

Safe & practical use of a Theatre Counterweight System.

Introduction

Counterweight Systems have been in theatres for moving scenery & technical equipment on stage for much of the last century and have eased the process of scene changes in thousands of venues across the world. Thousands of Theatre Technicians have helped create fantastic effects by the skilled use of counterweights during live performances, contributing to the enjoyment and excitement of millions of theatre-goers.

Hall Stage has built & installed hundreds in the UK & overseas, from New Zealand to Newcastle and continues to develop new & better ways of using the technology. The steel band DGS Drive is an award-winning retro-fitting hoist, designed to bolt straight on to your current header pulley arrangement - and does away with the need for loading & unloading for ever.

We continue to **service & maintain** counterweight systems installed in the 1950s and earlier, which function perfectly and without incident. A current project involves us extending a massive system, installed by us in 1965.

When operated and maintained by trained, experienced and thoughtful people, a counterweight system provides a safe, practical & extremely cost-efficient method of moving stage scenery in and out of view in a proscenium theatre setup.

When operated without care & consideration, by poorly trained and generally unsuitable people, a counterweight can – and has – caused injury and significant damage.

Hall Stage Limited, Unit 4, Cosgrove Way, Luton, Bedfordshire, LU1 1XL.

Tel; +44(0)845 345 4255 fax; +44(0)845 345 4256

sales@hallstage.com

www.hallstage.com

It is the legal responsibility of the venue owners & managers to ensure that any technical equipment is safe for the purposes which they were designed to carry out.

It is also the responsibility of the venue staff to ensure that they themselves are working in the correct proscribed manner and in line with a safe & regulated system of work.

Use this guide in conjunction with the relevant rules & regulations, which are listed at the back of this document. If risks need to be taken, ensure that they have been evaluated & assessed, with every possible measure taken to minimise any potential problems. Guidance on **Risk Assessment** Procedures can be found elsewhere, but an example is included at the back of this document.

The following information is not meant as a definitive "How to..." instruction manual. It is intended to be a useful, experience-based guide to the safe & sensible operation of pre-installed counterweight equipment.

No such guidebook can ever replace the vigilance & common sense of well-trained operators & Hall Stage can whole-heartedly recommend the ABTT as a source of such training.

Hall Stage Limited, Unit 4, Cosgrove Way, Luton, Bedfordshire, LU1 1XL.

Tel; +44(0)845 345 4255 fax; +44(0)845 345 4256

sales@hallstage.com

www.hallstage.com

The Basics.

Create & regularly update a LOLER “Programme of Maintenance” and record any incidents or problems as and when they occur. [See illustration page.]

Wear the correct PPE, boots, gloves, harnesses & hard hats etc when necessary and use the correct lifting & manual handling procedures, especially when loading & unloading weights from the cradles. Back injuries cost over 1 million lost working day in the UK last year.

Run regular Manual Handling courses for all staff who are lifting and moving anything in the building, including FoH staff if possible. Make sure that your Training Programme is suited to the age & profile of all staff, particularly when working with young people. Do not presume that ‘Casuals’, free-lancers and other non-permanent members of your crew come fully trained....!

Write Method Statements for the principal operations on Stage and make sure they are updated regularly. This helps to establish a Safe Working Culture & Environment, which is a very good thing.

Label and record all key information about every component in the system. Keep the paperwork & certificates for new bits, as & when you replace them.

Retain the services of a suitably qualified specialised engineer to check the entire installation thoroughly, once a year for certification & insurance reasons. (...cough cough, Hall Stage would be delighted to help, although other engineers are available – apparently...)

Build an annual budget for regular replacement & upgrade of key components in the installation, signage & warnings, training for new & existing staff, new specific PPE etc

Keep yourself & your colleagues posted & up to date with the latest developments in equipment design & safety issues by attending relevant trade shows, joining web based user groups, speaking to manufacturers like us etc.

Monitor levels of First Aid training across the stage staff and keep First Aid kits fully stocked in A1 condition at all times.

Maintain a small stock of replacement key components, cradle runners, pulley sheaves, steel wire rope etc. and make sure it's all kept in good order.

Take time to do some simple operational checks before a Get In or Load Out.

Keep all working areas tidy – remember, “A clean Flyfloor is a Happy Flyfloor”

Hall Stage Limited, Unit 4, Cosgrove Way, Luton, Bedfordshire, LU1 1XL.

Tel; +44(0)845 345 4255 fax; +44(0)845 345 4256

sales@hallstage.com

www.hallstage.com

Before loading:

We've assumed that you have a working system and you know what it looks like....if you need any pictures & drawings they can be found elsewhere on the Hall Stage website.

Carry out the following visual checks & basic procedures on a regular monthly basis;

1. Create & regularly update a LOLER "Programme of Maintenance" and record any incidents or problems as and when they occur. [See illustration page.]
2. Check all steel wire ropes & hemp lines for signs of abrasion, crushing, crimping etc. Does anything look unusual on the line, like a more reflective surface or deformed profile etc? If it looks wrong, it probably is....check with a trusted source if in doubt.
3. Take a grease gun with you. A spot of lubrication can save a lot of future unpleasantness all round.....

Before a loading session or a show Get in;

1. Check the terminations at the bar **and** on the cradle. Have you got the full compliment of nuts on cable dogs?
2. Check that the line set is left "in balance" when the bar is unloaded.
3. Check the rope lock is functioning properly and free from wear & tear.
4. Make sure the loading areas are clean and free of lose weights, ropes, cables hardware etc and that lighting levels are OK. Rig temporary lighting if necessary
5. Make sure the correct PPE is available for all members of the loading crew. Some venues thoughtfully provide a supply of fresh drinking water near loading galleries etc.
6. If the bar is unloaded, run the bar to grid and back. Does it sound right & run freely?

Hall Stage Limited, Unit 4, Cosgrove Way, Luton, Bedfordshire, LU1 1XL.

Tel; +44(0)845 345 4255 fax; +44(0)845 345 4256

sales@hallstage.com

www.hallstage.com

General Precautions & good practice

These are all obvious, but you'll be amazed what our engineers have seen over the years (and we have the photographs....!)

1. Mark the "Bar weight" with white/bright paint at the value of the 'empty' bar.
2. Never leave a line out of balance, without being properly secured and labelled.
3. Always 'feel' for over or underweight by testing the up & down lines before releasing the Rope Brake.
4. Number every line at every floor level.
5. Remove all unnecessary items from your pockets & belt. No lighters, cigarettes, mobile phones etc in the grid or on the Loading Gallery. An mobile telephone dropped from 20m hits the stage with unbelievable force.
6. Tie any long hair up & out of the way.
7. Control & restrict access to all areas of the counterweighting system, loading galleries especially during fit-ups, get-ins etc. They are not part of the Theatre Tourist Route...

Hall Stage Limited, Unit 4, Cosgrove Way, Luton, Bedfordshire, LU1 1XL.

Tel; +44(0)845 345 4255 fax; +44(0)845 345 4256

sales@hallstage.com

www.hallstage.com

8. During Loading:

We've assumed that you have a crew of well-trained & competent staff who are all familiar with your installed system and the correct procedures involved.

1. **Communication is absolutely essential.** Establish clear lines of communication that avoid mixed meanings or misunderstandings. Don't work in noisy conditions. Use radios or comms sets wherever possible & establish a routine for 'clearance' before any movement of load. Do not move anything without clearance from all key parties.
2. Appoint a crew person as a "Spotter" on each side of your stage and at each Loading level as required & ensure they are clear as to what they are 'Spotting' for....
3. Check the capacity of the bar with the load to be attached. Is it OK across the full stage width, with an even weight distribution. See reference tables for point loading capacity of various tube/bar types.
4. Check the method & equipment used to attach load to bar. Chains, wire ropes etc should only be used if suitably rated & certified. Check for CE markings, SWL labelling etc
5. Only use certified and marked components when joining bars together.
6. Use Secondary suspensions whenever necessary and keep them as short as possible.
7. There are various operational ways of loading & unloading a bar when out of balance, including overhauling, point hoists on the cradle etc. All have their strengths & weaknesses and need to be covered specifically to your site and installation, during a focused Training Session.
8. Secondary suspension & braking equipment, such as rope Locks, slings and all associated shackles should be stored carefully. Build a secure cupboard, with allocated spaces for each item – so you can see when it's not where it should be.

Hall Stage Limited, Unit 4, Cosgrove Way, Luton, Bedfordshire, LU1 1XL.

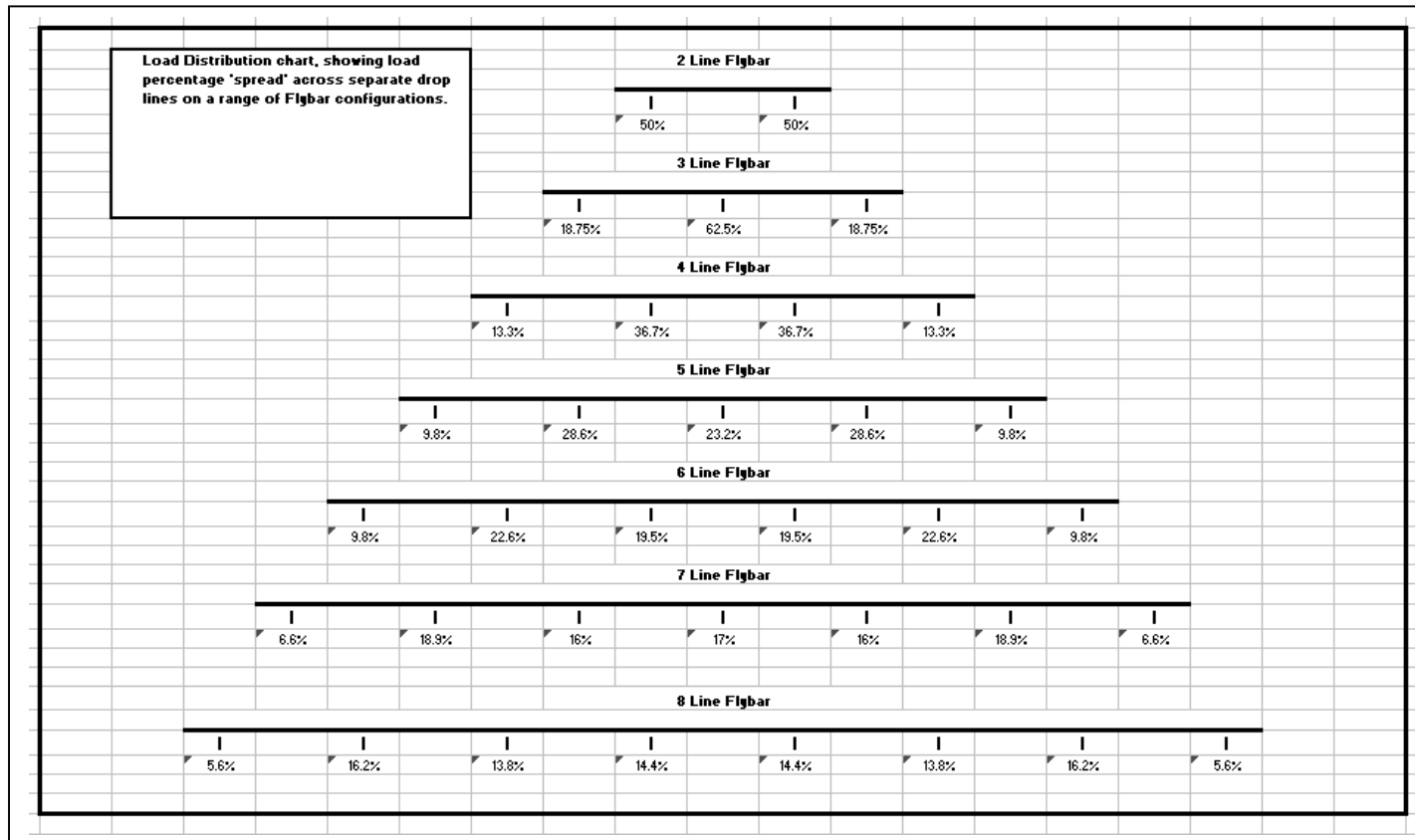
Tel; +44(0)845 345 4255 fax; +44(0)845 345 4256

sales@hallstage.com

www.hallstage.com

Loading distribution across a multiple line flying bar.

Just because a flown piece of scenery weights 500kg, it doesn't mean a 4 line flybar picks up 125kg on each line....The chart below shows how the dynamic load is spread across each line if the weight is spread evenly across the flow piece;



To fly a piece weighing 500kg on a 4 line bar, the 2 central lines need to carry 367kg between them.

Check the lines are OK for this imposed load.

Check the point loading capacity of the Flybar itself, not just the UDL of the whole bar. You may need to uprate the barrel or use a ladder beam.

Hall Stage Limited, Unit 4, Cosgrove Way, Luton, Bedfordshire, LU1 1XL.

Tel; +44(0)845 345 4255 fax; +44(0)845 345 4256

sales@hallstage.com

www.hallstage.com

Risk Assessment Processes.

We use this calculator idea to calibrate the risks involved in a task;

| Note: Multiply Likelihood of Occurrence by Potential Severity to obtain Risk Factor | | | | | | |
|--|---|------------------|--|------------------|--|-----------------------|
| Likelihood | 1 = Very Unlikely | 2 = Unlikely | 3 = May occur | 4 = Likely | 5 = Very likely | 6 = Will occur |
| Severity | 1 = Very minor | 2 = Minor injury | 3 = Lost time due to injury | 4 = Major injury | 5 = Single fatality | 6 = Multiple fatality |
| | Risk Factor 0-6 = LOW | | Risk Factor 7-17 = MEDIUM | | Risk Factor 18-36 = HIGH | |
| | Risk Factor above 6 = improve if possible | | Risk Factor above 12 = implement measures noted to reduce risk | | Implement measures and consider alternative work methods; Adopt different design | |

| Ref | Title of risk | Description of risk | Who is at risk? | Likelihood of occurrence | Potential severity | Risk Factor | Recommended measures to reduce the risk |
|-----|-------------------|--|---|--------------------------|--------------------|-------------|---|
| 1 | Manual Handling | Lifting or manual work resulting in minor or serious injury, especially to the back, hands and feet. | All personnel involved in assembling and fixing system components | 4 | 3 | 12 | Reduce the weight of the load where possible. Adopt a good handling technique. Use manual handling aids. Ask for assistance if the load is too heavy or awkward. Require all site personnel to wear appropriate PPE Run a "Manual Handling" course as part of site induction |
| 2 | Working at height | Falling from height without harness or other restraint including working adjacent to open traps or voids | All personnel involved in working at heights; personnel below | 3 | 5 | 15 | Prevent overhead working unless unavoidable. Provide barriers, work platforms, harnesses in compliance with the Working at Height Regulations 2005. Ensure correct management procedures are in place to ensure personal protective equipment is used and used correctly. |
| 3 | Working at height | Fall & injury caused by incorrect use of PPE | All personnel using PPE etc & staff below | 2 | 5 | 10 | Avoid use of PPE fall arrest techniques by providing barriers and work-platforms If unavoidable ensure personnel are competent in use and that anchorages are fit for purpose. Provide suitable training & site induction |
| 4 | Working at height | Falls from ladders | All site personnel using equipment + staff below | 3 | 5 | 15 | Avoid use of ladders by use of mobile work platforms, temporary work platforms and barriers etc. If unavoidable, use in conjunction with correctly designed PPE fall arrest system and use precautions to restrain ladder - hooks onto rails, tie-offs, battens to floor etc. |
| | | | | | | | |

A working example of Risk Assessment, carried out for a recent Hall Stage installation.

Safety Legislation, Guidelines & Rules Of Management.

We strongly recommend that all responsible users of Stage equipment read and understand the following before carrying out any lifting & rigging operations on stage – or anywhere else for that matter;

1. Health & Safety at Work Act 1974
2. Management of Health & Safety at Work Regulations 1999
3. Construction, Design & Management Regulations, 1994.
4. The Provision & Use of Work Equipment Regulations 1992
5. The Lifting Operations & Lifting Equipment Regulations 1998
6. British Standard BS:7905-1
7. The ABTT Code of Practice; Flying.
8. The ABTT 'Yellow Book' – Technical Standards for Places of Entertainment.

In addition to the above legislation & advice, Hall Stage work with our German partners ASM Steuerungstechnik and would therefore also recommend the following;

1. BGV C1 – for Staging & Production Facilities for the Entertainment Industry
2. DIN 56-950 – Standards for all rigging components.

Hall Stage Limited, Unit 4, Cosgrove Way, Luton, Bedfordshire, LU1 1XL.

Tel; +44(0)845 345 4255 fax; +44(0)845 345 4256

sales@hallstage.com

www.hallstage.com

| | | |
|---|--|--------------------------------|
| Theatre Royal, Certaintown, Upfordshire, | Flying system maintenance programme | Status date; 05/09/2006 |
|---|--|--------------------------------|

| Line # | Designated as; | Max load capacity | Actual load | Load Test dated | Bar type | Cable type | Point load | UDL/metre | Notes | |
|--------|-----------------|-------------------|-------------|-----------------------------|-----------------|-----------------|------------|-----------|---|--------------------------------|
| | | | | Next test date; 18/04/05 | | | | | Hall Stage booked in | |
| 1 | FOH Tabs | 350kg | 280kg | 11/05/04 | 60mm steel | 6mm | 45kg | 60kg | Bar brailed to D/S prpsc. Replace tube | |
| 2 | Any | 350kg | 0 | | | | | | | |
| 3 | Any/Border #1 | 350kg | 120kg | | | | | | Bent offstage R | |
| 4 | LX1 | 450kg | 432kg | | | 48mm ladder | 7mm | 60kg | 80kg | New ladder added 12/11/03 |
| 5 | Any | | | | | | | | | |
| 6 | Track traveller | 350kg | 300kg | | | 48mm steel tube | 6mm | 45kg | 60kg | Track T60 |
| 7 | U/S | 350kg | 0 | | | 48mm steel tube | 6mm | 45kg | 60kg | Hit grid 06/2004 DO NOT USE |
| | | | | | | | | | | |
| ↓ | | | | | | | | | | |
| 45 | Cyc bar | 350kg | 250kg | | 48mm steel tube | 6mm | 45kg | 60kg | Curved ends – watch clearance U/S/R | |

Example *Sample of Usage Chart – to be updated monthly...*