International Code of Practice for Entertainment Rigging

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5.0 Lifting Operations (continued)

International Code of Practice for Entertainment Rigging

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International Code of Practice for Entertainment Rigging

Introduction

In response to calls from the international entertainment rigging community, rigging professionals from around the globe have voluntarily collaborated to create this International Code of Practice for Entertainment Rigging (ICOPER).

Recognition and acceptance of this universal code will help promote regulatory harmony and reduce potential conflicts between regions around the world. The resulting improvements in communications and relations with regional and local regulators will be particularly beneficial to those professionals involved in international production.

Acknowledging that regulations and standards differ around the world, ICOPER is not prescriptive, rather it provides a series of guidelines that, if followed, will produce uniformly predictable results and enhance safe practice. Adopting and supporting ICOPER therefore benefits everyone involved in event production.

Mission Statement

The purpose of the International Code of Practice for Entertainment Rigging is to promote awareness and safety worldwide by providing a model code of practice with a focus on arena rigging.

The practices described in the code are intended to provide a universal foundation for those engaged in planning, managing and executing rigging.

ICOPER also provides guidelines for those who wish to develop policy, design training content or help establish certification criteria.

ICOPER – Genesis and Development

Calls from the international rigging community to create a uniform code of practice to serve riggers in all geographic areas first arose at the 2010 PLASA Rigging Conference. Many countries were keen to professionalise what they do and were concerned with international parity.

In response to this, the idea of adapting and applying an existing qualification such as the ETCP or NRC to all geographic areas was explored and found to be impractical due to legislative and educational differences between regions. The conclusion was reached that the global rigging industry would be best served by an International Code of Practice.

In 2013 Michele Enright and Lori Rubinstein from the PLASA Skills Division agreed to undertake the administrative aspects of developing this Code and assembled a group of subject matter experts (SMEs) representing three different regions of the world: Asia Pacific, European Union, and North America. They also contracted with a research firm to undertake a task-based mapping exercise of existing rigging standards and codes of practice from six countries around the world.

The report issued from this exercise stated that “Overall, while there was considerable overlap, there appeared to be significant unevenness in the standards coverage across the different countries. A substantial and important feature that emerged was that there was considerable variation in the weight attached to certain elements of the rigging process by individual countries. In nearly every case, certain elements of knowledge and skills related to rigging were missing, or were not explicitly covered, within documents.”

The SMEs developed a proposed content outline and received feedback on it from attendees at the PLASA Rigging Conference. The chapters were then divided up equally among the three regions to author a first draft. Once a region had completed their draft it was forwarded to the other two regions for comment.

The group discovered that, once an initial draft was completed, their most productive way of working was to meet via WebEx and go through each chapter on a line by line basis so they could discuss in detail and agree on final wording. The group met every four to six weeks for eighteen months for two to three hour sessions, often beginning at 6am in Sydney and 11pm in Amsterdam. The SMEs also completed extensive work between WebEx sessions.

ICOPER – Genesis and Development (continued)

The goal from the start was to achieve consensus on what to include, what constitutes good practice, what level of detail, and what terminology. In particular, the SMEs recognised that different regions use different terminology but, in agreeing on the final wording, the question they continually asked themselves was "Do I understand what it means?" It is hoped that the inclusion of the Glossary will help everyone to understand a common language. The SMEs wanted to approach the document from a "10,000 foot point of view" and a great deal of time was spent in paring down long descriptions or explanations to be as concise as possible.

Once the initial review was completed, the entire document was reviewed again for consistency of practice and terminology. A second group of SMEs from around the world was then asked to review the document and submit their comments. The original SMEs held several additional WebEx meetings to discuss each comment received and determine whether to incorporate the suggested change into the document.

Comments on ICOPER are cordially invited from the rigging community and will be reviewed on a periodic basis for inclusion in future editions. Comments may be sent to icoper@esta.org. We ask you to keep in mind that this document is intended to serve the worldwide community, so references to local legislation and practices, etc., should be appended to your copy of the Code but will not be included in the general consensus document.

When ESTA and PLASA ended their cooperation agreement in 2015, administration of the ICOPER project was undertaken by ESTA. The Boards of Directors of ESTA and PLASA agreed to make ICOPER electronically available at no charge to the worldwide rigging community.

ESTA and PLASA wish to extend their sincerest appreciation to all the SMEs who participated in the process, but particularly to the six individuals who gave so unselfishly of their time and knowledge to author and refine ICOPER for the benefit of all: Nick Barnfield, Tiny Good, Chris Higgs, Ed Kish, Bill Sapsis, and Roy Schilderman.

International Code of Practice for Entertainment Rigging

1.0 Pre-Installation, Planning and Engineering

Sub-Heading	*Index Number*	*Statement*
General	**1.1**	**All temporary rigging installations must be preplanned by a competent person.**
	1.1.1	Accurate drawings depicting the rigging design must be submitted to and approved by the enforcing authority and the venue prior to the commencement of any site work.
	1.1.2	The rigging design and engineering must comply with applicable regulations and standards.
	1.1.3	In cases where the rigging installation exceeds or is not covered by pre-determined limits, the design must be reviewed and approved by a qualified structural engineer with proven experience in entertainment rigging.
	1.1.4	House rigging rules must be complied with and incorporated into the rigging design.
	1.1.5	All critical site conditions affecting the proper execution, integrity and safety of the installation must be site verified prior to submitting rigging design documents for approval.
Documentation	**1.2**	**Rigging plans and documents must include sufficient information to convey the location, magnitude and effect of all rigging forces. Peak dynamic loads must be identified.**
	1.2.1	When appropriate, the location and load capacity of venue rigging members and attachment points must be identified and shown in the rigging design documents.
	1.2.2	The distribution of loads to supporting members and attachment points must be shown in the rigging design documents and plans.
	1.2.3	Venue obstructions which affect the proper execution of the rigging design must be identified and shown in the rigging documents.
Engineering	**1.3**	**All forces, including dynamic loads, must be within the pre-determined limits of the supporting stucture or, in non-conforming cases, approved by a qualified structural engineer.**
	1.3.1	Point loads indicated on rigging documents must include the self-weight of all equipment, crew and performers.
	1.3.2	Consideration must be given to the physical nature of any load with potential for dynamic loading (e.g. equipment containing fluids).

1.0 Pre-Installation, Planning and Engineering (continued)

Engineering (continued)		1.3.3		The behaviour of determinate and indeterminate rigging systems must be considered in the rigging design. (See Appendix A)
		1.3.4		The effects of weather must be accounted for in the rigging documents.
On Site Work	**1.4**			**Methods of access for work at height, fall protection systems and rescue must be designed by a qualified person and deemed to be adequate for the proposed work.**
		1.4.1		Crew and equipment requirements must be determined and agreed upon by all stakeholders prior to the commencement of any site work.
		1.4.2		Venue and temporary electrical service locations and capacities must be verified as adequate for the proposed design.
Risk Assessment and Management	**1.5**			**A risk management plan that mitigates risks to acceptable levels must be authorized by a qualified person prior to commencement of any site work.**
		1.5.1		The plan must be approved and adopted by all stakeholders, including the enforcing authority, prior to the commencement of any site work.
		1.5.2		The risk assessment must specifically identify and consider the risks associated with rigging operations and equipment failure.
			1.5.2.1	When assessing risk of equipment failure, consideration must be given to redundancy in multi-point [3 or more] suspension systems; accounting for the number and load capacity of suspensions.
		1.5.3		The plan must be coordinated with venue or other risk management plans.
		1.5.4		The plan must clearly identify the chain of command and individual responsibilities.
Rescue Plan	**1.6**			**A rescue plan must be developed and documented prior to commencement of any site work.**
		1.6.1		The plan must include contact information for outside emergency responders and medical services providers as agreed by all stakeholders.
		1.6.2		The plan must include the means and methods for communicating emergency information to all stakeholders.
		1.6.3		Rescue personnel must not be exposed to hazards beyond their training and ability when executing the plan.

1.0 Pre-Installation, Planning and Engineering (continued)

Rescue Plan (continued)		1.6.4	The plan must updated to reflect any on site changes.
Weather Related Procedures	**1.7**		**The emergency response plan to the effects of weather should include:**
		1.7.1	Appropriate responses to the effects of weather such as rain, wind, snow, flood and other environmental conditions such as seismic, fire, etc. on the rigging installation.
		1.7.2	The potential effects of weather on indoor rigging systems due to hazards such as open freight doors.

2.0 Drawing Conventions

Introduction	**2.1**		**All rigging work must be carried out in accordance with drawings.**
Title Block	**2.2**		**A Title Block must be used on all drawings and include the following information:**
		2.2.1	Name of the event or act.
		2.2.2	Name of client.
		2.2.3	Name of venue.
		2.2.4	Venue address.
		2.2.5	Name of person reponsible for the rigging design.
		2.2.6	Method for determining weights listed on plan.
		2.2.7	Name and contact information for the supervisor.
		2.2.8	Name and contact information of party responsible for rigging on site.
		2.2.9	Scale used on plan.
		2.2.10	Drawing number and draftsperson.
		2.2.11	Drawing version number and date.
		2.2.12	Drawing status (e.g. concept, approved, etc.).
All Drawings	**2.3**		**All rigging drawings must indicate the following:**
		2.3.1	All rigging points must be indicated by a symbol and a unique alphanumeric designation.
		2.3.2	A key or legend to symbols used on drawings.
		2.3.3	Rigging point symbols should convey information that is essential to the execution of the rigging (e.g. hoist type, capacity, speed, chain length, etc.).
		2.3.4	The datum point (i.e. a defined position that measurements are taken from.)
		2.3.5	For point location purposes, the drawing should utilize cartesian coordinates which reference the datum point. The datum axis lines on the drawing must be labeled for clarity.
		2.3.6	Units of measurement used in association with dimensions, weights and forces on drawings must be clearly identified.
		2.3.7	A scale bar (i.e. a graphic representation of the scale used).
		2.3.8	Required hook height (i.e. distance from venue floor to upper hook).

2.0 Drawing Conventions (continued)

All Drawings (continued)		2.3.9	Location of electrical power supply required for a rigging system including voltage, frequency, single or three phase, amperage, and connection (i.e. four or five wire and connector type, e.g.
Point Specific Information	**2.4**		**Point specific information must be indicated on the drawings or be listed in a supplemental table and should include:**
		2.4.1	Alphanumeric point designation.
		2.4.2	Point location relative to the datum.
		2.4.3	Static load of each point.
		2.4.4	Peak dynamic load of each point.
		2.4.5	Points associated with moving loads, or loads that vary, should have distinguishing symbols or otherwise be identified.
		2.4.6	Total static weight of all rigging.
Venue Specific Drawings	**2.5**		**Drawings that are specific to a particular venue must indicate the following:**
		2.5.1	Venue structural elements including specific anchors that support the rigging.
		2.5.2	Height of venue structural support elements above specified location (e.g. height of beam above venue floor).
		2.5.3	When appropriate, capacity of beams or anchors as specified by facility or engineer of record.
		2.5.4	Overhead obstructions and hazards that are part of the venue (e.g. height of airduct above venue floor).
		2.5.5	In venues where rigging can occur in multiple locations, a key plan should be provided to indicate where rigging is to take place.

3.0 Equipment Selection

Selection	**3.1**		**All equipment must be fit for purpose and comply with applicable standards or be professionally engineered for its intended use.**
		3.1.1	All equipment must be used in accordance with the manufacturers' instructions and recommendations.
Load Capacity	**3.2**		**The selection process for all equipment must consider the highest anticipated load or combination of loads, including dynamic loads.**
Risk Management	**3.3**		**The equipment selection process must take into account all forseeable hazards to which the equipment may be subject.**
Compliance	**3.4**		**All equipment selected must comply with applicable regulations and/or standards.**
Non-Standard Equipment	**3.5**		**In the absence of manufacturers' load ratings and specifications, or applicable regulations and/or standards, a qualified person must review and approve the selection of equipment for its intended use to ensure safety. Non-standard equipment must be provided with necessary markings and documentation to ensure safe use.**
Custom Built Equipment	**3.6**		**All custom built equipment selected for a project must be reviewed and approved by a qualified person. Custom built equipment must be provided with necessary markings and documentation to ensure safe use.**
Traceability	**3.7**		**All equipment must be identifiable and traceable to the manufacturer.**
Marking	**3.8**		**All equipment must be marked to indicate compliance with applicable regulations and/or standards.**
Maintenance	**3.9**		**All equipment must have current compliance with maintenance schedules per manufacturers' requirements and applicable regulations and/or standards at its time of use and for the duration of the event.**
Maintenance Records	**3.10**		**Maintenance records for equipment must be readily available at the time of selection and for the duration of the event.**

4.0 On Site Rigging Work

Tasks and Responsibilities	**4.1**	
	4.1.1	A chain of command must be established and clearly understood by all crew.
	4.1.2	The tasks and responsibilities of each crew member must be clearly defined and documented.
Prior to the Start of Work	**4.2**	
	4.2.1	Crew orientation must take place prior to the start of work.
	4.2.2	Supervisors must verify working conditions and identify new hazards.
	4.2.3	Confirm that all crew have valid licences/permits for the tasks they will undertake as required.
Briefings - Tool Box Talks	**4.3**	**A toolbox talk must be held for every work shift and address the following:**
	4.3.1	General workplace safety and housekeeping.
	4.3.2	Identify hazards, including any specific production hazards, and explain how to manage them.
	4.3.3	Identify supervisors, crew and specific tasks.
	4.3.4	Communicate how the work is to be accomplished.
	4.3.5	Communicate the schedule and end of shift goals and handover procedures.
	4.3.6	Check that all crew have personal protective equipment (PPE) appropriate to the tasks.
	4.3.7	Coordination required between teams.
	4.3.8	Overview of drawings and conventions.
	4.3.9	Overview of communication and radio use.
	4.3.10	Emergency procedures including rescue.
	4.3.11	Malfunctioning or faulty equipment should be clearly marked and quarantined.
On-Going Supervision	**4.4**	
	4.4.1	Supervisors must monitor changing circumstances and conditions, and take appropriate action when needed.
	4.4.2	Supervisors must monitor the physical and mental condition of their crew.
	4.4.3	Supervisors must compensate for and report deviations from the rigging plan or schedule.

4.0 Onsite Rigging Work (continued)

Safe Work	**4.5**		
	4.5.1		All crew must:
		4.5.1.1	Visually check equipment for proper condition.
		4.5.1.2	Malfunctioning or faulty equipment should be clearly marked and quarantined.
		4.5.1.3	Ensure clear communications with crew.
		4.5.1.4	Monitor the environment for changes and new hazards, and react accordingly.
		4.5.1.5	Wear personal protective equipment (PPE) as instructed.
		4.5.1.6	Verify safe condition of work at each stage before proceeding.
	4.5.2		Lead riggers must:
		4.5.2.1	Communicate installation methodology with crew.
		4.5.2.2	Verify the integrity of the rigging connections and the accuracy of point locations.
	4.5.3		Ground riggers must:
		4.5.3.1	Safeguard the ground area below the riggers.
		4.5.3.2	Check the integrity and correct configuration of rigging assembly before tying in.
		4.5.3.3	Guide the rigging assembly as it is pulled up.
	4.5.4		Up riggers must:
		4.5.4.1	Visually check their fall protection systems before use.
		4.5.4.2	Verify the integrity of the rigging connections and communicate when the point is ready to be loaded.
	4.5.5		Persons responsible for rigging power must:
		4.5.5.1	Verify the power supply is appropriate for the equipment being used.
		4.5.5.2	Check all electrical connections for proper functioning, direction of motor rotation, and repair or change equipment as necessary.
		4.5.5.3	Monitor hoist connections, cables, multicores, etc., according to the cable plan.
	4.5.6		Truss crew must:
		4.5.6.1	Assemble trusses according to the truss plan and manufacturers' instructions.
		4.5.6.2	Use connecting hardware according to manufacturers' instructions.

4.0 Onsite Rigging Work (continued)

Secondary Suspensions	**4.6**	
	4.6.1	Secondary suspensions should be avoided if possible and the rigging design should favor redundancy.
	4.6.2	Secondary suspensions, if required, should be installed (at their upper and lower attachments) such that time spent working at height is reduced to the minimum possible while employing the most appropriate means of access.

5.0 Lifting Operations

Prior to Starting Work On Site	**5.1**		**Planning, tasks and responsibilities include:**
		5.1.1	Operations must be planned and coordinated.
		5.1.2	Planning must take into account applicable local regulations and/or standards as well as best practices.
		5.1.3	The capacity of the rigging system, the nature of the load, its weight, and any characteristics that may affect its safe handling must be communicated in the pre-operation briefing.
		5.1.4	Crew involved in the lifting operations must be briefed about the communication methods to be used.
		5.1.5	The communications system design must allow anyone in the immediate area to stop the lifting operation.
Preparing the Equipment	**5.2**		
		5.2.1	All components must be visually checked by a competent person each time they are attached to or removed from a load.
		5.2.2	The integrity of the system must be visually checked prior to every lift and/or series of lifting operations.
		5.2.3	The capacity of the equipment must meet or exceed the design specification in the lifting plan.
		5.2.4	Equipment must be tagged or marked as required by applicable regulations and standards.
		5.2.5	Any item of equipment found to be defective, or suspected of being defective, must be removed from service and quarantined or disposed of immediately to prevent further use.
Attaching the Load	**5.3**		
		5.3.1	The load must be attached to the equipment in a manner that will not allow damage to the load or the equipment.
		5.3.2	The method of attachment must not create forces that exceed the working load limit (WLL) of the equipment or compromise the integrity of the load. Sling angle factors must be considered.
		5.3.3	The method of attachment must prevent sliding or shifting of the load.
		5.3.4	The load must be attached to the equipment in accordance with manufacturer's specifications.
		5.3.5	If components could unintentionally loosen in use they must be secured, e.g. "mousing" shackles.

5.0 Lifting Operations (continued)

Lifting	**5.4**		
		5.4.1	The lifting plan, or order of lifts, is to be understood and adhered to at all times.
		5.4.2	Supervisor and operator must perform a visual check of the system and flight path.
		5.4.3	Provide spotters as necessary to ensure effective visual monitoring of the moving load.
		5.4.4	All lifting operations must be supervised by a competent person.
		5.4.5	The load on the system must be applied or removed gradually in a controlled manner.
		5.4.6	The integrity of the system must be verified after initial "floating" of load.
		5.4.7	Stop the load before landing it to ensure the landing zone is clear.
Trimming	**5.5**		
		5.5.1	All objects must be positioned at trim height according to the lifting plan.
		5.5.2	Method of trimming must ensure appropriate load sharing.
		5.5.3	Method of trimming must avoid repeated dynamic loading.
Load Monitoring	**5.6**		
		5.6.1	The use of load monitoring equipment is recommended.
		5.6.2	The use of load monitoring equipment is highly recommended when performing a multi-point lift or when dynamic loads are involved.
Securing the Load at Trim	**5.7**		
		5.7.1	All rigging systems must ensure the safety of performers, crew and patrons in the event of equipment failure, without compromising the structural integrity of the building. Consideration must be given to redundancy of multi-point [3 or more] suspensions; accounting for the number and load capacity of suspensions.
		5.7.2	Check requirements for secondary suspensions to ensure compliance with applicable regulations and standards.
		5.7.3	Notice must be placed at the control point of a lifting system when secondary suspensions are used.
		5.7.4	Secondary suspensions must have capacity equal to or greater than the primary suspension.

5.0 Lifting Operations (continued)

Securing the Load at Trim (continued)	5.7.5	Secondary suspensions must be taut to avoid shock loading.
	5.7.6	Where possible, secondary suspensions should be attached to a supporting structure independent of the primary suspension.

6.0 Show Rigging Operations

Tasks and Responsibilities	**6.1**		**The supervisor must coordinate with all departments to ensure safe operations.**
	6.1.1		A chain of command must be established and clearly understood by all crew.
	6.1.2		The tasks and responsibilities of each crew member must be clearly defined and documented.
	6.1.3		A system must be in place that gives each crew member the authority to perform or halt activities in their area of control.
Risk Management	**6.2**		**A risk assessment must be carried out and a risk management plan prepared for each task in the show operation.**
	6.2.1		A risk assessment must consider the cast, crew, venue staff, and audience.
Method Statements	**6.3**		**A method statement must be produced for each task in the show operation to include handling of show stops and emergency procedures such as rescues.**
Communications Requirements	**6.4**		**The communications protocol and systems must be designed to ensure safety and smooth show operations:**
	6.4.1		The communications system must accommodate the specific tasks to be performed.
	6.4.2		The communications system must be capable of allowing specific teams to work independently of the main production.
	6.4.3		A clearly defined communications vocabulary must be established to ensure safe operations in the vicinity of moving loads or performers.
Safety Protocols	**6.5**		
	6.5.1		Scene changes:
		6.5.1.1	Scene changes must be rehearsed methodically, progressively adding elements such as show lighting, audio, effects, and cast only when proficiency is achieved.
		6.5.1.2	Scene changes must be rehearsed periodically on longer runs to ensure actual work matches documentation and understanding.
	6.5.2		Performer flying rigging:
		6.5.2.1	Must be operated only by trained crew.
		6.5.2.2	Must include a pre-performance check of all systems and components.

6.0 Show Rigging Operations (continued)

Safety Protocols (continued)

	6.5.2.3	Pre-performance checks must be logged.
	6.5.2.4	Rescue methods for all flying effects must be planned and tested prior to first rehearsal.
	6.5.2.5	Rescue methods for all flying effects must be periodically rehearsed.
6.5.3		Scenic automation and computer controlled effects must have the following safety features:
	6.5.3.1	A press and hold to operate device (dead man handle).
	6.5.3.2	Emergency stop systems (E-stops) as specified by risk assessment.
	6.5.3.3	An operator must always be able to overrride and stop a system regardless of what initiates motion.
	6.5.3.4	The operator must maintain good visual contact with the effect. Alternatively, this could be achieved with a direct camera and monitor system.
	6.5.3.5	A pre-performance check of all systems and components.
	6.5.3.6	Pre-performance checks must be logged.
6.5.4		Potential hazards to safe rigging operation caused by special effects such as pyrotechnics, lasers, stunts, etc., must be considered in the risk assesment:
	6.5.4.1	Reduced visibility.
	6.5.4.2	Operators being unfamiliar with other components of the show.
	6.5.4.3	Special effects that don't have a local safety switch being attached to flying elements.
	6.5.4.4	Increased noise levels.
	6.5.4.5	Special effects residue (heat, smoke, ash, confetti, etc.) with regard to proximity to performers, crew and equipment.
6.5.5		Potential hazards to safe rigging operation caused by water, including ice and steam, must be considered in the risk assessment. Some of the risks may include:
	6.5.5.1	Electrical circuits made unsafe.
	6.5.5.2	The corrosion of metallic items through immersion and/or condensation.
	6.5.5.3	Chemical and biological hazards.
	6.5.5.4	Burning.

6.0 Show Rigging Operations (continued)

Safety Protocols (continued)	6.5.5.5	Drowning, including fluid preventing air from being taken into the lungs.
	6.5.5.6	The effect on trafficable surfaces.

7.0 De-Rigging Work

Tasks and Responsibilities	**7.1**		
	7.1.1		A chain of command must be established and clearly understood by all crew.
	7.1.2		The tasks and responsibilities of each crew member must be clearly defined and documented.
Prior to the Start of Work	**7.2**		
	7.2.1		New crew orientation must take place prior to the start of work.
	7.2.2		Supervisors must verify working conditions and identify new hazards.
Briefings - Tool Box Talks	**7.3**		**A toolbox talk must be held per shift and address the following topics:**
	7.3.1		General workplace safety and housekeeping.
	7.3.2		Hazards.
		7.3.2.1	Identify hazards, including any specific production hazards, and explain how to manage them.
		7.3.2.2	Identify specific preparatory tasks that must be completed prior to any de-rigging.
	7.3.3		Identify supervisors, crew and specific tasks.
	7.3.4		Communicate how the work is to be accomplished and in what order.
	7.3.5		Communicate the schedule and end of shift goals and handover procedures.
	7.3.6		Check that all crew have personal protective equipment (PPE) appropriate to the tasks.
	7.3.7		Coordination required between teams.
	7.3.8		Overview of communication and radio use.
	7.3.9		Emergency procedures including rescue.
	7.3.10		Malfunctioning equipment must be clearly marked.
On-Going Supervision	**7.4**		
	7.4.1		Supervisors must monitor changing circumstances and conditions, and take appropriate action when needed.
	7.4.2		Supervisors must monitor the physical and mental condition of their crew.
	7.4.3		Supervisors must compensate for and report deviations from the de-rigging plan or schedule.

7.0 De-Rigging Work (continued)

Safe Work	**7.5**		
	7.5.1		All crew must:
		7.5.1.1	Visually check equipment for proper condition.
		7.5.1.2	Ensure clear communications.
		7.5.1.3	Monitor the environment for changes and new hazards, and react accordingly.
		7.5.1.4	Wear personal protective equipment (PPE) as instructed.
		7.5.1.5	Verify safe condition of work at each stage before proceeding.
	7.5.2		Ground riggers must:
		7.5.2.1	Safeguard the area below the riggers.
		7.5.2.2	Verify that suspended equipment can be lowered safely and equipment is operating correctly.
		7.5.2.3	Guide the rigging assembly during lowering and landing.
		7.5.2.4	Disassemble and remove equipment as soon as possible to keep work area clear.
	7.5.3		Up riggers must:
		7.5.3.1	Visually check their fall protection systems before use.
		7.5.3.2	Verify that suspended equipment can be lowered safely.
		7.5.3.3	Communicate when each point is ready to be de-rigged.
	7.5.4		Persons responsible for rigging power must:
		7.5.4.1	Verify the power supply is appropriate for the equipment being used.
		7.5.4.2	Check all electrical connections for proper functioning, and repair or change equipment as necessary.
		7.5.4.3	Monitor hoist connections, cables, multicores, etc.
	7.5.5		Truss crew must:
		7.5.5.1	Disassemble trusses and prepare for safe transport according to instructions.
		7.5.5.2	Collect connecting hardware during disassembly.
		7.5.5.3	Ensure good housekeeping is maintained.

8.0 Post Production

Reporting	**8.1**		**A post production report must be prepared by a competent member of the crew and must include:**
		8.1.1	Start and end dates of production.
		8.1.2	Crew involved and their roles.
		8.1.3	Record of pre-operational checks.
		8.1.4	Details of incidents or deficiencies.
		8.1.5	Details of items needing repair or replacement.
		8.1.6	Details of alterations to plans or procedures required during the duration of the production.
		8.1.7	Comments and remarks about the production from crew.
		8.1.8	All documentation pertaining to safety generated for the production must be held in the appropriate location for the period required by applicable regulation.
Gap Training	**8.2**		**Post production evaluation of crew skills and necessary training must be conducted by employer to:**
		8.2.1	Refresh skills.
		8.2.2	Upgrade skills required by new equipment or procedures.
		8.2.3	Upgrade knowledge due to changes in local regulations and/or standards.
		8.2.4	Upgrade skills to conform to industry best practice.

ICOPER – Glossary

Index Number	Term	Definition
2.3.5	Cartesian Coordinates	A system of coordinates that specifies the location of a point in relation to a datum, on 2 or 3 axes.
1.5.4, 4.1.1, 6.1.1, 7.1.1	Chain of Command	The hierarchy of authority that dictates who is in charge of whom, and of whom permission must be asked.
	Code of Practice	A set of written guidelines that explains how people working in a particular profession should plan, manage and execute their work.
6.4	Communications Protocol	A system of rules and etiquette enabling orderly communication amongst multiple users of a communications system.
5.1.5, 6.4.1, 6.4.2	Communications System	A reliable means of communication between parties, typically utilizing wired intercom or two way radios. Video can supplement audio.
1.1, 5.2.1, 5.4.4, 8.1	Competent Person / Competent Personnel	A person who has the knowledge, experience and skill to carry out the task at hand.
3.4, 3.8, 3.9, 5.7.2	Compliance	Conformity with regulations, standards or policies.
2.3.4, 2.3.5, 2.4.2	Datum	A defined point of reference.
2.3.5	Datum Axis Lines	Reference lines that originate at the datum.
6.5.3.1	Dead Man Handle	A switch in an automation system that must be manually engaged to enable the system to operate.
1.3.3	Determinate Rigging System	See Appendix A
1.2, 1.3, 1.3.2, 2.4.4, 3.2, 5.5.3, 5.6.2	Dynamic Load	The increased force that results from changing the speed of an object.
6.5.3.2	Emergency Stop System (E-stop)	An emergency means of stopping the movement of a rigging system to prevent injury or damage.
1.1.1, 1.5.1	Enforcing Authority	The person or entity having the power to enforce regulations, standards or policies.
	Equipment	Rigging hardware and machinery used to move or secure suspended objects.
3.1	Fit for Purpose	Equipment that is appropriate for the intended use.
5.4.2	Flight Path	The space required for unrestricted movement of a lifting system.
5.4.6	Floating	The initial lift of objects to working height.

ICOPER – Glossary (continued)

1.2, 1.3, 2.3.6, 5.3.2, Appendix A	Force	The push or pull on an object resulting from its interaction with another object. Force is characterized by its magnitude, direction and point of application.
8.2	Gap Training	Additional training required to ensure competency.
4.5.3, 7.5.2	Ground Rigger	The person responsible for assembling rigging hardware on the ground and coordination of hauling operations.
1.3.3	Indeterminate Rigging System	See Appendix A
2.3.2	Key or Legend	A section on a drawing that defines the sybmols used in that drawing.
2.5.5	Key Plan	A portion of the drawing that indicates the project specific location within a larger area.
5.2.2, 5.6.2	Lift	The controlled movement of a suspended object.
5.1.4, 5.1.5, 5.2.2, 5.4.4	Lifting Operations	Procedures and actions associated with the controlled movement of a suspended object.
5.2.3, 5.4.1, 5.5.1	Lifting Plan	The order of actions in carrying out a lift or sequence of lifts.
5.7.3	Lifting System	The equipment, controls and objects that comprise a lift.
	Load	See Appendix A. An external applied force. In entertainment rigging, generally, "load" refers to the object or objects to be lifted.
5.3.5	Mousing	Use of wire or other material to prevent the unintentional opening of a connector or hook.
2.5.4	Overhead Obstruction	An object that blocks the intended flight path of a lift.
6.5.2	Performer Flying	Suspending or moving a performer using a rigging system.
1.3.1	Point Load	A concentrated load applied at a single location.
4.6.2, 5.7.4, 5.7.6	Primary Suspension	The minimum number of suspension points required to support the load as dictated by the rigging design. See also "Redundancy."
1.4, 1.5, 3.5, 3.6	Qualified Person	A person who has the professional credentials required to solve or resolve problems relating to the subject matter.

ICOPER – Glossary (continued)

Appendix A	Reaction Forces	(See illustration in Appendix A) Equal and opposite forces that occur at the suspension point(s) in a structure that prevent an object's motion (e.g. the reactions to a load applied to a beam, occur at the beam supports).
1.5.2.1, 4.6.1, 5.7.1	Redundancy	The use of additional suspension points that share load to safeguard against a suspension failure.
1.1.2, 3.4, 3.5, 3.8, 3.9, 5.1.2, 5.2.4, 5.7.2, 8.1.8, 8.2.3	Regulation	A governmental order having the force of law.
	Rigging	The installation, use and removal of equipment to move, suspend or secure objects.
4.5.3.2, 4.5.3.3, 7.5.2.3	Rigging Assembly	A combination of hardware that is connected together.
2.3.1	Rigging Points	The connection of concentrated loads to a support structure according to the rigging plan.
1.3.3, 1.7.2, 2.3.9, 5.1.3, 5.7.1	Rigging System	Any equipment used for suspension below the supporting stucture.
1.5, 1.5.2, 6.2, 6.2.1, 6.5.3.2, 6.5.5	Risk Assessment	A formal process used to identify hazards and mitigate risk.
1.5, 1.5.3, 6.2	Risk Management Plan	A document detailing procedures to ensure the ongoing identification of hazards and mitigation of risk.
2.2.9, 2.3.7	Scale	The ratio of measurements used to represent objects on a drawing to their actual size.
4.6, 4.6.1, 4.6.2, 5.7.2, 5.7.3, 5.7.4, 5.7.5, 5.7.6	Secondary Suspension	Additional rigging used to support the load in case of equipment failure.
5.7.5	Shock Loading	The extreme surge in force associated with sudden impact.
5.3.2	Sling Angle Factors	Multipliers that account for increased forces in slings when they are not vertical.
6.5.4, 6.5.4.3, 6.5.4.5	Special Effects	Elements used to enhance an event (e.g. fog, laser, pyrotechnics, water, performer flying, stunts, etc.).
1.4.1, 1.5.1, 1.6.1, 1.6.2	Stakeholder	A person or organization who can affect, or is affected by, an action, decision or policy.

ICOPER – Glossary (continued)

1.1.2, 2.3.4, 3.1, 3.4, 3.5, 3.8, 3.9, 5.1.2, 5.2.4, 5.7.2, 8.2.3	Standard	A document that provides rules or guidelines to achieve a desired, consistent outcome.
2.4.3	Static Load	The constant force associated with a stationary object.
5.7.1	Structural Integrity	The ability of a structure to remain intact and stable under load.
2.2.7, 4.2.2, 4.3.3, 4.4.1, 4.4.2, 4.4.3, 5.4.2, 6.1, 7.2.2, 7.3.3, 7.4.1, 7.4.2, 7.4.3	Supervisor	The person responsible for overseeing the proper execution of a task.
3.5.2.1, 6.6, 6.6.1, 6.6.2, 7.7.1, 7.7.2, 7.7.3, 7.7.4, 7.7.5, 7.7.6, Appendix A	Suspension	The equipment in the load path that supports the load.
2.2	Title Block	A portion of a drawing that identifies the drawing contents.
5.5.1	Trim Height	Vertical distance from a datum to a specified point on a suspended object.
4.5.4, 7.5.3	Up Rigger	A rigger who carries out rigging work at height.
1.3.1, 2.2.6, 2.3.6, 2.4.6, 5.1.3	Weight	The effect of gravity on a static object.
5.3.2	Working Load Limit (WLL)	The maximum allowable load to be applied to a lifting component as specified by the manufacturer.

Appendix A – Determinate and Indeterminate Rigging Systems

It is important for riggers to have an understanding of the nature and behavior of Determinate and Indeterminate rigging systems when designing rigging and operating equipment. A brief description of these two systems and related terminology follows:

Determinate Rigging Systems

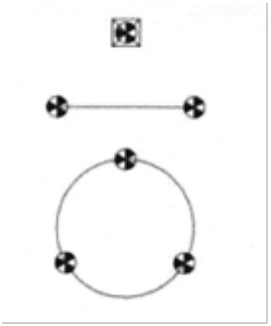
Definition:

A rigging system which has the minimum number of primary suspension points required to support the load.

Characteristics:

- Reaction forces are predictable and can be calculated using basic mathematical equations.
- By definition and for purposes of calculation they do not have redundant suspensions.
- Variations in an object's lift height caused by operating one or more hoists in a group will not result in unpredictable or large changes in reaction forces.

Examples:



Single point

Two points on truss

Three points on truss circle grid or PA bumper

(Above examples assume adequate support is provided.)

Appendix A (continued)

Indeterminate Rigging Systems

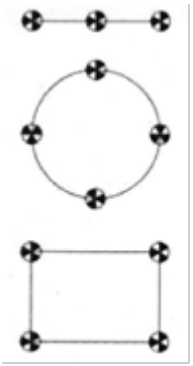
Definition:

A rigging system which has more primary suspensions than required to support the load.

Characteristics:

- Reaction forces can only be calculated using complex analytical methods.
- Small variations in lift height can produce potentially dangerous variations in reaction forces.
- Reaction forces must be verified on site using load monitoring equipment.
- The number of suspensions in an indeterminate system can provide redundancy, making it possible for a suspension failure to occur without causing collapse of the rigging system. Shock loads must be considered.

Examples:



Three or more points on truss

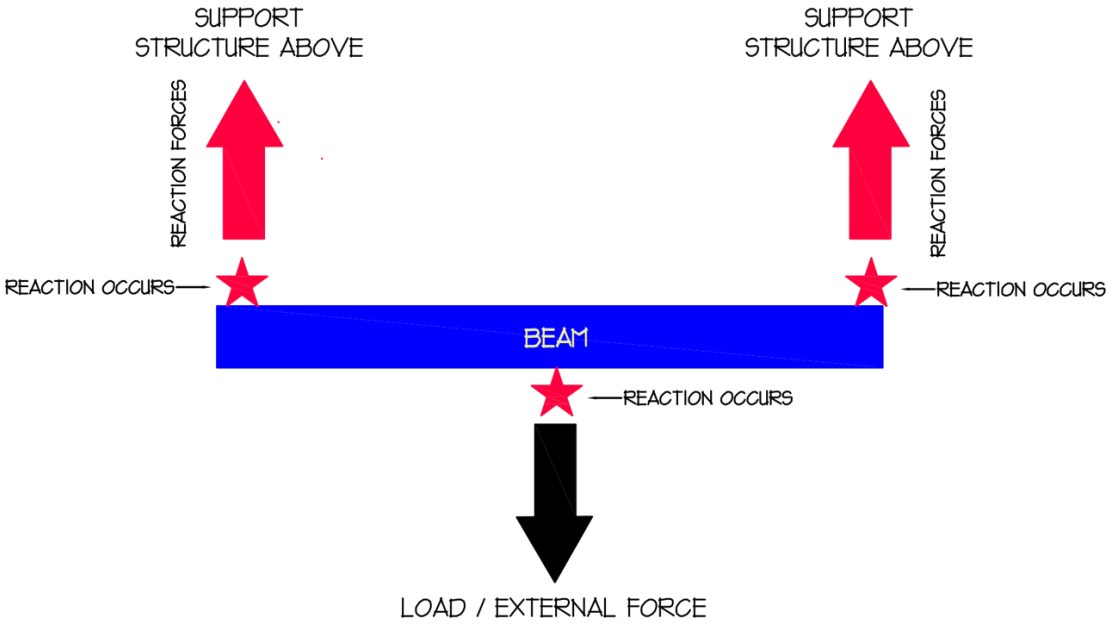
Four points on truss circle grid

Four points on truss grid

(In the examples above, it may be theoretically possible to remove one suspension and have the objects remain stable. In practice, adequate support must be provided to ensure stability.)

Appendix A (continued)

Reaction Forces



Regional Comparison of Terms Regarding Standards

Term	Description	Australia	European Union	New Zealand	United Kingdom	United States
Legislation / Regulation	Law enacted by government.	Legally required.	Legally required.	Legally required.	Legally required.	Legally required.
Standard	A consensus document drafted by industry using a formal process.	Not mandatory but legally referenced. Compliance required if referenced in legislation.	Equal to Norm. Not mandatory but legally referenced. Compliance required if referenced in legislation.	Not mandatory but legally referenced. Compliance required if referenced in legislation.	Not mandatory but legally referenced. Compliance required if referenced in legislation.	Not mandatory but legally referenced. Compliance required if referenced in legislation.
Norm	European equivalent of standard.	Term not generally used.	Compliance required if referenced in legislation.	Term not generally used.	Term not generally used.	Term not generally used.
Approved Code of Practice	Approved by government agency or a recognized standards administrator.	Not mandatory but legally referenced.	Has legal status.	Not mandatory but legally referenced.	Has legal status.	Not mandatory but legally referenced.
Code of Practice **Good Working Practice** **Safe Working Practice**	A consensus document drafted by industry offering good practice guidelines.	Not mandatory but may be legally referenced.	Not mandatory but may be legally referenced.	Not mandatory but may be legally referenced.	Not mandatory but may be legally referenced.	Not mandatory but may be legally referenced.

Users of this document are recommended to source and note the references for legislation/standards/norms/codes of practice applicable for your region. Be aware that these may be updated from time to time by the issuer and you will need to update your references accordingly. Some areas to consider: hoists, lifting equipment, aluminum structures, plant/machinery, working at height, fall protection, site induction, and safe work.