

PLASA Rigging Conference 2011

On 12 and 13th September a rigging conference was held during the PLASA exhibition in Earls Court, London. The format of the program was similar to the one in 2010 when it was held for the first time. In two day's time about 10 speakers from various companies and organizations gave interesting presentations about technical matters, structural problems, large scale shows, insurance and legislation issues, and more about the national rigging certificate (NRC). Every presentation took about 45 minutes, and there was about 15 minutes to ask questions or to elaborate on the topic. A panel of up to 5 persons who had experience in the topic sat on stage too, to give more background to it.

Unfortunately about 80% of the speakers was UK or US based, apparently the focus of PLASA is more on the UK and US than on Europe and the rest of the world. We surely missed a list of attendants and the various countries they came from. A great improvement compared to last year was that all presentations were available digitally to all those attending the conference. So even quite scientific or complex presentations could be studied afterwards and understood.

Sunday 12 September

The conference had a kick-off on Sunday afternoon, with a forum. Only one speaker gave a lecture and the rest of the afternoon was for discussions and questions that came from the audience. (Unfortunately I did not make notes on Sunday, so writing about it was a bit from tossing with the gray matter..)

13:30 FREE BEERS AND SNACKS

For starters we had some delicious sausage-mashed-potato-thingy and shrimpy-dimpies with some extraordinary free beers.. a warm welcome indeed!

14:00 WHO'S IN CHARGE?

- *Michael Anderson, Group Head of Health & Safety for Earls Court & Olympia Venues*

Michael presented the responsibility chain problem: who is actually in charge, and who takes (or gets) the blame when something goes wrong? Like always: it's the riggers responsibility to make a proper lifting plan, but on the other hand it's the promoters responsibility to hire a rigger that does just that, and the venue's responsibility (and liability) to check that the promotor actually takes that responsibility. But who says it is? Where is it written? And what would a judge conclude...?

15:00 YOUR TURN

- *Mark Surtees, Outback Rigging, Managing Director*

It was our turn now to start the questions, Mark led it all, with a backup panel.

Some of the questions discussed:

- What if you give someone advise, and thing do go wrong, are you liable? Answer to this lies in how you put the wording: if you write or say "you should" or even "you shall" the other has no choice but this only option; it's not his responsibility any longer in making that choice. If you give him or her some sensible suggestions, preferably in a discussion with him or her, the responsibility is much more shared.
- If you're a good grounder but are afraid of heights, you can never get NRC (PLASA) Rigging Certificate, because you need to climb for that: can we have a grounder certificate? This is important because more and more venues are demanding for a certificate when you're going to rig up there. Some representatives of venues replied they can only demand that for the climbing riggers, not for other workers, and that the NRC specifically is set-up for working at heights. At the moment there no plans for a grounder certificate.
- Should we have a world-wide or maybe European riggers association? Many attendants thought that some kind of international association would be a good idea. Note: in the Netherlands we have ARGH! (www.argh.nl) and at the conference we heard there is one in Portugal as well.
- Can we have a place where all the info and local standards are digitally stashed, so we can find them easily?

Monday 13 September

The conference itself was on Monday and Tuesday, and here's our little summary:

09:00 Welcome & introduction

- *Matthew Griffiths, CEO, PLASA*

- *Chris Higgs, Rigging Training Manager, Total Solutions Group*

Matthew opened the Conference, with a slight sour throat from all the speeches he had been giving already. Matthew and Chris welcomed us all, and thanked us for coming from far, and for the fact we came with so many of us, although we had the impression there were less people than last year. But with so many again showing serious interest in the issues of rigging a head count might not be the most important thing.

09:15 Opening presentation: The House of Dancing Water

- *Steve Colley, Steve Colley Associates*

- *Abigail Matthews, Director, Momentum Engineering*

Steve Colley presented the complete design, preparation and build up of the large scale water show in Macau, created and directed by Franco Dragone. Steve had been involved as head of rigging and rigging automation. The "in the round" theatre for this show was specially build for it, rehearsals and trials had been done in Belgium in an industry building. The show has performers flying, acrobats and acrobatic divers, a

flying human chandelier, and one of the really astonishing elements is a pirate ship that is hidden under water, and comes to surface on a large elevator that is placed in the water basin. For this about twenty riggers had to learn to scuba dive..!

To avoid show elements 'colliding' with each other 3-D visualizations were made to make sure that tracks, performer fly paths and other machinery would not interfere with each other. One of the biggest safety issues was all the languages that came together: everyday a tool-box meeting was held, and for each small rigging job a short risk analysis was made, and all the data was put into a database. And the database was accessible for every discipline. Furthermore: everyone took his own ways of working and legislation with him.. and for that an international 'code of practice for rigging' would have been very convenient!

Here's a link to a [technical description](#) done by Stage Technologies, who were involved in the automation.

Abigail Matthews presented some of the engineering problems they faced, like the human chandelier that could carry about 20 acrobats. Calculations would have made this chandelier much too heavy, so they made a prototype with strain gauges and researched it with all kinds of acrobat movements. With the results of these measurements they were able to make it much lighter. But also the building itself, as delivered by the builder, gave some headaches. And about 600-700 meters of S52 truss and heaps of corner blocks were needed to 'make it work' in roof of in the rehearsal building.

11:00 COMMON PRACTICE?

- *Cristiano Giavedoni, General Manager CMCO Entertainment EMEA*

This was one of the talks everybody had paid his ticket for, anxiously awaiting the funny drawings by Cristiano of rigger Mario getting tangled in the European laws and local rules... It was very entertaining and informative again.

He started off with asking the questions like:

- Are there rigging standards?
- What certification programs are already set up?
- Are there common rules?
- Do we need common rules, codes of practices?
- Do we need.. what? Are there any standards available for us to use, since standards (*NL: "normen", DE: "Normen", ENG: "standards", FR: "normes"..*) are not written for the purpose of *use*, but for *design and manufacturing*.

Cristiano travelled with Mario through Europe and found e.g. the Dutch code of practice *NPR 8020-13 Rigging plan*, that lays out the necessary contents of a proper rigging plan, consisting of a loading plan (- plot), bridle plan, truss plan and cable plan. In the UK the *BS 7906 Use of lifting equipment (part 1: use of lifting equipment, part 2: use of truss)* is used; in Germany the *SQ P1 - Truss and SQ P2 - Chain hoist* is used in the entertainment for the use of chain hoists and that has its British counterpart in the *BSR E1 .2 and .3 about Hoists*.

Brakes, bombs and.. statistics: consider one terrorist taking a bomb on a plane, and a second terrorist taking a second bomb. Does the second bomber make the chance of dying bigger? After some juggling with words and figures, Cristiano argues "no". Making a second brake on a chain hoist.. unnecessary! This was a very interesting explanation, that went a little to fast unfortunately.

Cristiano argues that we need a (or "one") *standard first*, and from that we can develop a *common (read: "EN" or "ISO") code of practice*. An international standard will bring us a plain field, like the EU Machine Directive gives an economical plain field for trade and manufacturing within the EU. The international codes of practice will give us the rules of the game; interpretation of the standard toward different applications and use of various lifting equipment. Furthermore, codes of practice are not mend for large scale installations like the one in Macau, but for everyday use.

12:30 RIGGING QUALIFICATIONS - AN UPDATE

- *Matthew Griffiths (PLASA)*

Matthew gives us an update on the two 'atlantic' certification programs: the NRC (National Rigging Certificate, PLASA) and ETCP-Rigger (Entertainment Technician Certification Program, ESTA). The two organizations officially have merged last January, and question is how the two programs will continue in the future. The ETCP has emphasis on preparation and calculation, and the NRC is largely based on the hazards of working at heights.

First Matthew elaborates about the character of the NRC: it is a certificate aimed at climbing riggers, who should be able to do calculations on bridles and reaction forces and have knowledge and experience in slinging methods. Level 1 and 4 still are under construction.

At the moment the ETCP and NRC are laid side by side for comparison, it's still in early stage of merging. And apart from that the ETCP rigging program is undergoing its first revision.

Following up the discussion about a grounder certificate, Matthew points out that it is a wish to elaborate on various topics, and perhaps split things up a bit. The original setup of the NRC is modular, as to be able to leave things out or add in the future.

14:00 DON'T FORGET TO CLIP ON...

- *Chris Blakeley, V,axess Petzl, Director*

Chris Blakeley is director of the Petzl research centre in France. He gave us a very informative talk on how things work when considering the impact of a fall: on the material, as well as on the human body.

One of the recent research topics is the impact on materials and the human body when the weight is 100 kilograms or more. Since PPE is more and more used, more and more heavy workers are using them.

The force always seemed a limiting factor: 6 kN was accepted as a maximum force that a human body could handle. But compared to a heavy person, a lighter person suffers from a bigger impact at the same force, a bigger G-factor. Roughly: 6 kN is 5G for a 120 kg person, but 10G for a 60 kg person. 3G is what a normal person can handle, 6-7G is fighter plane pilot stuff. So nowadays researchers are comparing two things when considering a fall arrest: the well known 6 kN and 6 kJ ("Joules") of energy.

- 6 kN is considered the maximum *FORCE* to keep your *gear* intact
- 6 kJ is considered the maximum *ENERGY* to keep a *human body* 'healthy'

"Doctor Petzl" had quite a long row of riggers having questions, after the lecture. It was a very interesting talk: technical, but very clear.

15:30 THOUGHT YOU WERE A RIGGER?

WHERE'S YOUR HARNESS?

- *Steve 'Nippy' Williams, Nippy Industries, Managing Director*

Well, this was one of the talks that ehh, was 'interesting'. Nippy made everyone look underdressed, but perhaps he was only showing a new type of fall arrest suit and safety shoes... Well let me first stick to the facts. Steve is a IRATE level 3 climber, and has been training 2 years for the last 12 years he's been involved in industrial climbing.

In short, he pointed out an accident is never just an accident when working at height, there is never a simple save way to get a wounded person into an ambulance. And that makes it necessary to have first aid at hand, that's always needed before you belay or even move a casualty.

And what do you need? Bespoke rescue kits is not his thing.. he prefers a simple gear like every IRATA level 1 is equipped with. Imaginable, since gear is easily used by others in that case, ripping gear from a unconscious colleague you're not used to handle is maybe not so wise. And.. a "piece of string, you can do anything with that!"

Well, if he talks that as much during a rescue as he did at the conference .. belaying won't be a problem and first aid unnecessary. Of course each accident needs an assessment first, before moving the wounded. And training is never enough. But, considering the fact that little accidents happen in our line of work, the small equation $Risk = Probability \times Effect$ has quite a tiny result. We should try to keep it that way, but does this much IRATA-ism help us while trying to do our daily work in a safe way? His remark about using simple cardboard to restrain a broken arm clearly underlines his improvisation talents, but it seems to us he'd better spend more of his time to accident prevention!

And, since Nippy has been seated in many standards committees, and was and is highly involved in the NRC, it was awkward to hear him say 'I don't care about standards'... it made his whole story about rope rescue a bit like 'cowboy tell tailing'.

16:15 WORK AT HEIGHT; ANOTHER PERSPECTIVE

- *Ted Moore, Stage Technologies, Director of rental services*

Ted Moore elaborated on the subject of performer flying in both smaller and larger scale shows. Stage Technologies had done the automation for the Macau show, sadly he did not give us a vivid background on the very interesting talk Steve Colley gave earlier.

Ted would like to see a performer flying standard, strangely enough not referring to the one that the ABTT already provided in the 1990-s. A presentation with that much of clear corners being cut was unworthy of the title and of the company it was representing.

So unfortunately the last two presentations did not contribute to the

17:00 Closing of the day

Tuesday 14 September

09:00 SERIAL KILLER?

- *Derrick Bailes, former Lifting Equipment Engineers Association (LEEA)*

Derrick is also member of the technical committee at CEN and ISO that deals with all types of sling and lifting accessories. His presentation had a strange title for a topic which had raised so much turbulence at last years conference, perhaps it was just to get us 'interested'.

Derrick gave us a few interesting views on lifting accessories and the EU Machine Directive. First he pointed that since the "new approach" the Directives are transformed in the direction of risk: the point to possible risks that manufacturers shall deal with, and do no longer prescribe how manufacturers shall "make it". Thus it leaves much more room for improvements and technical progress.

Excluded from the scope of the Machine Directive are, in Derrick's view:

- components, unless also a lifting accessory - *we cannot find this exclusion however*
- cuts of lengths of rope, chain and webbings - *neither specifically mentioned as such*
- structures without lifting machinery (e.g. truss portals) - *being pretty obvious as the MD does deal with machines, machinery and machine accessories only*

STAC chain

The STAC chain and similar high grade long link chains, also under the generic name of 'deck chain', is widely used, and until Derrick's talk it seemed forbidden to use in bridles, but the Machine Directive states:

Article 2 - Definitions

(d) *'lifting accessory'* means a component or equipment not attached to the lifting machinery, allowing the load to be held, which is placed between the machinery and the load or on the load itself, or which is intended to constitute an integral part of the load and which is independently placed on the market; slings and their components are also regarded as lifting accessories;

(editors: *lifting equipment* is the overall term: it comprises *lifting accessories*: shackles, steel wire slings, eye-bolts etc and *lifting machinery*: lifting-"machines", also hand driven, Derrick elaborated on some commonly used UK terms and specified them in his powerpoint.)

That means that everything above the hoist is not considered as a lifting accessory, quite ridiculous perhaps, since it can be the same wire rope sling in a leg, or even a STAC chain. But still, it means STAC chain is excluded from the scope of the Machine Directive in case we use it in the bridle above the hoist, since it's not placed between the lifting machinery and the load.

In the UK STAC chain is allowed by LOLER when:

- it is used as part of the load
- or it is used as part of the supporting structure for the hoist

An other topic Derrick addressed was second hand equipment. When it is imported into the EU it *also* shall have an accompanying II-A declaration of conformity, user manual etc. In many times it's not the case.

And he answered the frequently asked question "is truss a lifting accessory?". Clearly the manufacturer sells single parts, and the *user assembles* single parts into *temporary arrangements*. In his opinion a single module used as such is a *lifting beam*.

The discussion that followed was - of course - about serial numbers in shackles. We all feel it's b.s. to put a serial on a shackle: the shackles never are the problem. The whole issue is clearly is an inspectors thing, they simply cannot put their signature on it, when it's not "serialized". One of the comments was: 'why bother about the serial on shackles, they never break or deform.. What about the truss, there are so many sections without serial number; and they do bend, deform, break, get crush and so forth!'

As the Machinery Directive has shifted to a "new approach" a general feeling was that our business also should deal with the serious risk related matters first.

In our opinion: inspect them every year and spray them newly with you company color: if something goes wrong with a shackle it can have two reasons:

- we overloaded it - in that case we can obviously see that because the attached steel wire rope will have a thimble that will not resemble a pear anymore, but will be elongated: throw away the shackle, steel wire rope (and a lot of truss!) and inspect other lifting equipment involved (hooks of chain hoists etc) We don't need a serial number in this case.
- if there was a hidden problem in the shackle and it would unexpectedly brake in pieces, we should send half of it to the manufacturer (and the casualties to the hospital etc) In this case the batch code is needed, to have a recall.

11:00 IT'S GOT TWO BRAKES - IT MUST BE SAFER!

- Matthias Müller, Hoffmann Fördertechnik GmbH, Engineering Manager

Matthias gave us an insight in hoist safety from an engineering point of view. It was a bit to technical for most of us, but being an engineer myself I found it quite interesting how a hoist manufacturer has to design, calculate and test parts of a hoist like shafts, gears, breaks etc.

First he gave us a reminder how things legally work with Directives, standards, norms etc, because there still is a lot of confusion about it. And e.g. the the German legal system is quite different from many other EU nations. BGV-C1/D8, CWA 15902, BS 7906 etc come by, with a remark on the BS 7906-1 that it is not consistent with the current FEM standards. (EU lifting machinery manufacturers; FEM is not an official Legal body within the EU by the way, just as PLASA isn't or ARGH!)

Matthias gave us insight in what loading up to the WLL and loading to only half of that means for the lifetime of parts of the hoist. Consider the following equation:

$$L = \left(\frac{C}{P}\right)^3 \quad L = \text{Lifetime}, C = \text{Allowable Load}, P = \text{Applied Load}$$

When we only apply half of the allowed load, the lifetime will increase with $(1/2)^3 = 8$. If we only use 0.8 x WLL, the lifetime is doubled.

Chain hoists are tested by the way with a minimum of 400 hours at WLL.

Matthias made some interesting statements:

- Safety Factor of 8 for chain in chain hoists is ok for him / Liftket, this factor currently is used in the BS standard - but 10 is still required by the EU standard EN 818-7 (Annex B), with selection criteria from ISO 4301-1.
- And, last, but certainly not least: **a double break is**, from the manufacturers point of view, **not necessary for a chain hoist** - anything can happen: chain can break, shaft can break, gear can break, all not covered by the second brake. Other manufacturers in the panel did agree with him! (Cristiano Giavedoni - CM, Jerome Goualt - Verlinde) And Dave Weatherhead from Kinesys Controls also pointed out that from a control manufacturer perspective a second brake doesn't always make that much sense.

12:30 HOIST FAILURE UPDATE

- Ron Bonner, PLASA, Technical Resources Manager

Ron Bonner had send a questionnaire a few months before the conference. Astonishingly xx people had answered him an some very nice figures came out from it.

Response	
Total Questionnaires returned	134
Riggers	91
Non- Riggers	43
Total number of years experience – Riggers	1,481 years
Total number of years experience – Non-Riggers	853 years
Grand total of experience from the respondents	2,334 years

Results	
Failures witnessed by Riggers	53 (853 years)
Riggers never seeing a failure	38 (623 years)
	<i>1,481 years experience</i>
Failures witnessed by Non- Riggers	13 (236 years)
Non Riggers never seeing a failure	30 (617 years)
	<i>853 years experience</i>

Types of failures: Brakes	
Failures witnessed by Riggers	11
Failures witnessed by None Riggers	2

How many CH are out there? Estimate of 100,000 CH placed on the market in the last 5 years adding to the stock of older units which equals:

typical comments:

“brake & clutch failed on old style XXXX hoist, the load was only 1ft off the ground and not fully loaded. these hoists were however notorious for having clutch issues.

“Many years ago, a XXXX failed to hold the load of a cable pick whilst being lifted, the hoist slipped approximately 1' whilst being lifted.”

“In the case of the XXXX the load shifted to the other point. Which managed the extra load, as far as I could see.”

Types of failures: Clutch	
Failures witnessed by Riggers	17
Failures witnessed by none Riggers	5

typical comments:

"Rigging PA hangs in Millennium Stadium. Load got off the ground then the hoist started to slip, (note load was no more 600kg on 1t XXXX), so we swapped it out."

"Pre-rigged Master grid Motor: a 1 ton motor was placed (and no safety) where a 2 ton was needed. The touring rigger still applied the full load. The clutch failed in obvious overload."

"Only ever seen a failure once. Directly attributed to over loading the SWL by 300kg on a very old 1ton XXXX."

Types of failures: Chain	
Failures witnessed by Riggers	15
Failures witnessed by none Riggers	4

typical comments:

"LED screen came down after the initial failure of one chain transferred the weight of the whole screen onto one hoist only. Chain failure later on proved to be due to hydrogen embrittlement."

"The chain link snapped on the live end of the chain. Motor and PA came crashing down"

" A chain broke on a hoist. The other hoist was not able to take all of the load and started to slip. But the excess chain wasn't in a bag but knotted to the catwalk. So that did snap as well - with the 300 000 Euros screen in bits-n-pieces."

Types of failures: Hook	
Failures witnessed by Riggers	7
Failures witnessed by none Riggers	5

typical comments:

"The sound company 'rigger' had taken the hook off, to bring the chain through a small slot,~ but forgot to put all 4 bolts back in, and did only 2 more or less. With the PA system on it failed when approx 1 m of the floor."

Types of failures: other reasons	
Failures witnessed by Riggers	20 (highest score)
Failures witnessed by none Riggers	4

typical comments:

"Control system failure, motor ran without being enabled by control. System had yet to be raised to trim. Power pulled from motor, stopping motor, before damage could be done to truss."

"loose wires internally is the common cause; vibration and hard travel is usual suspect in these issues. Common result of failure is load stops moving."

Types of failures: unknown	
Failures witnessed by Riggers	3
Failures witnessed by None Riggers	3

typical comments:

At about 15' up motor started coming down on it's own wouldn't stop. I unplugged to stop, No one on site knew how this could of happen, all swore they hooked up clip for whips. Once down unplugged, back in shop was unable to make motor repeat problem

Summary	
Brake failures	13
Clutch failures	22
Chain failures	19
Hook failures	12
Other types of failures	24
Reason for failure never identified	6
Total 93 failures over 2,334 years of experience or 851,910 days	
1 failure for every 9,160 days	
Fatalities from falling rigging/equipment due to failure	0
Injuries from falling rigging/equipment due to failure	4

Conclusions from the questionnaire

- There were no fatalities due to CH failures and Injuries are few (thankfully)
- There are failures! But hoists appear to be reliable if serviced, inspected and used correctly and there are a lot of them!
- Number of multiple point rigs (>3) that fell as a result of failure = 0

- The more serious failures tended to be due to poor servicing/maintenance or human error

The results brought a lot of clamor in the conference room: for the more experienced riggers it wasn't that surprising, but still: it was nice to have 'some evidence'.

And looking at the comments, most of the brake failures appeared to be other failures, contributing to our thoughts on the subject of the single brake..

14:00 WHEN DESIGN MEETS REALITY

- *Bob Stagg, Director, Conisbee Consulting*

Bob Stagg is a structural engineer and has been involved in quite a few theatrical design issues in existing or even monumental buildings. He showed us with quite some humor how engineering and safety can be a real common sense thing.

And that engineering is about *judgement*, not only about making calculations. And in this view he stated that in modern society health and safety is gone too far at some points; it's too much an exercise with little rules and hard-had gentlemen with clipboards, instead of common sense for workers at the work floor.

It was a very enjoyable lecture, brilliant! Too few guys like Bob are part of the business, and too many structural engineers are 'living inside' computing software these days.

16:00 'Question time'

Unfortunately Chris had many cancellations, e.g. from Alan Jacobi and Robin Elias, who surely would have given the conference even more body with virulent remarks or sceptic jokes, not to mention lot of experience. So Alan could not play chairman during question time, and Chris took the honors.

Bill Sapsis raised a question about wind loads on stages: apparently some structural engineers told him it doesn't matter for the wind load whether the scrimms are in or out, due to the fact that the trussing with all the small diagonals and all the luminaries, speaker cabinets etc are accountable for the same kind of wind load in a stage as the scrimms. He was answered these objects indeed take some wind load, estimated 25-50% of the wind load with scrimms mounted, but certainly don't take an equally high load.

Marc Hendriks warned us for the permeability of scrimms. Most of the times it's about light, not about sound or wind! Ask for a Cf value from your supplier, and pass it on to your structural engineers.

Big rigid screens like LED screens should always have the bottom connected to the structure, to avoid dynamics due to swinging in the wind.

The rest of the question time largely was about the NRC qualifications, and what that little bit of paper actually values. Someone asked what about an qualified rigger who fucks up bad, does he lose his qualification? Marc Surtees replied that it is like a

drivers license: when you cause an accident, you don't lose your divers license. Being competent is not only about your rigging certificate, the employer still has to make sure the personnel is qualified for the job.

Marc emphasized that the NRC program only aims at the 'safe working at height' part of rigging. So venues *can* require NRC certification for climbing riggers, but for grounders it makes no sense.

Furthermore, the NRC is the first program in our line of work, so it's not perfect, and will need time to get imbedded in the market. It's still not obligatory.

As a last remark the guys from *ARGH!* - "we" - told everybody they're working on an international dictionary of rigging words and terminology. A call for help was done to those not living within the UK that were interested for participating. Some immediately responded, coming from Portugal, Germany, Spain, Croatia, and Japan right at that moment. Mark Surtees and Ron Bonner said that PLASA could have a look in how to support this initiative.

17:00 Closing summary & drinks!

Chris and Ron thanked us again for our attendance, and we raised hands to find out if the conference should be held next year: the majority was in favor!

This document can be found at www.argh.nl, the website of the Association of Riggers and Grounders in Holland. At our website you can find much info like information about equipment use, regulations, in Holland and in other countries.

In the future we will e.g. have an on-line vocabulary with languages like Dutch, English, German, French, Spanish, Russian, Portuguese etc.

If you would like to help out and give us information about things not mentioned on the site, or make comments, please don't hesitate and mail us at info@argh.nl