

Restricting the Storage and Use of Acetylene

Reference: HI/13/001 V1.0
Date: 13th June 2013

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1. PURPOSE

This Heathrow Instruction details the restrictions on the storage, transportation and use of acetylene at Heathrow Airport.

2. SCOPE

This Instruction applies to everyone working at Heathrow Airport.

3. BACKGROUND

All pressurised cylinders present significant hazards when involved in a fire. From a Heathrow Airport perspective fires involving pressurised cylinders may have a significant operational impact on our business by potentially closing runways and other critical facilities. This is especially relevant for fires involving Acetylene cylinders where the current operating protocol from Fire Services is a minimum 200m hazard (exclusion) zone.

4. HEATHROW SPECIFIC CONTROL MEASURES

To reduce and control the risks outlined above, the following applies at Heathrow airport: -

- High risk flame cutting and welding operations should, wherever possible, be avoided within the airport boundary by the use of alternative techniques or taking the work off airport.
- If such operations have to be carried out at the airport, alternative and more stable gases than acetylene should be used.
- If there are absolutely no practicable alternatives then acetylene may be used subject to the approval of an "Acetylene Justification Report" by the Heathrow Fire Safety Team.
- Approval to use acetylene will only be granted where it can be demonstrated that alternative methodologies have been exhausted and high levels of control will be applied.
- Storage of acetylene within the airport boundary is also subject to strict approval via the "Acetylene Justification Report".

5. QUERIES

A copy of the Use of Acetylene Procedure including the Justification Report is attached. For further information on this Instruction or the Procedure please contact the Heathrow Fire Safety Team by 'E-Mailing' HFST@baa.com



Mike Evans
HSE Director

Restricting the Storage & Use of Acetylene

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1. PURPOSE

- 1.1 The purpose of this procedure is to detail the arrangements for and restrictions on the storage, transportation and use of acetylene at Heathrow Airport.

6. SCOPE

- 1.2 The arrangements detailed in this procedure shall apply to everyone working at Heathrow Airport. This procedure does not set out to repeat statutory requirements or authoritative guidance but focuses on the specific requirements of Heathrow Airport Limited.

7. BACKGROUND

- 3.1 Everyone permitting, managing or using pressurised gas cylinders has an obligation to meet all applicable legislative requirements including the Dangerous Substances and Explosive Atmospheres Regulations 2002 and the Regulatory Reform Fire Safety Order (RRFSO) 2005.
- 3.2 All pressurised cylinders present significant hazards when involved in a fire. Fuel gases such as Butane, Propane, Acetylene and Hydrogen all present particular hazards because they are highly flammable materials stored in pressurised containers with the risk of explosion if involved in fire. There are detailed differences between the gases but a similar initial approach is required if any are involved in fire.
- 3.3 From a **LHR** perspective fires involving pressurised cylinders may have a significant operational impact on our business by potentially closing runways and other critical facilities. This is especially relevant for fires involving acetylene cylinders which historically required a closure of up to 24 hours due to the unstable nature of the gas during the cooling phase. Whilst the current operating protocol from Fire Services is a minimum 200m hazard (exclusion) zone for any pressurised cylinder involved in a fire, following a number of major incidents, here have been significant developments in tactical fire fighting methodology for fires involving acetylene cylinders.
- 3.4 Acetylene requires special consideration due to its unstable chemical nature and because of this, acetylene continues to represent a hazard even after a fire has been extinguished. In addition to the effect of heat, there is also a possibility of decomposition being initiated from a severe shock.
- 3.5 The new procedures, which have now been adopted by Fire Services, involve applying substantial cooling to the cylinder(s) for at least 1 hour. This new methodology has reduced the disruption associated with acetylene cylinders from an average of 19 hours in 2006 to approximately 3 hours. However, this could still cause significant impacts for the operational airport.
- 3.6 Acetylene has a wide use of application but is primarily associated with flame cutting and welding operations. However, most common cutting and welding operations can now be carried out with alternative and more stable gases such as propane. The following documents have been consulted in the preparation of this procedure: -
 - Guidance from the Cylinders in Fire National Stakeholder Group.
 - London Fire Brigade Cylinder Procedure Policy Number 376 November 2011.
 - London Fire Brigade : A study of Acetylene cylinder incidents in London 2004-2008

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3.7 This procedure is aimed at restricting and controlling the use and storage of acetylene at Heathrow Airport such that all the associated risks can be managed to a level that is as low as reasonably practicable (ALARP).

8. PROPERTIES OF ACETYLENE GAS

4.1 The following provides a brief overview of some of the properties of acetylene cylinders when exposed to fire:

- All gas cylinders have the potential to explode in a fire. Acetylene cylinders are the only ones that have the potential to explode during the cooling process.
- Acetylene is an extremely flammable gas with a 'garlic-like' odour. It is supplied as a gas dissolved under pressure in a solvent, usually Acetone, which is contained within a porous mass of a 'breeze-block' type material inside the cylinder. Acetylene is far too reactive a gas to pressurise without the solvent to stabilise it.
- Acetylene is only slightly lighter than air and has extremely wide explosive limits (2.5% - 80%).
- If cylinders of dissolved acetylene are heated to approximately 400°C, e.g. in a fire, or if a flashback occurs in cutting equipment attached to the cylinder, the acetylene can decompose (i.e. 'break down') into hydrogen and carbon. The internal heat produced by this 'breakdown' process can cause the cylinder to catastrophically fail i.e. explode.

4.2 Hazards inherent in the explosion of Acetylene cylinders include:

- A blast pressure wave.
- Fireball of up to 25 metres
- Acetylene cylinders are designed to fail in ductile mode and split along their entire length however if a partial split occurs the cylinder(s) itself can be propelled for up to 200m

4.3 Acetylene cylinders with a pressure gauge reading of zero still contain 500 litres of dissolved acetylene. Cylinders grouped together and joined by common pipework present an increased risk and will be more difficult to cool. They are normally found in open air. There is a possibility of decomposition of the Acetylene being initiated by a severe shock to even an unheated cylinder.

9. HEATHROW SPECIFIC CONTROL MEASURES

5.1 In order to reduce and control the risks outlined above, the following procedures apply at Heathrow airport:

- High risk flame cutting and welding operations should, wherever possible, be avoided within the airport boundary by the use of alternative techniques or by taking the work off airport.
- If such operations have to be carried out at the airport, alternative and more stable gases than acetylene should be used.
- If there are absolutely no practicable alternatives then acetylene may be used subject to the submission of an "Acetylene Justification Report" by the user and approval of such by the Heathrow Fire Safety Team. Refer to Appendices A and B.

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- Only sufficient acetylene should be brought onto the airport for the approved works and, where possible, acetylene cylinders should be removed from the airport on completion of those works.
- If acetylene has to be used on a regular basis then approval to store acetylene on the airport may also requested via the same "Acetylene Justification Report". Any such approvals will be valid for a maximum period of one year, upon expiry of which renewed application must be made.
- Approval to use and/or store acetylene will only be granted where it can be demonstrated that alternative methodologies have been exhausted and high levels of control will be applied.

5.2 Control measures for the use and/or storage of acetylene within the airport boundary must include: -

- Risk assessments that include consideration of existing building or construction site fire safety plans.
- Identification of use and storage of any pressurised cylinders must be specifically identified in the fire risk assessments together with specific control measures.
- Details of any pressurized cylinders must be included in plan information boxes for attending fire crews. The information must include type, quantity and location to support Fire Services undertaking dynamic risk assessments of the incident
- Limiting the amount of acetylene brought onto the airport to just that needed for the job by the use of smaller mobile cylinders that can be transported for the task in hand and removed immediately after use.
- Hot works management system including permit to work process. This will generally be the HAL 'Hot Work Permit System' unless use of the employers' system has been specifically approved in writing.
- Transportation arrangements including manual movement and carriage by road
- Security of cylinders during the working shift.

5.3 It is the intent of HAL to absolutely minimise the use of acetylene and to gradually phase out the storage of acetylene at the airport. In space planning and lease negotiations consideration will be made of the potential need for acetylene and any other compressed gas storage in relation to critical facilities such as runways and terminal buildings.

10. QUERIES

6.1 For further information on this procedure please contact your Safety Adviser, the Heathrow Health and Safety Team or the Heathrow Fire Safety Team.

Justification reports are to be e-mailed to HFST@heathrow.com

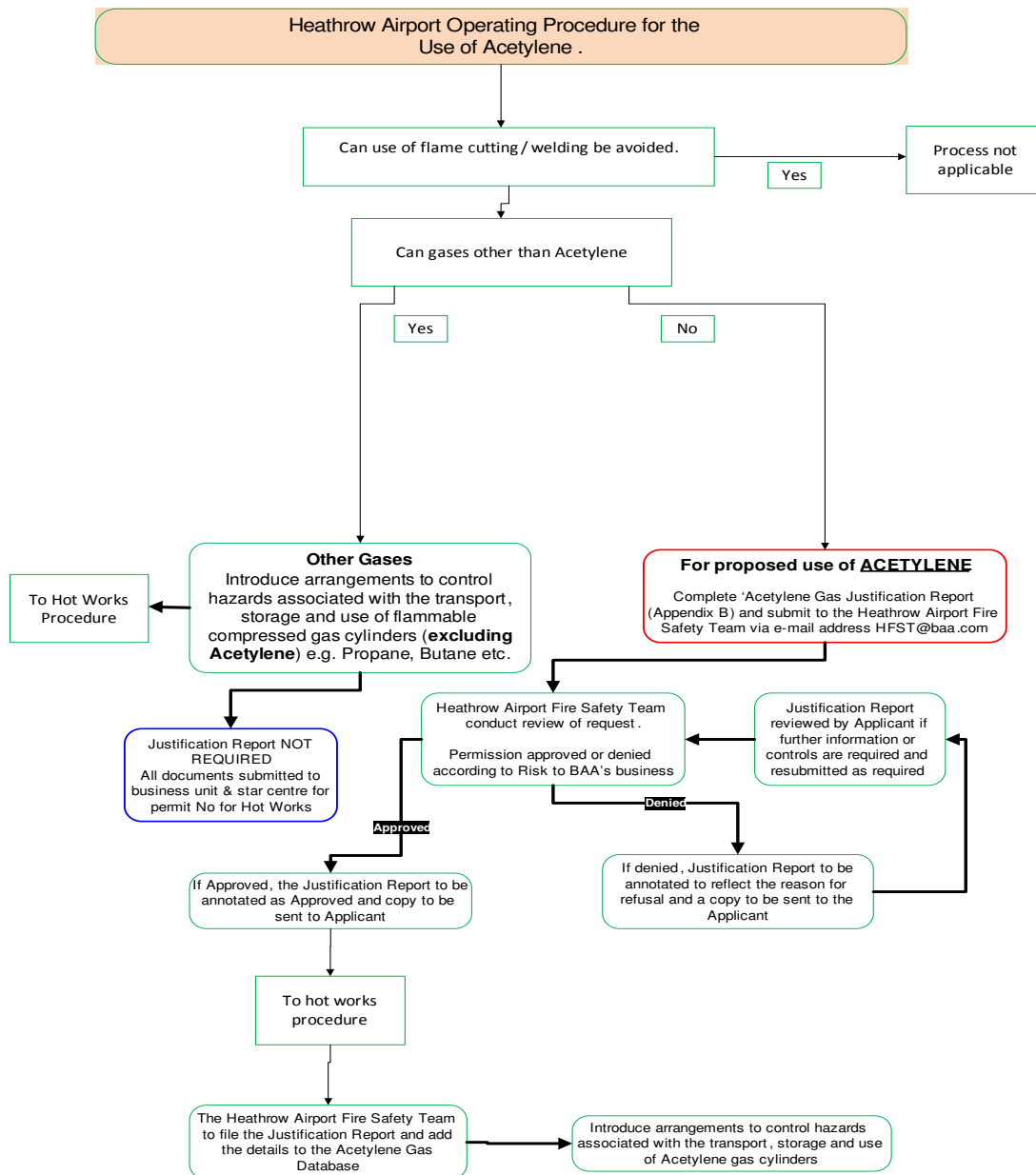
Any deviation from this procedure must be agreed with the Head of Fire Safety for Heathrow Airport (HFST@heathrow.com).

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APPENDIX A



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APPENDIX B

Acetylene Justification Report

Refer to Heathrow Airport Operating Procedure – Storage and Use of Acetylene: IMRS-FSM-001

Application for acetylene use only.....or use and storage.....(please indicate which)	
Dates, from to.....	
Work Activity – Give details on why acetylene gas is needed for the activity	
Acetylene gas is needed because:	
Work involving acetylene cannot be carried out off-airport because:	
An alternate method cannot be used because:	
Location – Give precise details for the locations of use (and storage if applicable) of acetylene	
Precautionary measures	
Estimated quantity of acetylene (litres) to be used or stored	
Method of transportation to site	
Largest cylinder of Acetylene (litres)	
Building Fire Safety Plans or Construction Fire Safety Plans have been reviewed	YES / NO
A risk assessment has been prepared for this work activity	YES / NO
Any other precautions taken	YES / NO
Justification prepared by:	
Accepted for Heathrow Airport Ltd by:	
Name (please print):	Name (please print):
Position Held	Position Held
Company Name	Company Name
Signature	Signature
Date prepared:	Valid Until:
Justification report to be submitted to HFST@baa.com at least 7 days before required work date	

For Official Use Only

Status: **Accepted / Rejected / Query**

APPROVED BY:

Approval No.

Head of Fire Safety:	Name	Signed
Valid until (Date):		

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John Boyce – Head of Fire Safety

Mike Evans – HS&E Director