. Where used herein, the term “*Temporary Structure*” is construed to mean a **temporary special event structure**.

2.17 tensioned structure: any temporary structure relying on fabric or membrane tension for structural support or stability.

2.18 tent: a generic term referring to any canopy to which a fabric or membrane covering is attached on one or more sides (see membrane structure; membrane structure, tensioned).

2.19 umbrella canopy: any canopy that uses a single, central vertical support, or that uses a number of vertical supports less than the number of corners or quadrants.

3 Essential design requirements

3.1 General

Temporary special event structures used over, under or around public assembly events shall be designed by qualified persons, and shall be evaluated by a registered design professional, to ensure structural capacity and suitability of use in the designated special event environment.

3.1.2 Documentation - Structural description

Temporary structures shall be described by a qualified person. The description shall define the structural support systems used for the design.

3.1.3 Documentation – Structural detailing

Temporary structures shall be documented in a manner that details the components and connections for the structural support system.

3.1.4 Documentation – Limits of use

The description for temporary structures shall include the intended use, and limits of use for the structure.

3.1.5 Documentation – Occupancy and egress

The description for temporary structures shall include occupancy type and classification, maximum number of occupants permitted on or within the structure. Documentation shall show the egress requirements necessary for conforming with the structure’s limits of use, and for conformance with any AHJ egress, exit and evacuation requirements.

3.1.5.1 Occupancy load factors, general. Occupancy load factors shall be determined using methods approved by the AHJ. Use of the specific methods described in 3.1.5.2 and 3.1.5.3 shall be permitted where no specific requirement is provided by the AHJ, and provided that the lowest result shall be used.

3.1.5.2 Occupancy load factors, IFC method. Where the IFC applies to the jurisdiction of use, occupancy load factors shall be determined in accordance with the International Fire Code - 2018 edition, Chapter 10 Means of Egress, Table 1004.2 Maximum Floor Area Allowances Per Occupant.

3.1.5.3 Occupancy load factors, NFPA method. Where NFPA 101 applies to the jurisdiction of use, occupancy load factors shall be determined in accordance with NFPA 101 Life Safety, 2015 edition, Chapter 7 Means of Egress, Table 7.3.1.2 Occupant Load Factor.

3.1.6 Definition of design loads

All anticipated structural loads shall be defined. Anticipated loads shall be construed as including any design loads intended to be accommodated, and any loads required by the applicable design codes adopted by the AHJ.

3.1.6.1 When a structure is designed to meet specific application requirements, those intended requirements shall be defined by the designer.

3.1.6.2 When a structure is evaluated by a registered design professional, all loads and load cases required to be considered by commonly acceptable engineering practice shall be defined.

3.1.6.3 The designer and the registered design professional shall collaborate to ensure that all intended design loads are accommodated by the engineering evaluation.

3.1.6.4 When application design requires the structure to accommodate variable, event-specific live-load cases, the initial structural design shall be templated so that the variations in live-load cases can be evaluated by the registered design professional.

3.1.6.5 When the structure cannot, or is not intended to, accommodate variable, event-specific load cases, such limitations shall be explicitly defined by the designer or by the registered design professional.

3.1.7 Permit submittal and construction documents.*

Where permits are required for construction, use or occupancy of a temporary structure, all documentation required by this standard shall be submitted as part of the permit application. Documents shall be provided in printed or electronic format, scaled and dimensionally accurate at scale.

3.2 Foundations & footings

All temporary structures shall be placed on load-bearing surfaces capable of supporting the structural bearing pressures required by the jurisdiction's applicable building code requirements, and as determined by a registered design professional. Modifications to allowable bearing pressures for temporary structures shall be permitted where the jurisdiction's applicable building code specifically allows modifications relevant to temporary structures.

3.3 Design loads

Vertical, lateral, environmental*, event-specific and other anticipated loads, including structural self-weight, shall be defined and included in the design evaluation of temporary special event structures.

3.4 Lateral force resisting systems

Lateral loads shall be defined and assessed. Details of the lateral force resisting system requirements shall be included in the design evaluation of temporary special event structures.

3.5 Specific system requirements

3.5.1 Stages and platforms

Stages and platforms shall be documented to show conformance with International Building Code or International Fire Code requirements, or with local code and AHJ requirements where different, for capacity, stability, framing, bracing and anchoring requirements.

3.5.1.1 Allowable capacity. Temporary stages and platforms shall be designed for an allowable capacity of not less than 100 PSF for the entire platform surface area.

3.5.1.2 Exceptions.* Lower allowable capacity shall be permitted for special-use platforms with restricted access, where maximum occupancy on the stage or platform is strictly limited to an approved, predetermined number of persons or maximum allowable load. The reduced allowable capacity shall be evaluated by a registered design professional.

3.5.1.3 Stairs and ramps. Stairs and ramps shall meet the requirements as described in this section for stages and platforms.

3.5.1.4 Edge protection*. Edge protection, railings or guardrails for performance stages shall not be required on the platform edge nearest to the audience or performance side, during performance operations. Stage edges, stair edges, and railings, where used, shall be clearly marked.

3.5.1.4.1 The 4" sphere rule shall not be required for enforcement on limited access or restricted access platforms, or on platforms not intended for public assembly access.

3.5.1.4.2 The handrail return rule shall not be required for enforcement on limited access or restricted access platforms, or on platforms not intended for public assembly access.

3.5.1.4.3 Railing or other edge protection systems shall conform to IBC and OSHA requirements, for other edges and work platforms.

3.5.2 Temporary support structures*

All temporary special event structures used for support of entertainment technology equipment shall conform to the requirements of ANSI E1.21, most current published edition.

3.5.3 Tents, canopies and other membrane structures

Tents, canopies, umbrella structures, and other such membrane structures shall be designed in accordance with ASCE/SEI 55 – 16.

3.5.3.1 Tensioned fabric support structures

Tensioned structures shall be designed in accordance with ASCE/SEI 55 – 16, Tensile Membrane Structures.

3.5.3.2 All tensioned fabric and membrane structures not within the scope of ASCE/SEI 55 shall be evaluated for allowable capacities by a registered design professional, using commonly accepted engineering practice.

3.5.3.3 Tensioned fabric and membrane structures – tension criteria

Where tension in fabric or membrane coverings is integral to structural support or stability, the documentation for the structure shall clearly state how the tension criteria is established for analysis purposes, and how the design criteria can be verified, monitored, and maintained while the structure is in use.

3.5.3.4 Non-fabric elements

All non-fabric structural framing, connection and support elements shall be designed in accordance with their respective material's applicable design standards.

3.5.3.5 Loads suspended from tents, canopies and membrane structures

Loads not defined in the application design criteria or in the existing structure's engineering evaluation shall be evaluated by a registered design professional.

3.6 Anchorage*

Anchorage systems shall be designed and approved by a qualified person or by a registered design professional.

3.6.1 Anchorage system capacity documentation

Anchorage system capacity shall be included in construction documents, and in all installation and use documents. Anchorage system documentation shall include all acceptable anchorage configurations, quantities, tension capacities, tension cable angles and connection methods.

3.6.2 Anchorage proof test required

Where anchorage systems rely on soil penetration, anchorages shall be proof-tested at each installation in accordance with the anchorage manufacturer's instructions. Where no manufacturer's instructions exist, the proof load test shall not be less than the anchorage design capacity shown on the construction documents.

3.6.3 Anchorage minimum proof load.

Where anchorages for a single structure require different design capacities, the proof load test shall not be less than the highest anchorage design capacity for the structure. All components used in the connection shall have a rated capacity of not less than the design evaluation loads shown on the construction documents.

4 Site selection and advance planning

Site selection shall be done in accordance with *Event Safety Guide (v1.1)* chapters 2 *Planning and management*, 3 *Major Incident (Emergency) Planning*, and 8 *Venue and site design*. Site locations where structures will be placed shall be evaluated for suitability of soil allowable bearing pressure, hidden or buried utilities or obstructions, emergency vehicle access, egress doorways and pathways, and for required clearance between structures, if any, and if such clearance space includes perimeter lines for stakes, anchorage, or ballast.

4.1 Site selection - size and occupancy load

Sites shall accommodate the anticipated occupancy load. Allowable occupancy load as determined by available space shall be calculated using NFPA or ICC methods as designated by the AHJ. Minimum required space for a specified occupancy load shall be calculated using NFPA or ICC methods as designated by the AHJ.

4.2 Site location

Sites shall be selected and located to provide reasonable access for any technical equipment necessary for erection, use or dismantle. Locations of structures shall not limit emergency access. Emergency access requirements shall be determined in accordance with the event Risk Assessment/Risk Reduction procedures of *Event Safety Guide (v1.1)* chapters 2 *Planning and management*, 3 *Major Incident (Emergency) Planning*, and 8 *Venue and site design*.

4.3 Site layout*

Structures shall be installed at locations according to the site layout as determined by *Event Safety Guide (v1.1)* chapters 2 *Planning and management*, 3 *Major Incident (Emergency) Planning*, and 8 *Venue and site design*. Structure locations shall not deviate from those shown on the site plan unless approved by a qualified person(s).

5 Erection and dismantle

Structural erection and dismantle shall consider and implement reasonable work practices and procedures customary to the work, and in conformance with applicable OSHA workplace safety requirements.

6 Operation and use

Structures shall be operated in conformance with their respective operations management plan, as correlated with or revised by the event-specific requirements.

6.1 Operations Management Plans

Operations management plans (OMP) shall be required.

6.1.1 OMP requirements – engineering limits

The OMP shall define the engineering controls established by design and engineering evaluations.

6.1.2 OMP requirements – administrative controls

The OMP shall define the administrative controls necessary for functional operation of the structure, and shall include all preparedness, alert, mitigation and stop-show/evacuation requirements as determined by the event risk assessment process.*

7 Inspections

7.1 Inspections – general*

Structures shall be inspected prior to first use on any special event. Site-specific inspection criteria shall be approved by the AHJ, but shall at minimum verify that the installed structural systems are as described in **section 3 Essential design requirements** and construction documents, including foundations, baseplates, cribbing (where required), bracing, anchorages, ballasting, guy wires and other components of the lateral force resisting system.

7.2 Types of inspections

The manufacturer and designer shall collaborate to provide inspection types and criteria.

7.3 Frequency of inspections

The manufacturer and designer shall collaborate to provide frequency of each type of inspection.

7.4 Results of inspection

The manufacturer and designer shall provide requirements for documentation of inspections.

8 Maintenance, repair, removal from use

The manufacturer or designer of the structure shall provide written criteria for maintenance, repair and removal from service, for components or for the entire structure, as applicable to the criteria.

8.1 Repairs

The manufacturer and designer shall provide instructions for identifying components for repair, and whether or not such components may be repaired. Unrepairable components shall be clearly marked and removed from service.

8.2 Removal from service

The manufacturer and designer shall provide criteria for identifying components that must be removed from service, and shall further provide instructions for all conditions by which any component removed from service may or may not be placed back into service, whether as a result of inspection, repair or replacement of the component.

Annex A – Supplemental commentary

A1.3 Application, event production phases. The three primary phases of an event are:

DESIGN: In the design phase the specific operational functions and structural criteria are determined. These are the criteria used by the design professional to develop the concept into a functional structure. Good planning facilitates proper design.

INSTALLATION/DISMANTLE: Installation and dismantle are often overlooked aspects of production. To the generally uninformed guest, the event – and all of its associated structures - magically appear 10 minutes before their arrival, and disappear as they depart the event. To the event professional, this phase often represents the most rigorous – and potentially the most dangerous - aspect of their work. For example, site logistics, use of cranes, working at height and personal protection equipment might all factor into the installation and dismantle of an event structure. Good planning for installation and dismantle facilitates safety for the workers, and due diligence for the installed structures.

OPERATIONAL USE: Use of the structure during the event represents the highest risk to public safety. Good planning means safety for the event guest, and good planning should include contingencies for undesired or unanticipated hazards occurring during the event.

A2.7 Membrane structure. Membrane structures is a generic term referring to many different styles of support systems and membrane coverings. The essential distinction between the various styles of membrane structures is in the basic structural support system. Structures that do not rely on any membrane tension for structural stability have a rigid frame support system designed to remain stable, and to withstand loads applied to the membrane covering. These structures may have wire rope or cable guying elements integrated with the membrane, but the membrane is not essential for lateral stability. Frame and clear-span tents are examples of this style. Tensioned membrane structures do rely on the membrane tension for lateral stability. Saddle span structures, pole tents, and cable-supported structures are examples of this style. A simple method to resolve a question about which style of structure is being used is to ask the question: *will removal of any (portion of) the membrane result in a loss of structural stability?* If the answer is “no”, then the structure is simply a membrane structure. If the answer is “yes” then the structure is considered a tensioned membrane structure. The engineering approach to answering the question is to determine if the structural framing and lateral stability system can be fully evaluated and resolved as a brace frame or a moment frame (braced or unbraced). Basic membrane structures are either rigid brace frames, or are moment frames. Tensioned membrane structures are never braced frames, but can be either type of moment frame if the membrane contributes to the moment frame’s resistance to deformation under load.

A2.16 Temporary is defined by the International Code Council as any structure installed for a period of time less than 180 days. However, many local and municipal codes may define the duration for temporary use consideration as a shorter period of time.

A3.1.7 Construction documents. A basic set of documents should meet or exceed code requirements, regardless of what code requirements might indicate. Currently, most codes related to special events have submittal document requirements, but many of them are not explicit about the content of those requirements, nor are they consistent in explicit requirements. Recommended practice for due diligence suggests that there is no such thing as “too much information” with respects to special events. Every procedural aspect of event production can be anticipated, if not templated.

A3.3 Environmental loads. Environmental loads include wind, rain and snow. It is not always necessary to consider all environmental loads in the design of a temporary structure that is not intended to be erected and used in a specific type of environment. For example, snow loads need not be considered if the structure is erected in a warm environment, or is erected during a time of year when snow is not a consideration. Similar considerations apply for seismic design in non-seismic geographic locations. Consideration of wind loads is critically important, because geographic location, terrain type, presence of buildings contributing to wind

funneling effects may all have a significant effect on the magnitude of loads to which a structure may be required to withstand.

A3.5.1.2 Allowable capacity exceptions. When structural capacity is reduced, the event organizer is responsible for limiting the applied loads.

A3.5.1.4 Edge protection. The exceptions for edge protection along the audience viewing edges of the stage are necessary to ensure clear sightlines for the audience. This is included in this standard because the presence of railings and guards inherently demands an evaluation of structural safety. Edge marking, identification and user notification regarding the unprotected edge is not directly related to structural safety, yet those elements remain highly important so that performers and technicians are made aware of their existence prior to actual performance, and can see the marked unprotected edge(s) in low-light conditions. This is also a very important consideration for stair edges.

A3.5.2 Temporary overhead support structures. ANSI E1.21 is available for free download at tsp.esta.org.

A3.6 Anchorage. Anchorage systems include stakes, engineered earth anchors, and ballasting methods of many styles. Earth anchors are generally engineered soil penetration and embedment products, the manufacturers of which typically require a proof load test for validation of load bearing capacity. Such proof test loads are typically not less than 1.5 times the anchor's rated capacity, which will vary depending upon soil geotechnical characteristics. Manufacturers of embedded anchorage systems usually provide a range of capacities, depending upon many site-specific factors. Anchorage capacity should always consider the worst-case geotechnical variables unless such variables can be reasonably limited or excluded altogether based on site-specific evaluation. Proof-load testing is always the best measure for determining the actual, in-situ anchorage capacity.

A4.3 Site layout. Site plans and onsite location of structures are assumed to have considered the location of underground utilities and other such obstructions or limitations in the event planning process prior to installation.

A6.1.2 OMP Administrative controls. The engineering controls and physical limitations of the structure must be established in order to accurately develop administrative and operational controls for operation of the structure. For example, the structure's wind speed capacity must be known in order to establish an appropriate high-wind action plan, in which wind speed triggering thresholds are established for alerts, mitigation actions, stop show and evacuation. All of these actions must be performed at wind speeds below the structure's defined maximum wind speed capacity, unless other limiting safety criteria designates to the contrary. Evacuation(s) of the vicinity of the structure's fall zone should occur when wind speeds exceed 56.3 kilometers per hour [35 miles per hour] 3-second gust.

A7.1 Inspections. Inspections are important in the event production timeline. In general, they cannot be conducted without proper documentation – i.e construction documents – because inspections should be performed using construction documents, and should verify that the erected structure conforms to them. This illustrates the importance of respecting the event production timeline with respects to jurisdictional permitting processes. It also demonstrates the importance of collaborative safety and of the essential need for documentation prior to erection, so that AHJ's and other planning participants can be duly apprised of expectations. Inspection criteria should always consider frequency and severity of the use environment.

Annex B – Overview of participant roles and responsibilities (Example only)

| Entity | Roles and responsibilities | Deliverable |
|--------------------------|---|---|
| Designer | <p>Conceptual design of the structure. Identify desired construction materials. Identify anticipated live loads. Coordination with equipment suppliers and structural engineer. Coordinate with Fabricator for material selections and substitutions if applicable.</p> | <p>Provide drawings and specifications to fabricators, suppliers and installers. Provide documents to structural engineer for analysis and proof of concept.</p> |
| Structural Engineer | <p>Validation of material selections. Analysis of structural design; proof of concept; Identify any analytical failures, coordinate with designer and fabricator to mitigate analytical deficiencies and failures; Coordination with designer for structural safety; Coordination with designer and end-user for OMP requirements.</p> | <p>Inform designer of all analytical failures. Provide signed and sealed engineering documents showing summary of calculations. Provide specific limits of use, and other information required for inclusion in OMP.</p> |
| Manufacturer Fabricator | <p>Construct the physical components of the structure. Fabricate according to design requirements, in accordance with engineering documents. Coordinate achievable tolerances with designer and engineer. Coordinate with others as necessary for OMP requirements.</p> | <p>Communicate structural capacity and limit case information to the purchaser. Identify safety-critical elements that may require inspection. Identify service life and maintenance intervals. Provide installation and use instructions to end user.</p> |
| Supplier Installer | <p>Supplies structure, may also be the installer. Maintain structure's components in good condition. Provide all components as per the Design. Provide competent persons to install safely, if installing. Take reasonable steps to establish the end-use. Inform the End-User if the structure meets their objective. Install safely, using competent persons. May also be the supplier.</p> | <p>Supply and install correctly. Report any deviations from design and engineering documentation. Installation according to the construction documents and manufacturer's instructions.</p> |
| End-User Event Organizer | <p>Operates the structure as part of an event. Obtain necessary Permits. Protect the safety and well-being of participants and event workers. Communicate end-use plan, including details of location, loads, intended occupancy. Ensure ancillary safety features are installed (lighting, signage, security, fire extinguishers etc.). Obtain from the Supplier any information relating to the safe operation of the structure e.g. max wind speed.</p> | <p>Provide a written OMP. Provide resources as necessary to protect public safety. Coordinate the activity of multiple contractors/suppliers on the event site. Provide a written coordinated emergency response plan.</p> |

Annex C – Preparation checklists (example only)

Use these list examples as tools, in conjunction with the specific requirements in this document. Add or delete items as necessary to meet your specific needs.

| Action | Completion Date | Verified |
|---|-----------------|----------|
| 1. Structure assembly drawings | | |
| 2. Stamped engineering calculations | | |
| 3. Rigged component list with description | | |
| 4. Rigging plot overlay on structure | | |
| 5. Site layout drawing | | |
| 6. Permits | | |
| 7. Inspection records of components | | |
| 8. Operations Management Plan | | |
| 9. Local weather service resource established | | |
| 10. Responsible individuals identified | | |
| 11. Pre-event meeting reviewing OMP | | |
| 12. Completion certificate of structure | | |

General:

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|--|----------------------------|
| | RA/RR Matrix as applicable |
|--|----------------------------|

Site plan:

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|--|--|
| | structures identified and correctly keyed to site plan |
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|--|--|
| | emergency vehicle access is shown and marked |
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| | exits and egress pathways are shown and marked |
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| | |
|--|--|
| | proper clearances shown between structures, where required |
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| | |
|--|--|
| | proper safety zones, limited or restricted access zones shown and marked |
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Per structure:

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|--|------------------------|
| | Structural description |
|--|------------------------|

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| | Limits of use (incl max occupancy capacity if applicable) |
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|--|-----------------------|
| | Structure self-weight |
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|--|--|
| | allowable gravity (ancillary) load maximum capacity, if structure is capable of load bearing |
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|--|---|
| | notation that structure is not load bearing if applicable |
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|--|--|
| | Guy wire, anchorage connection details and capacities for LFRS |
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|--|---|
| | Foundation/cribbing capacity and requirements |
|--|---|