

The Control of Major Accident Hazards Regulations 1999

OIL / FUEL STORAGE
REPORT OF OPERATOR'S SAFETY REVIEW

COMAH TOP-TIER INSTALLATION

Name of Operator:			
Address of Installation:		Correspondence address: (if different)	
		Post Code:	
Post Code:		Date of Review:	
Contact name:		For a combined report – details of the sites covered in the review:	
Telephone:			
E mail:			

Please complete and return this form by 18 April 2006 to: ChemicalIndustries.OilFuelQueries@hse.gsi.gov.uk

or by post to:

Kevin Allars, Head of Chemical Industries Division, Health and Safety Executive, Building 2.2, Redgrave Court, Merton Road, Bootle, Merseyside L20 7HS

For HSE use only

Date of site visit:	CIS Location:	CIS Client:
Inspector:	Mgt Group:	Tel. No.



Guidance: COMAH Top-Tier Sites

1. This report form has been prepared to assist COMAH operators to complete their safety review as requested in the Safety Alert issued on 21 February (<http://www.hse.gov.uk/comah/buncefield/alert.htm>) following the publication of the Buncefield Major Accident Investigation Progress Report (<http://www.buncefieldinvestigation.gov.uk/reports/index.htm>). A copy of the Safety Alert should have been posted to you. Should you require an additional copy please contact: ChemicalIndustries.OilFuelQueries@hse.gsi.gov.uk

References to the Safety Report

2. Please reference the relevant section of the safety report that covers each item. This will assist in any follow up that may be needed to clarify the information provided.

Supplementary Information

3. Please complete each section as thoroughly as possible by providing a summary of the arrangements in place against each item/issue in the report form. Supplementary information e.g. copies of standards, codes, or procedures, **should not be appended** to the review report form. The summary information should be sufficiently detailed to allow an adequate assessment of the arrangements in place.

Guidance on good practice

4. The main sources of guidance are HSG 176 The Storage of Flammable Liquids in Tanks, and HSG 186 The Bulk Transfer of Dangerous Liquids and Gases Between Ship and Shore. Unfortunately, HSG 186 is currently out of print although copies are still available via HSE Direct. The protocol references other underpinning standards and codes such as:

- BS2654; API 659 and BSEN 1405 design of vertical steel tanks,
- HSG244 – Remotely operated shut of valves,
- API 2000: Venting atmospheric and low-pressure storage tanks,
- HSG250: Guidance on permit-to-work systems,
- HSG253 The safe isolation of plant and equipment,
- HSG48: Reducing error and influencing behaviour,
- EEMUA 158 / API 653: Examination of tanks,
- HSG238: Out of Control,
- IEC 61508, 61511: Functional safety of control systems.

Representative Sample

5. Some sites will have large numbers of tanks of a variety of designs, duties, valves and instrumentation systems etc. It is not necessary to provide detailed information against each tank on site. The return should be based on a sample of facilities to provide a fair representation of the variety in the arrangements in place across the whole of your operations e.g. where automatic gauging of tanks contents is used and where manual dipping is practiced.

Multi-Site Organisations

6. Multi-site operators may wish to submit a combined return for a number of their sites. In such cases the return should be clearly marked with details of the range of facilities included. A covering note explaining the basis for selecting the sample would also be helpful. HSE will aim to organise site visits via the company Lead Inspector.

Further Information - contact: ChemicalIndustries.OilFuelQueries@hse.gsi.gov.uk

No.	Issues	Key Questions & Sources of Good Practice	Safety Report References	Comments / Findings
1	Site Overview – Location / Layout			
1.1	<p>Pattern and utilisation of storage tanks.</p> <p>(Note: Hazardous Substances Consent may limit flexibility on use of tanks)</p>	<p>Indicate the pattern and type (e.g. fixed / floating roof) of tanks and show how the various tanks on site are utilised e.g. by providing a colour-coded plot plan, or reference to the safety report, to show tank duties by flammability classification, and to show any tanks that may not be dedicated to specific substances.</p>		
1.2	Separation distances between tanks	<p>Are separation distances in accordance with good practice guidance? If not, what exceptions are there for:</p> <p>a) Small tanks – HSG176 Table 2 b) Groups of small tanks – Table 3 c) Large tanks - Table 5</p>		
1.3	Separation distances from site boundaries, buildings, process areas and fixed sources of ignition	<p>Are separation distances in accordance with good practice guidance? List any exceptions for:</p> <p>a) Small tanks – HSG176 Table 2 b) Groups of small tanks - Table 4 c) Large tanks - Table 5 d) Underground tanks - p24</p>		
1.4	Separation from other dangerous substances and incompatible materials.	<p>Are separation distances from other substances (e.g. LPG) in accordance with good practice guidance? List any exceptions for:</p> <p>a) LPG - HSG176 Table 6 b) Other hazardous substances – Table 2.</p>		

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2	Design for Primary Containment			
2.1	Tanks			
2.1.1		Are all tanks used for the storage of flammable liquids designed in accordance with a standard recognised as suitable for the storage of flammable liquids? HSG176 p25. (Note: Vertical steel storage tanks would typically be designed to BS2654; API 650; BSEN 14015)		
2.1.2		Do any of the tanks used for the storage of flammable liquids pre-date the above standards, and if so has a review or gap analysis been undertaken to identify any significant differences in the design of these tanks compared with a 'modern' tank?		
2.2	Pipework to and from the tank			
2.2.1		Is pipework constructed to a recognised and suitable standard? HSG176 p31-32.		
2.2.2		Are flexible hoses only used where rigid piping is unsuitable? HSG176 p32.		
2.2.3		Apart from tanker loading / offloading, describe the situations where flexible hoses are used.		
2.3	Tank connections and fittings	Are tank connections and fittings in accordance with the several criteria specified in HSG176 p33-34? List any exceptions.		

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2.4	Valves (for filling and discharge lines)			
2.4.1		Is each pipeline connected to a tank provided with a suitable fire-safe shut-off valve located inside the bund wall and close to the tank? (HSG176 p34)		
2.4.2		Are ROSOVs provided? (HSG176 p34, and HSG244 Remotely operated shutoff valves (ROSOVs))		
2.5	Pumps	Are pumps located outside the bund, on an impervious base? HSG176 p34 Do they have there own secondary containment systems?		
2.6	Contents measurement:			
2.6.1	<ul style="list-style-type: none"> • Defined max working capacity. • Tank gauging systems • Local / remote indication. • Operational methods / dipping. 	Are tank capacities clearly defined; what safety margin is provided? (Note: Safety margins may vary according to the source and rate of filling; there should be enough time between overfill and overflow to allow the error to be spotted and remedial action taken). Ref: HSG176 p35-36		
2.6.2		Do tanks containing highly flammable or flammable materials have automatic gauging?		

No.	Issues	Key Questions & Sources of Good Practice	Safety Report References	Comments / Findings
2.6.3		Where dipping is used, is this in accordance with the criteria in HSG176 p36?		
2.7	Overfill protection:			
2.7.1	<ul style="list-style-type: none"> • Trips / automatic shutdown • Alarms • Operating procedures 	<p>Do overfilling protection systems include alarms and / or trips? Detail any exceptions.</p> <p>HSG176 p35</p>		
2.7.2		Are these independent of the means of contents measurement?		
2.8	Venting (excluding fire relief)			
2.8.1		<p>Are tank venting systems suitably designed to cope with the pressure variations that may be encountered during normal operation or upset conditions, including overflow conditions?</p> <p>Flame arrestors: p37 Pressure / vacuum valves: p37 API 2000 Venting atmospheric and low-pressure storage tanks HSG176 p36-37</p>		

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2.9	Marking of tanks and fittings	Tanks containing highly flammable liquids should be clearly identified and marked, and it may be necessary to provide labelling of pipes, sampling points, joints, valves etc. HSG176 p42		
2.9.1		Identification and marking should be suitable for all foreseeable operating conditions e.g. normal/ maintenance/upset/emergency/ situations? (Note: Some refineries treat everything as flammable unless otherwise marked, so there may well be some variation in compliance with this standard)		
3	Secondary Containment / Mitigation HSG176 p40-41?			
3.1	Bundling / spill containment • Capacity Integrity	Is bund capacity and integrity in accordance with the good practice guidance described in		
3.1.2		How are tanks segregated by bunding? (Note: Bund capacity of 110% of the largest vessel will normally be sufficient. Individual bunding is preferred; where several tanks are contained in one bunding area, intermediate lower bund walls are recommended)		

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3.1.3		Are bunds liquid tight? (Note: capacity and integrity may be put at risk by pipework penetrations. In this initiative we are not concerned with chronic leaks but are focusing on the ability of the bund to prevent large-scale acute leakage).		
3.1.4		Are arrangements for emptying rainwater sufficiently robust to ensure that bunds remain liquid tight in the event of a major spillage		
3.2	Spill detection: <ul style="list-style-type: none"> • Gas detection • Bund (sump) level measurement • Operational monitoring / CCTV 	What provisions has the operator made for detecting and dealing with loss of containment of flammable materials? (Note: Gas detection is not normal for liquid storage, but some means for detecting unscheduled movement / variation in tank contents would be expected).		
3.2.1		Do these include adequate assurance for operator response to detection?		
3.3	Control of ignition sources			
3.3.1	<ul style="list-style-type: none"> • Area classification / selection of electrical equipment • Static electricity / earthing • Control of vehicles / hot work etc. 	Has an assessment been carried out in accordance with DSEAR Reg. 5?		
3.3.2		Has the site been subject to hazardous area classification? HSG176 p11-14		

No.	Issues	Key Questions & Sources of Good Practice	Safety Report References	Comments / Findings
3.3.3		Has this been assessed / reviewed by a competent person?		
3.3.4		Are suitable bonding / earthing systems in place? (HSG176 p39-40)		
3.3.5		Do these take adequate account for potential for operator or other error?		
3.3.6		Are suitable arrangements in place to control vehicle movements, hot work, and other potential sources of ignition?		
3.4	Emergency (fire) relief venting	Have emergency relief devices been sized in accordance with an appropriate design standard? (Pressure relief is required to cope with possible fire engulfment HSG 176 p37-38)		
3.5	Fire protection <ul style="list-style-type: none"> • Fire resistant claddings / coatings • Fire walls • Water cooling systems • Foam blankets etc 	What fire protection has been provided? (Note: HSG176 p38-39 states that fire protection may be necessary where the storage conditions are less than ideal, such as where it is difficult to achieve adequate separation distances)		
3.6	Fire precautions <ul style="list-style-type: none"> • Fire detection • Fire fighting systems • Fire escape 	Has the Fire Service been consulted on plant design and layout considerations detailed in HSG176 p55?		

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4	Operational Control			
4.1	Training / competence <ul style="list-style-type: none"> • Hazard awareness • Training / competence in operating procedures Emergency actions	Are suitable arrangements in place for training and competence assurance?		
4.1.2		Are operators/other adequately prepared for all foreseeable operating conditions e.g. normal/ maintenance/upset/emergency/ situations? Arrangements should include: <ul style="list-style-type: none"> ▪ Process-specific training; ▪ Task-specific training / operating procedures; ▪ Hazard analysis / risk assessment ▪ Emergency actions A training schedule and competency assessment process should be in place, and records kept.		
4.2	Operating procedures			
4.2.1	<ul style="list-style-type: none"> • Selection and filling of tanks • Selection of routes, valve / pump sequencing etc. • Stock and packet control • Flow measurement and tank contents monitoring • Communications for transfer control • Operational tours of site 	Are suitable written instructions in place for operation of the facility?		

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4.2.2		Do operational procedures reflect suitable and sufficient risk assessments		
4.2.3		HSG 48 gives summary guidance on good practice. Do procedures and other job aids comply with these and other good practice guidelines. Is there a sufficient major accident focus?		
4.3	Shift Patterns	What shift pattern is in place for personnel involved with tank storage operations?		
4.3.1		HSG 48 provides relevant guidance. Is the shift pattern designed/reviewed against this or some other good practice guidance?		
4.3.2		Is the system adequately managed and monitored to ensure that fatigue in shift work is adequately controlled?		
4.4	Shift handover procedures	Is there a structured handover format in place? HSG48 provides relevant guidance. Procedures should specify simple and unambiguous steps to ensure effective communications at shift / crew change. These include: <ul style="list-style-type: none"> • Carefully specifying what information needs to be communicated (and cutting out unnecessary information) • Using structured easy-to-read logs or computer displays 		

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4.4(cont)		<ul style="list-style-type: none">• Ensuring key information is transmitted verbally and in writing• Encouraging two-way communication. High risk situations that are liable communications problems, and that should be catered for in handover procedures, include: <ul style="list-style-type: none">• Maintenance that continues over a shift change;• Deviations from normal working;• Handovers following a lengthy absence from work, and• Handovers between experienced and inexperienced staff.		

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4.5	PTW procedures	<p>Are PTW and Isolation procedures in accordance with good practice guidance?</p> <p>HSE publication HSG250 Guidance on Permit-to-Work Systems, supersedes previous guidance (Oil Industry Advisory Committee Guidance, and HSE Guidance leaflet IND(G)98 (Rev 3)).</p> <p>HSG253 The Safe Isolation of Plant and Equipment also supersedes previous guidance (OIAC Guidance).</p> <p>The system should be monitored, and the arrangements should be effective in practice.</p>		
4.6	Plant change procedures	<p>Do change control procedures cover changes involving:</p> <ul style="list-style-type: none"> ▪ Plant hardware ▪ Software ▪ Process operating parameters ▪ Mode of operation ▪ Temporary changes ▪ Replacement of equipment with non-identical parts ▪ Operating procedures <p>Organisational changes?</p>		

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5	Inspection and Maintenance			
5.1	Tanks, pipework and fittings (including vents)	Does the site have a preventative maintenance schedule that lists the component parts of the installation and contains details of the scope and frequency of planned inspection and maintenance work? HSG176 p51		
5.1.2		Does the site have a scheme of examination covering all safety critical elements of the tanks, pipework and fittings? HSG176 p51. (Note that HSE recognises that there are specialist inspection companies who are competent to devise and undertake the examination of tanks, pipework and fittings whose existence is not acknowledged in HSG 176)		
5.1.3		Are the schemes of examination for the tanks in line with accepted industry practice such as EEMUA 159 or API 653?		
5.1.4		Are the tanks and pipework examinations, including internal examination of the tanks, being undertaken in the timeframe recommended, is any necessary remedial work actioned in a timely manner?		
5.2	Isolation valves	Is there a schedule to ensure that valves required for emergency isolation are exercised periodically to ensure that they are operable? HSG176 p51.		

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5.3	Testing of safety-related instrumentation	<p>Is safety-related instrumentation (e.g. level alarms & trips, tanker loading protection systems) regularly tested, from sensor to final actuator, to reveal faults in any part of the system?</p> <p>Ref: HSG 238 'Out of Control – Why Control Systems Go Wrong and How To Prevent Failure'. (This sets out the principles of IEC 61508 and IEC 61511 in a form that is appropriate for this review).</p>		
5.4	<p>Electrical systems</p> <ul style="list-style-type: none"> • Ex equipment • Electrostatic bonding 	<p>Is there a schedule for periodic inspection of electrical equipment?</p> <p>HSG176 p51.</p> <p>Note: "Ex" rated electrical equipment should be inspected periodically to identify any deterioration that could make it a source of ignition. Similarly, electrical bonding arrangements to prevent electrostatic discharges should be inspected regularly.</p>		

No.	Issues	Key Questions & Sources of Good Practice	Safety Report References	Comments / Findings
6	Emergency Procedures			
6.1	On-site emergency plans	<p>Is a suitable on-site emergency plan in place?</p> <p>COMAH Reg. 9 guidance – operators of top tier sites must prepare adequate emergency plans for dealing with the on-site consequences....</p>		
6.2	Off-site emergency plan	<p>Is an off-site emergency plan in place?</p> <p>COMAH Reg. 10 guidance – The local authority must prepare an adequate emergency plan for dealing with the off-site consequences of possible major accidents.</p>		
6.3	Review and testing of emergency plans	<p>Has the on-site plan been subject to routine testing? When was the last test carried out?</p> <p>COMAH Reg. 11 guidance – at least once every three years the on-site and off-site plan must be both reviewed and tested.</p>		
6.4		Is there suitable training, preparation and practice for key roles resp and tasks		
7	Monitoring and Review			
7.1	Review of precursor events and sharing of information	<p>Has the company got arrangements in place to review precursor events, and to share this information with others?</p> <p>(Note: There is unlikely to be sufficient time in this round of the programme to review this with each operator; this is best left for broader discussions with the Trade Associations).</p>		