ADR REPORTING AND DATA COLLECTION PROJECT

NCEC

Report for: Dangerous Goods Unit, Department for Transport

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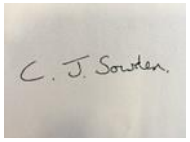

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EXECUTIVE SUMMARY

Under the Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) regulations, serious accidents or incidents that take place during loading, filling, carriage or unloading of Dangerous Goods (DG) must be reported to the Competent Authority, within one month of their occurrence. As current reporting levels to the Authority for Great Britain (the Department for Transport) are low, it was suspected that there may be an element of underreporting. DfT wished to better understand the frequency, location and details of DG incidents that are occurring and encourage incident reporting where appropriate. NCEC therefore conducted a project on behalf of the DfT to achieve these aims.

The first phase of this was to collect data from different agencies to understand the level of reportable incidents that are likely to be occurring with Great Britain and understand how accurate the reporting levels to DfT are.

Data was received and analysed from five different sources to identify 198 incidents involving DG transport on roads. It was noted that many of the incidents within the data sets were not true DG road transport incidents so they could be discounted for the purpose of the project, leaving 46 true DG incidents and a further 43 that were possibly true DG incidents. Due to the lack of detail and consistency in reporting both between agencies and within a single agency, NCEC had to make several assumptions over incidents that were likely to be reportable. We split the true DG incidents into those we thought would definitely be reportable and those we thought would possibly be reportable. By considering within this only the incidents we felt were definitely reportable, we were able to conclude that the best case was likely to be 77% underreporting. However, this figure would rise to give a worst-case picture of 89% if we considered the possibly true DG incidents and all within both categories that were potentially reportable.

It was anticipated that a social value (with economic and environmental benefits) would result from the project, by enabling consideration to be given to measures that might reduce DG incidents. The low occurrence of DG incidents can be seen as a positive illustration that the current safety measures and regulations have the desired consequence in most transport movements. However, no real patterns in location were identified within the data gathered. A high proportion of the incidents identified involved Class 3 products, with Class 2 and Class 8 also prevalent.

As this was a very small data set and some agencies were very England centric, it would be beneficial to repeat the exercise with a higher number of agencies / over a longer period so a larger data set could be analysed. We did encounter barriers in engaging with stakeholders and obtaining their data sets, which could also prove problematic in any future study. We also know that some agencies simply do not hold data of this kind in a consistent way at a national or local level.

To provide an ideal data set for analysis, a national reporting database would be required for road transport incidents involving hazardous materials that all agencies feed into. As the information available in current reporting systems is sparse and inconsistent, both within agencies and between agencies, it has been very difficult to be certain on the outcomes, but this research has nevertheless provided an indication of the situation that is likely to exist. It has also allowed consideration of what else could be done to improve data collection in the future.

The second phase of the project was to raise awareness of the reporting requirements in an engaging way as well as promote other subjects of concern. A key part of this was the production of a quarterly newsletter covering compliance issues, transport regulations and example incidents. If the project was run again, it would be useful to see if the reporting compliance improved because of the awareness activity conducted but the project has also allowed consideration of what else could be done to improve reporting levels.

CONTENTS

Appendices

1. PROJECT BACKGROUND

The Dangerous Goods Unit of DfT leads on policy for the safe and secure carriage of dangerous goods by road. Goods that are classified as hazardous are vital to the economy and a modern way of life, and can include chemicals for industry, fuel to heat and light our homes, or batteries which power our gadgets. Movement of such goods is essential, but it must be carried out in a way which minimises the risk of harm to people, property, or the environment. The objective of the dangerous goods division is therefore to ensure that the regulations continue to safeguard the carriage of dangerous goods, but in a manner that is proportionate and does not needlessly hinder trade, and that the UK compliance and enforcement framework is as effective as possible. Under ADR 1.8.5, if a serious accident or incident takes place during loading, filling, carriage or unloading of dangerous goods, a report conforming to the model prescribed in ADR 1.8.5.4 must by law be submitted to the Department for Transport within one month of the occurrence. In the case of significant incidents or accidents, these reports are shared with the Secretariat of the United Nations Economic Commission for Europe. The serious accidents or incidents which must be reported are those which meet one or more of the criteria stated in ADR 1.8.5.3.

The submission of reports to the Dangerous Goods Unit is low and it was suspected that this is due to an element of underreporting. DfT therefore decided to initiate a project for the collection and analysis of incident and accident data collection relating to the carriage of dangerous goods from a variety of sources. The project was also designed to remind industry of their responsibilities and ensure the legal requirements are understood by highlighting ADR obligations and encouraging reporting in an engaging way. It was anticipated that a social value would result from this project in terms of economic and environmental benefits, by highlighting the incidents occurring and enabling consideration to be given to measures that might reduce the number of dangerous goods related incidents.

2. DATA COLLECTION PHASE

2.1 AIM

The DfT wished to better understand the frequency, location and details of dangerous goods incidents and accidents which may be occurring in Great Britain. Whilst there is no mandatory reporting requirement on response agencies to record transport incidents involving DG, it was thought that records held by these agencies could give some indication of the incidents that they are responding to and could be combined to form a more accurate national picture. The project therefore planned to include analysis of data obtained from different sources to allow assessment of potential levels of incident underreporting, which could contribute to the evidence base for policy development and underpin any guidance that may be issued by officials within the Dangerous Goods Unit. It was not designed to attribute blame to operators but instead to enable DfT to effectively plan policy intervention and improve engagement with law enforcement agencies.

2.2 METHODOLOGY

Identification of stakeholders – NCEC worked with DfT based on existing knowledge of agencies that would hold data at a national level to come up with a sensible list of agencies to include in the data collection phase of the project. This included DfT (supplying official ADR reports and National Incident Liaison Officer (NILO) reports), Fire Service, Environment Agency, NCEC (supplying data from our national emergency response role), Driver and Vehicle Standards Agency (DVSA) and National Highways. Police were considered in this, but NCEC were already aware that they do not hold data of this kind consistently at a local or national level.

Scope of data collection – it was agreed that it would be sensible to examine a calendar year of data from January 2022 – December 2022. It was intended to ask for any data set relating to road transport incidents involving hazardous goods as an initial starting point. NCEC developed a data collection template based on the formal ADR reporting form.

Data requests - initial requests were submitted to the above agencies, along with the developed template to give an indication of the type of data we required. Data from the Environment Agency, DfT and NCEC was available almost immediately. However, it took some time to extract the required Fire Service data from the Home Office IRS reporting system. DVSA replied to state that they did not hold data of this kind. The Health and Safety Executive (HSE) were also contacted later in the project to determine whether they could supply any information on recorded prosecutions.

Data collation and analysis – all incidents provided were transferred to the developed template and data from different agencies were compared to highlight duplicate reports on the same incident. This resulted in 198 separate incidents being identified. This process highlighted the inconsistency of data both within a single agency and between different agencies. It also highlighted that specific data that would conclusively determine reportability was not available from most agencies. In our first analysis we removed incidents that were definitely not true dangerous goods transport incidents, which included fuel tank ruptures, alternatively fuelled vehicles, other vehicle component loss, such as engine oil or coolant, and goods that were not classified as hazardous. We had to assume that some of the incidents listed were possibly true DG transport incidents as there was insufficient information to rule them out. For example, any incidents that involved diesel or petrol carried in anything other than a tanker were considered possibly true DG. Whilst we thought that these would most likely relate to fuel tank ruptures and therefore would not be true DG incidents, from the information supplied, we could not completely rule out that fuel was being carried as DG in a different type of container. We then realised that we would have to implement some assumptions in our analysis to determine whether an incident would fall under reportable definitions, particularly in terms of Fire Service data. We decided that unless the incident description or a link to a report on the same incident from another agency clearly contradicted this we would assume:

- All Fire Service major hazmat incidents would be reportable.
- All fatalities would be reportable.

- All Fire Service minor hazmat incidents with containment required would possibly be reportable.

For the fuel example stated above, we concluded that even if these were true DG incidents, given the volumes of fuel likely to be involved in these cases, they would not be reportable. However, in other cases, we simply did not have sufficient information to determine whether incidents fell into the possibly reportable or definitely reportable categories.

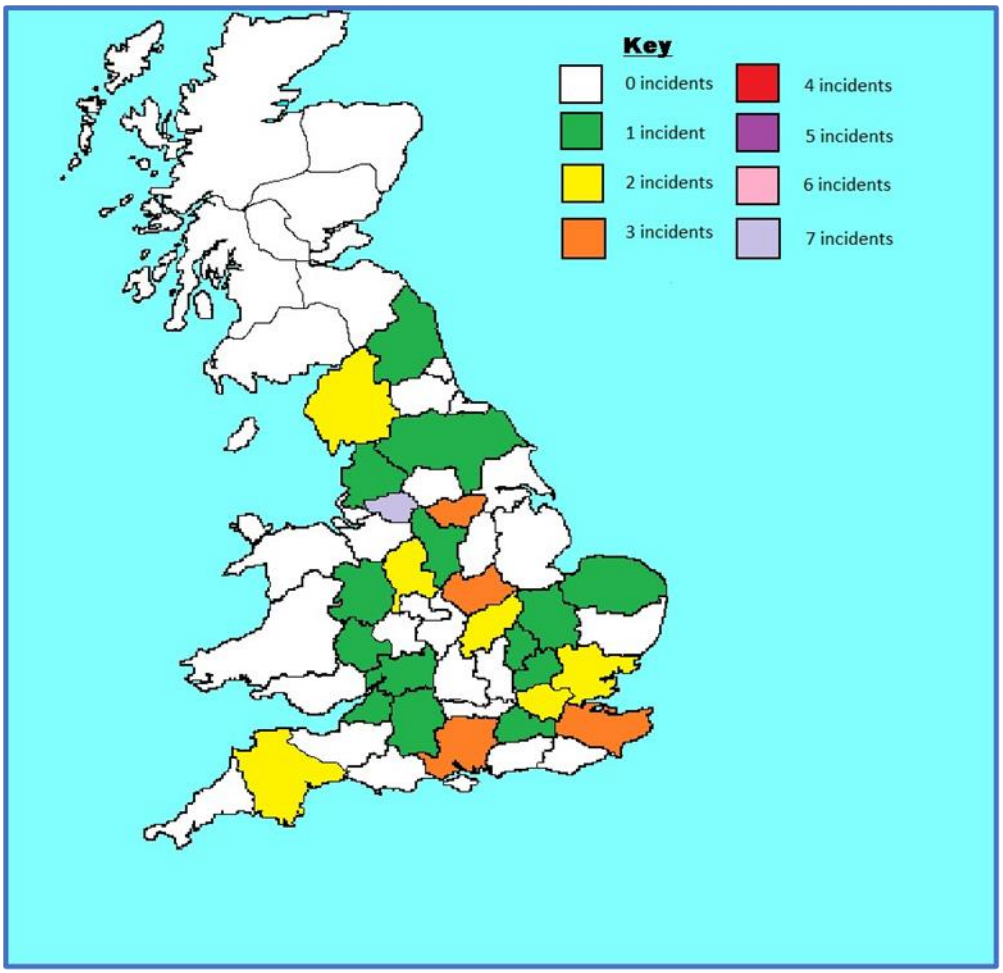
2.3 RESULTS

198 separate incidents were analysed, in a calendar year of data from January 2022 – December 2022, of which 46 were true DG transport incidents (23%) and another 43 were possibly true DG incidents (22%).

A high proportion of the incidents identified involved Class 3 products, with Class 2 and Class 8 also prevalent.

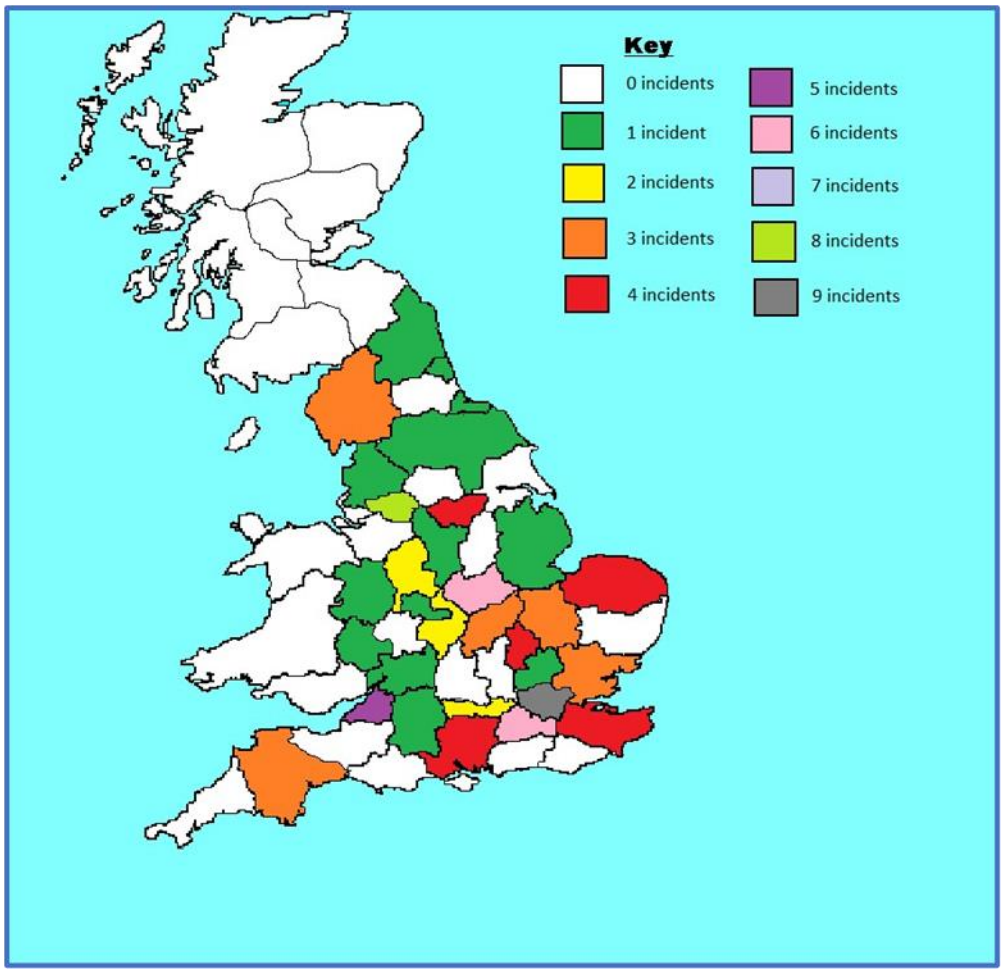
When considering mapping incidents, NCEC quickly realised that the location data supplied in many cases was simply not accurate enough to pinpoint the incident. We therefore decided that we would initially map by county to see whether there were any areas of concern as it would then be possible to look at the data for these areas to determine whether there were any specific roads highlighted as hotspots for incident occurrence.

Figure 1 Map of ALL definitely true DG transport incidents



* One incident could not be mapped as no location data was provided

Figure 2 Map of ALL true DG and possibly true DG transport incidents



* One incident could not be mapped as no location data was provided

There is no obvious pattern to DG transport incident occurrence or hotspots in Great Britain. Some of the Metropolitan Fire Service areas have slightly higher incident occurrence but this could be due to the size / population the area covered, along with the possibility of more established reporting procedures in larger organisations (based on the assumptions outlined). Even when the data for these areas was examined in more detail, there were no specific roads of concern identified.

Table 1 True DG incidents

True DG incidents	Definitely reportable	Possibly reportable	Reported to DfT
46	22	13	5

For definitely true DG incidents, 48% were definitely reportable (only 5 of these or 23% had been reported through to DfT).

A further 28% of true DG incidents were possibly reportable (none of these had been reported to DfT). If factoring in these then only 14% of incidents had been reported to DfT.

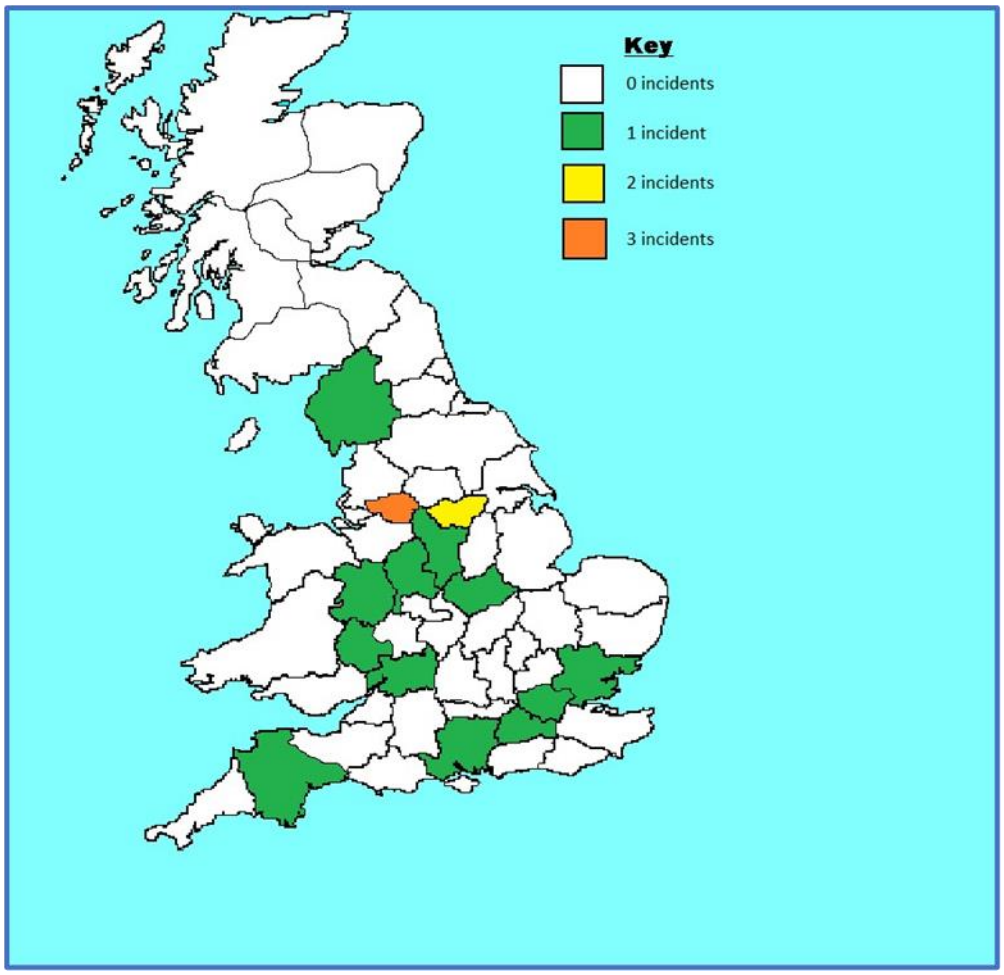
The likely underreporting for definitely true DG incidents is therefore 77% - 86% depending on whether the possibly reportable incidents are taken into account.

Table 2 Possible true DG incidents

Possible DG incidents	Definitely reportable	Possibly reportable
43	0	10

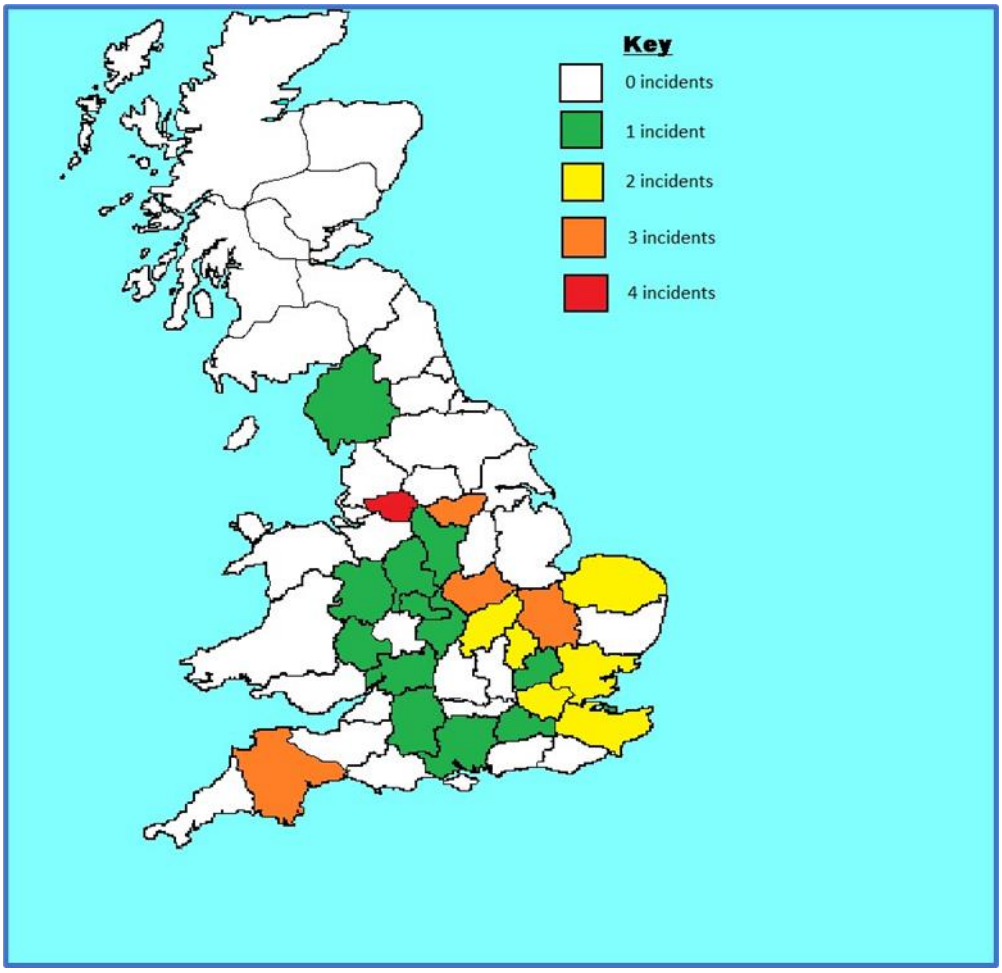
For possibly true DG incidents, 23% were possibly reportable, which would add to the underreporting total if they were deemed to be true DG. If we factor in all definitely reportable and possibly reportable incidents across both true DG and possible DG incidents, then the worst-case underreporting percentage rises to 89%.

Figure 3 Best case underreporting map



This reflects a best case of underreporting within Great Britain by highlighting only the definitely reportable incidents that were not reported to DfT within the definite true DG incidents in the above tables (based on the assumptions already outlined).

Figure 4 Worst case underreporting map



This reflects the worst case of underreporting within Great Britain by highlighting all definitely and possibly reportable incidents not reported to DfT within the definitely and possibly true DG incidents in the above tables (based on the assumptions outlined).

2.4 CONCLUSION

There was a low occurrence of reportable true DG transport incidents in Great Britain, which can be seen as a positive illustration that the current safety measures and regulations have the desired consequence in most transport movements. No real patterns in location were identified within the data gathered so there do not appear to be hotspots or problem areas within the country.

A high proportion of the incidents identified involved Class 3 products, with Class 2 and Class 8 also prevalent. This is largely unsurprising when considering the vast quantity of fuel shipments and large volumes of gases transported.

As this was a very small data set and some agencies were very England centric, it would be beneficial to repeat the exercise with a higher number of agencies / over a longer period so a larger data set could be analysed. We did encounter barriers in engaging with stakeholders and obtaining their data sets, which could also prove problematic in any future study. We also know that some agencies simply do not hold data of this kind in a consistent way at a national or local level. It should also be noted that the information gathered would likely not include incidents that occur during vehicle unloading / loading at company premises but only those on the transport network itself.

To provide an ideal data set for analysis, a national reporting database would be required for road transport incidents involving hazardous materials that all agencies feed into as the information available in current reporting systems is sparse and inconsistent both within agencies and between agencies, so it has been very difficult to be certain on the outcomes but this research has nevertheless provided an indication of the situation that is likely to exist.

In the absence of a centralised database and reporting system, data collection of incident reporting could be improved by reaching out to trade bodies to see to see if they hold data from their members. However, depending on the engagement, this may bias the data towards a particular cross section of industry, but it could give another avenue for data collection from a wider base. It would also be helpful to seek engagement from National Highways and the HSE as they are the remaining government agencies that would likely hold data of this type at a national level that could be used to supplement that obtained from other agencies. The Office for Nuclear Regulation (ONR) may also be able to provide relevant data for their specific sector.

DfT could also submit a request to specific response agencies to refine their existing collection databases e.g., the Fire Service IRS system. This would require requesting tick boxes for both hazardous materials incidents and transport incidents and it would be impossible to filter the relevant incidents, without using these in conjunction with each other. To be clear on whether incidents are definitely reportable though would need additional information fields to also be added to these reporting templates, such as quantity of material involved and road closures, or the inclusion of a much more detailed incident description. Our understanding is that the owners of such databases are incredibly resistant to changing the parameters currently included but this could warrant further discussion and exploration. This could also be done for the various Police collection databases in operation, but this would be more difficult as there is currently no centralised database that collects any information on hazardous materials incidents and as a result they are often not even recorded at a local level. Any change would have to be accompanied by a formal communication from DfT to every organisation affected to highlight how important it is for this information to be completed and the reasons behind this.

3. ADR REPORTING PROMOTION

3.1 AIM

The DfT wished to remind industry of their reporting responsibilities and ensure the legal requirements of ADR are widely understood. The project was focused on doing this in a way that would engage and interest any person involved in the transport of DG by combining the reporting obligations with real world examples and sharing other DG transport related subjects and areas of interest and concern. It is hoped that this will enhance the understanding of those involved in the transport of DG and encourage them to submit their data where appropriate through official reporting channels.

3.2 METHODOLOGY

A key part of this was the production of a quarterly newsletter covering compliance issues, transport regulations and example incidents. Four of these were produced, covering issues such as load security, high consequence dangerous goods, lithium batteries and hydrogen. All four bulletins are supplied in Appendix 1, along with a link to their location on our website.

These bulletins were circulated to a wide audience of chemical regulatory and emergency response experts, spanning both the public and private sector, from the different contact lists held by NCEC. They were also sent to the Carriage of Dangerous Goods Practitioner's Forum (CDGPF), the Chemical Hazards Communication Society and the British Association of Dangerous Goods Professionals (BADGP) for circulation to their members. Bulletins were also promoted on NCEC LinkedIn and Twitter streams. The key ADR reporting article from the first bulletin was also included in the NCEC newsletter.

In addition to this, NCEC spoke about the project at the NCEC Hazmat Practitioner's Forum, the DfT Industry Advisory Group (IAG) on Transport Security and the Vehicle Certification Agency (VCA) conference. It was also highlighted by a DfT guest speaker at the NCEC annual Hazmat conference, with NCEC answering questions as required.

Lastly, we were asked to produce an article for Chemical Watch about the project.

3.3 RESULTS

The following results were reported for each bulletin circulated (this relates only to the publication sent directly from NCEC and not those that may have been more widely shared by other agencies):

Quarter 1:

- Number of emails sent: 4599
- Number of emails opened: 1341
  - i.e. open rate = 29%
- Unique clicks made on the direct 'access' button to the article: 337 (7.3%)

Quarter 2:

- Number of emails sent: 4747
- Number of emails opened: 1330
  - i.e. open rate = 28%
- Unique clicks made on the direct 'access' button to the article: 213 (4.5%)

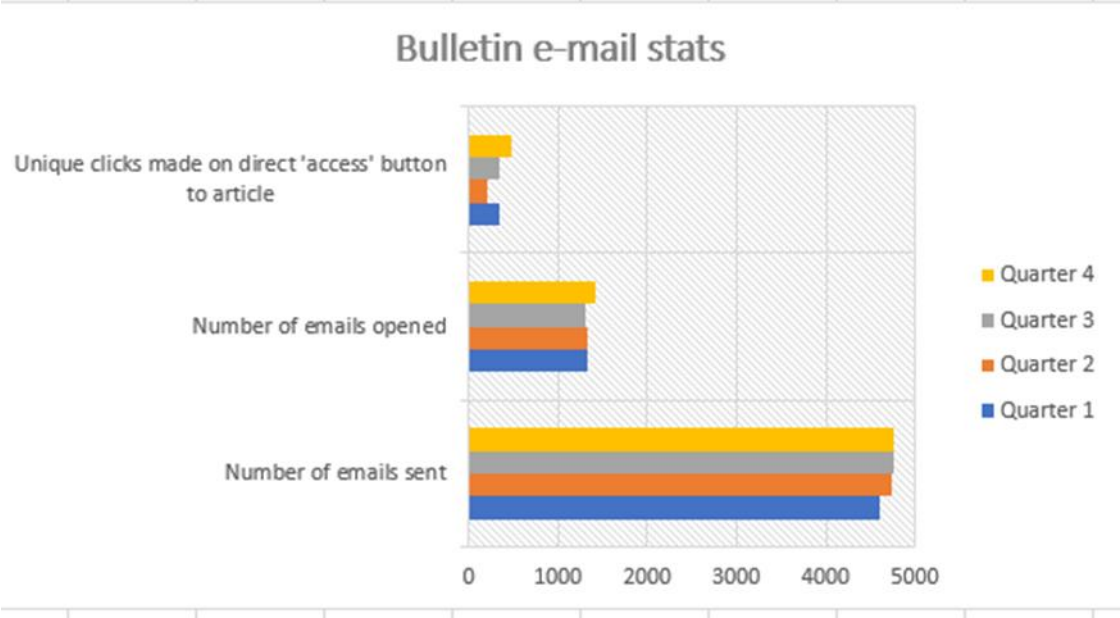
Quarter 3:

- Number of emails sent: 4766
- Number of emails opened: 1312

- i.e. open rate = 28%
- Unique clicks made on the direct 'access' button to the article: 342 (7.2%)

Quarter 4:

- Number of emails sent: 4769
- Number of emails opened: 1410
  - i.e. open rate = 30%
- Unique clicks made on the direct 'access' button to the article: 473 (9.9%)



Average click rates in 2022 were between 2-3% depending on the industry. The open rate is higher than the average across all industries, which is 21.5%. Both the click rates, and the open rates therefore demonstrate that the bulletin was positively impactful in marketing terms.

It should be noted that the circulation lists increased following delivery of the various presentations outlined above. However, as other companies opted to leave the circulations lists the number of companies receiving the bulletin from the first one sent to the final one sent remained static. The number of individual email recipients increased by 4% between Bulletin 1 and Bulletin 4. In addition to individual companies, this also captures multiple contacts from the same organisation and individuals on the distribution list who may be self-employed or have not listed their company name with us.

It is very difficult to know whether there has been any direct impact from the promotional activities on the number of incidents meeting ADR reportable criteria that have been reported to DfT. However, feedback received from both the public and private sector has been positive, both in terms of the bulletins circulated and the presentations delivered.

3.4 CONCLUSION

If the project was run again, it would be useful to see if reporting compliance has improved because of the awareness activity conducted. However, consideration should also be given to what else could be done to improve reporting levels. It may be helpful to distribute an anonymous survey to industry bodies / organisations to solicit reasons why incidents are not being reported (e.g., lack of awareness of requirements, the process is perceived to be too complex, fear of the consequences etc.). Anecdotal evidence has suggested that industry can feel discouraged when they do report as they do not receive any feedback from their submission so it would be interesting to see if a survey of this kind reinforces this view. It could also be worthwhile for DfT

to issue a clarification notice on the reporting requirements directly to reinforce the message delivered by the bulletins produced by NCEC in a more formal way. Lastly, it would be interesting to contact other countries where ADR is in force to see if they are experiencing similar issues with underreporting and whether they have established any understanding of the reasons for this. It was also noted during the project that near miss scenarios, such as issues identified in roadside checks by the Police are not factored into any ADR reporting requirements. It may be sensible to consider whether this would be a possible regulation amendment worth exploration in the future as this would show the true extent of non-compliance that could ultimately result in serious accidents or incidents.

APPENDICES

APPENDIX 1 QUARTERLY BULLETINS

All bulletins circulated a part of this project can be found on the NCEC website at:

https://www.ricardo.com/en/news-and-insights/campaigns/adr-reporting-and-dangerous-goods-safety-awareness-bulletin

Bulletin 1 (sent 16/02/2021)

NCEC is conducting a project on behalf of the UK Department for Transport, part of which aims to raise awareness and promote the reporting requirements for dangerous goods incidents that occur on the road network.

Welcome to our first quarterly newsletter to support this.

Road (ADR) Incident Reporting Requirements

Imagine that your warehouse manager lets you know that while loading a trailer for delivery to a customer, a forklift truck punctured a 950-litre intermediate bulk container (IBC) containing UN 1764, DICHLOROACETIC ACID, Class 8, PG II.
This caused a 500-litre spill that spread across the floor of the warehouse. It is cleaned up appropriately by trained warehouse staff, so the incident is now closed with all actions taken. However, from your dangerous goods awareness training you believe there is some sort of notification process for reporting dangerous goods accidents. And you are right to think that!

It is a legal requirement under the Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) regulation to report certain serious types of incidents involving dangerous goods to the Competent Authority. In Great Britain this authority is the Department for Transport (DfT). In Northern Ireland, operators would be required to report to the Health and Safety Executive for Northern Ireland (HSENI). The incident must be reported within **one month** of the incident occurring. To ensure that your organisation is accurately fulfilling its legal responsibilities, you may implement an internal best practice incident reporting process so that key stakeholders are promptly alerted when an incident meets the criteria outlined in ADR 1.8.5.

A report is required when an incident involving dangerous goods fits into one of the following events **AND** it is serious enough to meet at least one criterion.

Event	**Criteria**
Immediate risk of, or confirmed loss of product	• Transport category 0 / 1: > 50 kg or litres • Transport category 2: > 333 kg or litres • Transport category 3 / 4: > 1,000 kg or litres *There are also additional stipulations for Class 6.2 and Class 7 materials.*

Personal injury or fatality	• Death • Unable to work for at least three consecutive days • Hospital stay of one day or more • Intensive medical treatment
Material or environmental damage is sustained	• Damage value more than €50,000
Involvement of the authorities	• Evacuation or route closure for three hours or more

This table provides a brief summary of criteria, however for full legal definitions please refer to ADR 1.8.5.

ADR 1.8.5 covers more than the movement of goods on public roads. It also encompasses **loading and unloading operations.** Therefore, there may be reporting obligations on the loader, filler, carrier, or consignee.

Some scenarios that would require reporting to the DfT (or other Competent Authority) are detailed below for you to consider. They are designed to demonstrate the breadth of dangerous goods incidents that must be reported.

- While loading a trailer for customer delivery, a forklift truck punctured a 950-litre IBC containing UN 1760 Corrosive Liquid, N.O.S., PG II, which is assigned to transport category 2. This resulted in a 500-litre spill that spread across the floor of the warehouse. Although it was cleaned up appropriately by trained warehouse staff, this would qualify for reporting to the Competent Authority, as the spill exceeded the 333-litre threshold for transport category 2.

- A shipment of UN 2067 ammonium nitrate fertilizer grade was on route to a farm, however the load was shed on a minor B-road. The spill occurred at night and the road was closed by the police for 12 hours, until first light, when the clean-up crew arrived and worked on the spill. This road closure would need to be reported to the Competent Authority as it was closed for more than three hours.

- A warehouse employee was supervising the loading of a mixed load pallet of dangerous goods into a curtain-sided truck but accidentally trapped his hand beneath the pallet. He sustained a crush injury to his hand and was unable to work for five days. As the employee was unable to work for over three days, the Competent Authority would need to be notified.

- During icy weather conditions, the driver of a lorry lost control and crashed through the railing of a low bridge. The damage to the vehicle caused an unknown amount of its load, UN 3077 Environmentally Hazardous Substance, Solid, to enter the river below. The chemical was toxic to fish and destroyed £70,000 of fish stock in a downstream fishery, despite prompt action by the relevant agencies. The Competent Authority would need to be informed as the estimated value of damage caused by this incident involving dangerous goods exceeded €50,000.

- A road tanker was being filled with fuming nitric acid for delivery to a customer but the filling hose was poorly fitted. The road tanker operative accidentally inhaled some of the vapour as it escaped and began to cough violently, and experienced pain when breathing. The operative was admitted to hospital for treatment and kept under observation for 48 hours due to the

serious risk of pulmonary oedema. Since the operative stayed in hospital for more than one day due to exposure to a dangerous good, this incident would qualify for reporting to the Competent Authority.

If you are the person responsible within your organisation for reporting dangerous goods incidents to the Competent Authority, you should familiarise yourself with the full criteria of ADR 1.8.5, which defines when you need to submit a report. It is a legal requirement for incidents and accidents meeting the requirements of ADR 1.8.5 to be reported to the Competent Authority who, on receipt of the report, are entitled to request further relevant information. The online reporting form for Great Britain can be found here:

Transporting dangerous goods - GOV.UK (www.gov.uk)

If an incident occurs during an international journey covered by ADR 1.8.5, a report must be submitted to the competent authority of the territory where the incident occurred.

If you have any questions on the reporting requirements of ADR 1.8.5 or other regulatory obligations, please contact the DfT at dangerousgoods@dft.gov.uk or call 020 7944 2271 / 2058.

Load Security – An Enforcement Perspective

Do we really have an issue with load security?

Enforcement experience on vehicles carrying dangerous goods indicates that there is plenty of work to be done by us all. Non-compliance with the regulations has led to some very serious incidents involving insecure loads during the carriage of dangerous goods. These incidents range from IBC's sliding along the load bed and being pierced by protruding items within the vehicle, to containers completely falling off the vehicle. Such incidents have not only led to the loss of the product but have endangered life. Injuries can be sustained from the physical impact of the container hitting drivers, loaders, and the public, or from exposure to the product. Incidents such as these can also lead to significant clean-up operations with associated environmental damage. These can have catastrophic costs in terms of reputational implications for the operator. Moreover, there may be costs for the wider UK economy, such as those associated with road closures while specialist teams restore the infrastructure. Therefore, prolonged vehicle-related incidents, along with associated road closures, can have a massive cost impact on the wider UK economy.

While we are starting to see the positive effects of responsible hauliers, who have invested in load security (both in training and equipment) we must all continue to be vigilant. We can continue to improve and it is the responsibility of everyone involved in the carriage of dangerous goods to invest time, effort money to achieve the goal of the safe carriage of dangerous goods.

and

How can enforcement agencies support operators to improve?

To support operator improvement, the Driver and Vehicle Standards Agency (DVSA) and the Health and Safety Executive (HSE) undertook a review of the existing load security enforcement policy. Part of that work entailed re-writing the load security guidance available on the GOV.UK website and updating the operator instructions. This led to a formal change to the Load Security Enforcement Policy, which came into effect on the 1 May 2022. The policy change removed the load security matrix and introduced more options in the Categorisation of Defects (CoD) to ensure officers choose the correct 'defect' for the issue noted and communicate this accurately to the company involved. The CoD also provides more notes to assist in choosing the right defect, again helping the operator to fully understand any remediation action required from them. The decision to remove the matrix was based on the principle that any load must be properly secured for transit and that any shed load has an impact on road safety, whether it is a pallet of bricks or cardboard packaging.

When assessing a load for the purpose of load security, the focus must be ‘is it secure?’. If not, then the consequences for an operator could be severe, both in terms of the enforcement action they will face if their vehicle is stopped and, more critically, the potential impact if an incident does occur due to the load being insecure. If a vehicle is stopped by an enforcement officer and the answer to this question is ‘no’, then a prohibition must be issued, causing delays to the delivery of the load and business disruption for the operator, along with possible reputational damage from being unable to complete deliveries. However, if the answer to this question is ‘yes’, and there are no other serious regulatory infringements, the vehicle will be allowed to continue its journey, with perhaps some advice for future improvement if necessary. It is therefore in the interest of an operator to ensure that their load is fully compliant before it embarks on its journey.

To assess whether a load is compliant with the ADR regulations on load security, there are five key questions to ask, which can be used as a checklist for operators prior to signing off on a load:

- Can any part of the load slide, topple or bounce in any direction?
- Is the load causing the vehicle to be unstable or could it affect the handling?
- Can any part of the load fall off during transit?
- Is the load security equipment in poor condition and/or not appropriate for the load?
- Does any part of the load, or the way in which it is secured, present or is likely to present, an immediate danger to road users during transit?

If the answer is ‘yes’ to any one of these, the result can be:

- an immediate roadside prohibition;
- a prosecution;
- a referral to the Traffic Commissioners Office for Operator Licence consideration.

ADR 7.5.7 (Handling and stowage) sets out clear requirements for hauliers in terms of securing dangerous goods in a suitable manner to prevent movement and damage during transport.

Note: Our sincere thanks to Jason Dearsley, Essex Police/Vice Chair of the National Carriage of Dangerous Goods Practitioners Forum for providing the content of this blog.

ADR 2023 – Summary of Changes

ADR

Amendments to Table A

The existing entry for UN 1169 “EXTRACTS, AROMATIC, LIQUID” will be deleted for ADR 2023. Shipments will need to be transferred to UN 1197. To account for this, UN 1197 will be given an updated proper shipping name, “EXTRACTS, LIQUID, for flavour or aroma”. This affects all five sub-entries of both UN 1169 and UN 1197.

There is a new entry UN 3550 “COBALT DIHYDROXIDE POWDER containing not less than 10% respirable particles”.

In addition, there are some minor changes, for instance altered special provisions, to the following UN numbers:

1002, 1010, 1012, 1038, 1051, 1060, 1081, 1082, 1085, 1086, 1087, 1092, 1093, 1143, 1167, 1185, 1218, 1246, 1247, 1251, 1301, 1302, 1303, 1304, 1345, 1545, 1589, 1614, 1724, 1829, 1860, 1872, 1891, 1917, 1919, 1921, 1961, 1966, 1972, 1991, 2015, 2055, 2200, 2218, 2227, 2251, 2277, 2283, 2348, 2352, 2396, 2426, 2452, 2521, 2522, 2527, 2531, 2607, 2618, 2838, 2908, 2909, 2910, 2911, 3022, 3073, 3079, 3138, 3208, 3209, 3269, 3302, 3312, 3509, 3531, 3532, 3533, 3534, 3536, 3538.

If your organisation transports any of the above, then the changes to the ADR entries should be reviewed.

Amendments to special provisions

Four new special provisions have been created:

- SP396, which affects gas cylinders;
- SP397, which affects oxygen and nitrogen: in summary where in approximate concertation alignment with air are not considered oxidiser Class 5.1;
- SP398, which affects butylenes: 1-butylene, cis-2-butylene & trans-2-butylene;
- SP676, which affects polymerizing substances.

In addition, the following special provisions have been amended: 119, 188, 225, 291, 327, 363, 389, 591, 593, 642, 644, 650, 654, 655, 663, 674.

Amendments to packing instructions

The following packing instructions have been amended:

> P003, P004, P005, P006, P130, P137, P144, P200, P205, P208, P408, P621, P801, P903, P905, P906, P907, P909, P910, P911,
>
> IBC02, IBC07, IBC520,
>
> LP906.

Other amendments

Tank containers have been further divided such that those over 40,000 litres will now be placed in the new category of extra-large tank container.

The requirements for tanks to be equipped with safety valves have been reviewed and ADR chapter 6.8 now makes their fitment mandatory for tanks intended for the carriage of flammable liquefied gases and are optional for the carriage of compressed gases, non-flammable liquefied gases or dissolved gases. Tanks fitted with safety valves will need to display the new Safety Valve Mark, shown below. Tanks constructed prior to 2024 which are fitted with safety valves, are provided with an exemption from the requirement to display the new Safety Valve Mark until their next intermediate or periodic inspection.

Chapter 6 has been redesigned with a new chapter 6.9 and the old chapter 6.9 moved to 6.13.

> CHAPTER 6.9 - Requirements for The Design, Construction, Inspection and Testing of Portable Tanks with Shells Made of Fibre Reinforced Plastics (FRP) Materials
>
> CHAPTER 6.13 - Requirements for The Design, Construction, Equipment, Type Approval, Testing and Marking of Fibre-Reinforced Plastics (FRP) Fixed Tanks (Tank-Vehicles) and Demountable Tanks

In Section 9.7.9, there are now new rules for FL and EX/III vehicles which will require them to be fitted with automatic engine fire suppression systems and also for each wheel to be fitted with a thermal

protection device to avoid the propagation of fires from the wheels to the load. These requirements apply to vehicles entering into service from 1 January 2029.

Please note, this is not a comprehensive overview of all the changes. Remember that these changes took effect when ADR 2023 came into force on 1 Jan 2023, with compliance required by 1 July 2023 (or compliance with an extended transitional measure).

In addition to the above, a previous version of ADR made it a legal requirement for organisations that participate in the carriage of dangerous goods only as consignors to appoint a Dangerous Goods Safety Advisor (DGSA). However, as this was likely to create a significant burden on industry (to appoint the relevant people and implement the required regulations) a transitional measure was introduced to allow for this. This derogation ended on 31 December 2022, meaning that it is now necessary for office-based consignors that outsource the storage, packaging, and transportation of goods to a third-party logistics organisation to have a DGSA appointed. The DfT has released a video in support of this measure:

Consignors Required to Appoint a DGSA by 31 December 2022 - YouTube

Road Transport regulations (ADR/CDG) and Emergency Response

The National Chemical Emergency Centre's (NCEC) experience of advising on hazardous materials incidents over the last 50 years has given us an excellent view of how Dangerous Goods (DG) transport regulations support the emergency services and other people to safely resolve incidents.

DG regulations include administrative controls (such as hazard classification and consignment procedures) and practical measures (such as packaging and tank provisions) to maximise safety during transport. However, accidents do still occur but there is a clear sequence of how to use the regulations to respond to an incident.

Consider a scenario where a tanker is slowing down at a junction when another vehicle drives into the back of it, causing a leak of UN 2031, nitric acid 98%, from a damaged valve. Let us take a look at how everyone involved in this incident is supported by the clear regulatory structure in place, which facilitates its safe and efficient resolution.

Driver

The first level of response in this incident is the driver and the training they have received before being permitted to carry dangerous goods. The driver is not expected to have the chemistry or engineering expertise to resolve incidents but they play a key role in taking several early steps to help prevent the incident escalating and notifying the incident to the emergency services. ADR requires the driver to carry the Instructions in Writing (IiW) document, which provides an aide-memoir of key actions to take in the event of an incident.

Keeping the Dangerous Goods Note (DGN) to hand is also a key action that the driver can take to assist in the efficient resolution of the incident.

Driver Training ADR Chapter 8.2 Instructions in Writing ADR 5.4.3 Linguistic versions of "Instructions in Writing" are available from UNECE website

First responders / Emergency services

Several parts of the transport regulations support the emergency services in determining the chemical hazards present at an incident. These include:

Vehicle markings and placarding

The type and positioning of vehicle markings vary depending on the exact type of vehicle and the load being carried but these will always be used by first responders in several ways.

The marking and placarding of the vehicle are predominantly used in the defensive stage of the emergency response, when the first responders are gathering information, ensuring the incident does not escalate, formulating a response plan, and preparing risk assessments.

Type	Use	Regulatory reference
Hazard warning diamonds	Identify primary and secondary hazards of the load	ADR 5.3.1
Orange plate: Front and rear	Provides a warning that dangerous goods are present BUT does not identify the product(s) being carried	ADR 5.3.2
Orange plate with UN number and Hazard Identification Number (HIN) (ADR international transport)	UN number identifies the chemical(s) being carried HIN indicates the hazard class of the materials and the severity of their hazards	
Elevated Temperature Substance Mark and / or Environmentally Hazardous Substance Mark	Additional placards will be used to indicate other hazards, such as environmental risk and elevated temperature warnings	ADR 5.3.3 ADR 5.3.6
UK Domestic Journey Derogation Hazard Warning Panel (Orange plate) with UN number, Emergency Action Code (EAC) and emergency advice	UN number identifies the chemical(s) being carried EAC provides guidance on personal protective equipment, suitable extinguishing media and containment priorities Emergency telephone number provides a source of specialist advice	Carriage of Dangerous Goods Regulations 2009

telephone number (CDG UK domestic transport)		

Dangerous Goods Note (DGN)

The DGN provides the most comprehensive set of data on the shipment. It includes full details of the consignment, including the type and quantities of the dangerous goods being carried for packaged goods, packing group assignments for the evaluation of the severity of hazards and information on the consignor and consignee of the shipment.

This is extremely valuable information for more experienced responders, such as hazmat officers within the fire service, who are able to use the more detailed information to assess the hazard and associated level of risk posed and formulate a proportional response to the incident.

Specialist support and clean-up

There will be occasions where the emergency services require additional support from a product expert or emergency response specialist. The first stage of this is to determine who to contact. In our 50 years of proving an emergency response service, we have learnt that the most efficient way of facilitating this is to include a 24/7 emergency number directly on the DGN. For shipments in tanks in the UK a dedicated 24/7 emergency number on the placard provides a best practice option.

Once specialist support has been contacted, they will utilise transport regulation data to provide support to the emergency services. Using UN numbers to identify products can avoid any ambiguity over products with similar sounding chemical names, whilst keeping commercial formulation compositions confidential, to ensure an efficient and accurate response.

It is also likely that the product expert or emergency response specialist will use bespoke chemical information databases and other product information available through chemical supply regulations e.g. safety data sheets (SDS).

Once the incident enters the clean-up phase, all the chemical safety data will have been collated and can be passed to the remediation specialist. Ultimately, for many clean-ups the vehicle removing the dangerous goods will be driven by an ADR qualified driver, thereby completing the use of regulatory requirements in the incident response loop. To prevent future error and to help inform policy and shape safer practices, the DGSA should conduct an investigation and report incidents meeting the criteria outlined in ADR 1.8.5 to the Competent Authority as per the legal requirement to do so.

New Emergency Action Codes for 2023

The Dangerous Goods Emergency Action Code (EAC) List 2023 is now available. The new list has again been produced by the NCEC, in co-operation with the UK Home Office, and is published by The Stationary Office (TSO). A digital copy can be accessed here along with a summary of all the changes implemented, and a physical copy of the publication is available to purchase from TSO.

For those wishing to start using ADR 2023 from 1st January 2023, the following changes to the EAC codes have been implemented:

UN	Substance	EAC
1872	**LEAD DIOXIDE**	**1Z**
1891	**ETHYL BROMIDE**	**2WE**
3550	**COBALT DIHYDROXIDE POWDER**, containing not less than 10% respirable particles	**2Z**

The **use of the Dangerous Goods EAC List 2023** in connection with the use of ADR 2023 Edition will be mandatory from 1st July 2023. The EAC List 2021 should no longer be used from that date.

* In the case of any contradiction between this article and the printed version of The Dangerous Goods Emergency Action Code List 2023, the latter will have precedence.

We hope you found this newsletter useful and informative. If you have any questions regarding the information in the newsletter, please contact us at ncec@ricardo.com.

Bulletin 2 (sent 15/06/2023)

NCEC is conducting a project on behalf of the UK Department for Transport (DfT), part of which aims to raise awareness and promote the reporting requirements for dangerous goods incidents that occur on the road network.

Welcome to our second quarterly newsletter to support this.

Road (ADR) Incident Reporting Requirements

Picture the scene: your recently qualified Dangerous Goods Safety Advisor (DGSA) colleague contacts you to discuss an incident that occurred three weeks ago. One of his drivers has informed him that a 950-litre intermediate bulk container (IBC) of UN 1219, ISOPROPYL ALCOHOL, CLASS 3, PG II shifted during transport and leaked across the back of his trailer. This had been noticed when an alcoholic smell began to permeate into the vehicle's cab. The 300-litre spill from the leaking IBC had been successfully cleaned up, however your colleague is unsure if this incident should be reported as there were no consequences to other parties, aside from a delayed shipment. Because you solidified your understanding of ADR notification requirements by reading a previous version of this bulletin earlier in the year, you quickly confirm that it should be reported. You also run through with your colleague what the exact requirements are, such as the fast-approaching one-month deadline for reporting the incident.

Below is a recap of the reporting requirements. It is a legal requirement under the **Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) regulations** to report certain serious types of incidents that involve dangerous goods to the Competent Authority. In Great Britain, this authority is the Department for Transport (DfT). In Northern Ireland, operators are required to report to the Health and Safety Executive for Northern Ireland (HSENI). The incident must be reported within **one month** of the incident occurring. To ensure that your organisation is accurately fulfilling its legal responsibilities, it is advisable to implement an internal best practice incident reporting process so that key stakeholders are promptly alerted when an incident meets the criteria outlined in ADR 1.8.5.

A report is required when an incident that involves

dangerous goods fits into one of the following events **AND** it is serious enough to meet at least one criterion.

Event	Criteria
Immediate risk of, or confirmed loss of product	• Transport category 0 / 1: > 50 kg or litres • Transport category 2: > 333 kg or litres • Transport category 3 / 4: > 1,000 kg or litres *There are also additional stipulations for Class 6.2 and Class 7 materials.*
Personal injury or fatality	• Death • Unable to work for at least three consecutive days • Hospital stay of one day or more • Intensive medical treatment
Material or environmental damage is sustained	• Damage value of more than €50,000
Involvement of the authorities	• Evacuation or route closure for three hours or more

This table provides a brief summary of criteria, however for full legal definitions please refer to ADR 1.8.5.

ADR 1.8.5 covers more than the movement of goods on public roads. It also encompasses **loading and unloading operations.** Therefore, there may be reporting obligations on the loader, filler, carrier, or consignee.

Some scenarios that may require reporting to the DfT (or another Competent Authority) are detailed below for you to consider. They are designed to demonstrate the breadth of dangerous goods incidents that must be reported and can be used to support revision sessions for DGSA exams.

- A full road tanker, carrying UN1202, DIESEL to a rural farm, skidded on mud as it rounded a corner of the A361 near Chipping Warden and experienced a rollover into a neighbouring field. The driver was not injured, and nor was any product spilt. However, in the impact the tanker was severely dented, and the valve assembly bent, so it was unable to continue its journey. The diesel was pumped into a replacement tanker and tractor unit once the damaged tanker was righted. Due to the imminent loss of more than 1000 litres for a transport category 3 product, the Competent Authority would need to be notified.

- An 80-kilogram industrial reel of UN0065, CORD, DETONATING, FLEXIBLE (UN0065) fell off a pallet while it was being loaded by a forklift truck onto a lorry. The reel smashed to the ground and critically damaged the goods, but thankfully no operatives were injured. The dangerous goods note (DGN) had not yet been issued in this operation as this had happened when the lorry was fully loaded but before departure. The subsequent investigation revealed that the wrong strength of securing straps had been used. Since 80 kilogram of transport category 1 goods were damaged, this incident must be reported to the Competent Authority. The reporting threshold for transport category 1 is 50 kilograms. The fact that the DGN had not been prepared was irrelevant as the loading operation was still underway.

- Following a random inspection at Swansea dock on a 40-foot shipping container, it was collected by a lorry that misjudged a turn within the dockyard. The trailer overturned and the shipping container was lost into the dock. The container had not been correctly closed following the inspection and as a result the product (5 tonnes of UN2211, POLYSTYRENE BEADS, EXPANDABLE, EVOLVOING FLAMMABLE VAPOUR) floated into open water, caused an estimated £85,000 of pollution damage to the nearby Gower Nature Reserve and affected the local population of European Otters. Since more than €50,000 of damage had been sustained to the environment, this incident would need to be reported to the Competent Authority.

- A forklift operative was carrying out an internal warehouse transfer on an IBC of UN2672, AMMONIA, AQUEOUS SOLUTION, 10-35%, which was held on the top row of the shelving unit. During the operation, the operative forgot to lock the aisle entrance and a warehouse employee entered. The forklift operative was distracted, and incorrectly positioned the forklift under the IBC. When it was raised, the IBC slipped off the forks and fell to the floor, splitting open and splashing the solution on the warehouse employee, causing chemical burns to their skin. Even though there were serious injuries, as this was an internal transfer in progress, ADR 1.8.5 does not apply and therefore the Competent Authority does **not** need to be informed through this channel.

- A manufacturing plant that produces recycled paper and cardboard had received a delivery of sulfuric acid by road tanker. The plant operator escorted the driver to the fill-line inlets before walking away. The driver connected the delivery hose to what he believed to be the correct inlet for the sulfuric acid storage tank and began to dispense the liquid. After 30 seconds, he noted that a green cloud of gas was escaping from the sodium hypochlorite storage tank, so he stopped the filling process and fled the area before raising the alarm. The entire plant and surrounding 1km^2 were evacuated, and the fire service called to site. It was discovered that the driver had selected the incorrect inlet due to lack of labelling and as a result, had mixed 1,000L of sulfuric acid with 30,000L of sodium hypochlorite, which had caused a chemical reaction and the generation of chlorine gas. This would require reporting to the Competent Authority due to the large-scale evacuation and attendance of the emergency services.

If you are the person responsible within your organisation for reporting dangerous goods incidents to the Competent Authority, you should familiarise yourself with the full criteria of ADR 1.8.5, which defines when you need to submit a report. It is a legal requirement for incidents and accidents that meet the requirements of ADR 1.8.5 to be reported to the Competent Authority who, on receipt of the report, are entitled to request further relevant information. The online reporting form for Great Britain can be found here:

Transporting dangerous goods - GOV.UK (www.gov.uk)

If an incident occurs during an **international journey** that is covered by ADR 1.8.5, a report must be submitted to the Competent Authority of the territory where the incident occurred.

If you have any questions on the reporting requirements of ADR 1.8.5 or other regulatory obligations, please contact the DfT at dangerousgoods@dft.gov.uk or call 020 7944 2271/ 2058.

Enforcement of the safe Carriage of Dangerous Goods – Prohibition Notices

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (CDG) in conjunction with the ADR regulations regulate the carriage of dangerous goods by road.

In the UK, the Department for Transport (DfT) is responsible for the enforcement of the secure carriage of dangerous goods requirements (excluding class 7 radioactive materials). For road transport, the associated enforcement activity is undertaken by several authorities including the Health and Safety Executive (HSE), the Driver and Vehicle Standards Agency (DVSA) and the police.

Following on from our enforcement perspective on load security in our last bulletin, we thought it would be helpful to have a broader look at enforcement issues that are encountered during roadside checks on vehicles carrying dangerous goods within the UK. We have reviewed archived data from various online sources, including the HSE website, along with data we gathered from various forums, and have identified the subject areas that are most frequently causing prohibition notices to be issued.

Top five issues identified relate to:

- Fire extinguishers
- Transport paperwork/instructions in writing being inaccurate/incomplete
- No/incorrect placarding/marking
- Equipment not available
- Load security.

ADR chapter 8.1 covers equipment and documentation. ADR 7.5.7 covers handling and stowage. We touched on several of these issues in our previous bulletin, but we thought it would be helpful to summarise the importance of these items and some things to consider.

Fire extinguishers: ADR 8.1.4 concerns fire extinguishers. The regulations stipulate how many and what type of fire extinguishers must be carried by a vehicle carrying dangerous goods. They also state that the extinguishers must be accessible as it is hoped that their use will allow a driver to safely exit a vehicle in the event of an incident. In some instances, they can also stop an incident escalating and becoming much more serious if they can be deployed as soon as an issue emerges. Enforcement officers encounter vehicles where fire extinguishers are missing or out of date, so it is critical that operators (and drivers for the sake of their own safety) remember to check that the correct number of extinguishers are present for the vehicle and that they are serviced/replaced as necessary.

Transport paperwork inaccurate/incomplete: The regulations state that a vehicle carrying dangerous goods must carry

transport documents, which contain key information about the material being carried (such as UN number, Proper Shipping Name, Class, Packing Group, volume etc.) and instructions in writing (which contain basic information for use in an emergency). Documents to be carried are covered in 8.1.2 of ADR, with cross references to Chapter 5.4. Instructions in writing will support the driver with taking immediate action in the event of an emergency, but the wider transport documentation is critical so that the emergency services can understand what is being carried on a vehicle and implement the most appropriate response.

Placarding/Marking: Placarding refers to the correct placement of hazard labels (diamonds) on the vehicle and marking refers to the correct placement of orange plates on the vehicle. ADR 8.1.3 refers to ADR Chapter 5.3 in respect to placarding and marking. Placarding and marking provide an early indication to observers of an incident that dangerous goods are on board and provide preliminary information to the emergency services, to inform their response, until more detailed paperwork can be located.

Equipment not available: ADR 8.1.5 refers to "miscellaneous equipment", which includes things such as wheel chocks, pocket lamps, warning signs and warning vests. Other specific items, such as eyewash, protective masks, environmental first aid items, may be needed according to the Class of Dangerous Goods being transported. As outlined in a later article, enforcement officers have developed a mat that allows required equipment to be laid out during roadside checks to expedite the check process and ensure that everything remains in a sanitary condition.

Load security: ADR 7.5.7 (Handling and stowage) sets out clear requirements for hauliers in terms of securing dangerous goods in a suitable manner to prevent movement and damage during transport. It should be noted that the Road Traffic Act 1988 has a requirement for loads to be secured, and guidance on meeting those legal requirements has been published by the Department for Transport (Safety of loads on vehicles: code of practice (publishing.service.gov.uk)). In particular, Section 15 of the code provides specific guidance on securing Dangerous Goods loads.

As outlined in our previous bulletin, non-compliance with the regulations has led to some very serious incidents involving insecure loads during the carriage of dangerous goods, and prohibition statistics confirm that it is a significant area for improvement within industry. It is therefore critical that operators assess whether a load is secure and that it cannot become unstable during transport by checking that all appropriate load security measures, detailed in the regulations, are implemented and in good condition.

Even in a highly regulated area of industry, there is still appears to be a significant issue with non-compliance nationally when looking at the reported statistics. The purpose of a prohibition notice is to remove the risk to road safety. In the case of vehicles found in breach of regulations relating to the carriage of dangerous goods, separate notices will be issued for each individual breach to comply with the requirements of the HSE. It is therefore in the interest of every operator to comply with the regulations to ensure the safe carriage of dangerous goods and smooth operation of their business.

Roadside Compliance Check Safety and Personal Protective Equipment (PPE) Mat

The UK National Carriage of Dangerous Goods Practitioners Forum has been gaining more and more members over the past few years, from the 42 police forces, industry, and government agencies, which has significantly improved the sharing of best practice. With many enthusiastic and industrious minds striving for easier and more professional ways to conduct enforcement activity, we have seen first-hand some practical solutions that have been developed.

One such innovation came from drivers and officers who, whilst doing roadside compliance checks, noticed that equipment stipulated by the regulations was often being placed onto the ground by the driver. Lay-bys and lorry parks are not the most sanitary of conditions and this could result in contamination of the safety equipment, which is not desirable.

Also, whilst undertaking compliance checks with foreign lorry drivers, often the internet, hand signals and the long-lost art of mime were being employed to help all parties and ensure that the driver understood what was required by the enforcement officer. This was often costly in time and could lead to frustration on all sides.

One police force, with support from National Highways, proposed that the answer to this was to develop a safety equipment and PPE mat, reflecting the requirements of the road (ADR) regulations.

This mat is made of a durable rubber material that can be simply laid onto the ground. It has internationally recognisable pictographs that aid communication and can be washed afterwards to prolong its life. The mat enables drivers to place their equipment onto the ground without fear of contamination. It also assists enforcement officers and international drivers alike to navigate a compliance check, quickly and efficiently, regardless of any language barriers. This means that the interaction can be more inclusive and take up as little time as possible.

PS 407 Jason Dearsley – Essex Police

Vice Chair of the National Carriage of Dangerous Goods Practitioners Forum

Road (ADR) Additional Measures for the Carriage of High Consequence Dangerous Goods

Security is an important issue for dangerous goods (DGs) while in transport due to their potential for theft and subsequent misuse, which may cause damage to people, property, or the environment. ADR regulations 1.10.1 require certain measures to be in place before, during and after the transport of DGs to reduce the risk of the load falling into incorrect hands.

On a generic level, those involved in the transport of DGs should have regular and sufficient training that focuses on preventative best-practice behaviours and actions that can be taken in the event of interference with the DGs, as well as knowledge of and participation in internal plans (if present) to enhance the security of the DGs during transport. DGs should also only be transported by suitable qualified hauliers and each driver should always have photo identification while transporting DGs. Areas storing DGs should, where possible, not be accessible to the public and have appropriate physical barriers against theft e.g. high fences, locked gates and CCTV.

Examples of best-practice behaviours could include conducting regular security walks around a DGs' compound, challenging drivers who are not carrying identification badges in a loading bay, or reporting poor physical infrastructure, such as broken CCTV cameras. Furthermore, records of employees' training must be kept on file by their employer for a timeframe set by the Competent Authority to prove compliance (in Great Britain this is the Department for Transport (DfT) and for Northern Ireland this is the Health and Safety Executive for Northern Ireland (HSENI)).

So, with all these measures in place, what are High Consequence Dangerous Goods (HCDGs) and how and why are they treated differently by the regulations?

The Emergency Services conduct exercises to streamline their response to real terrorist events. Under the Chemsafe scheme, the NCEC participated in one such multiagency exercise in 2022, when a large quantity of a highly toxic solid (Class 6.1, Packing Group I) was dumped into a reservoir that was part of the wider water distribution network for 90,000 homes. The implication was that terrorists were attempting to poison a town's population and cause widespread panic, disruption, and numerous potential fatalities. As the product was a Class 6.1 PG I product, it is classified as a HCDG and therefore to obtain 900kg of the product, terrorists would have had to have overcome several security measures, or the security measures were not stringent enough to deter acquisition.

HCDGs are substances most attractive to terrorists due to their potential for misuse and harm in a Chemical, Biological, Radiological, Nuclear and Explosive (CBRNe) event, as they may produce serious consequences, such as high human impact (mass casualties), physical damage (caused by explosions) or socio-economic disruption.

Table 1.10.3.1.2 in ADR lists classes of goods, other than Class 7, which have been identified as HCDGs. These include substances that are commonly transported such as:

- Nitric acid >70%
- Ammonium nitrate
- Ethylene oxide.

More unusual examples include certain explosives, e.g. non-electric detonators, or category A infectious substances, such as foot and mouth disease. The additional security measures may not be required for some smaller loads applying the exemption outlined in Section 1.1.3.6.3. For the specific definitions of high consequence radioactive materials, see ADR 1.10.3.1.3 - 1.10.3.1.5.

The overarching principle of ADR is to provide the requirements for the safe carriage of DGs by road: to the general public, those involved in the transport chain or emergency responders, who interact with DGs when an incident occurs *during* transport. However, the additional requirements for HCDGs place an emphasis on preventing security breaches, which ultimately could result in theft.

HCDGs therefore have extra security measures designed to protect the wider public by reducing the likelihood of these types of materials entering an uncontrolled situation and therefore the potential for CBRNe terrorist attacks. One of these measures is that there **must** be a security plan (unlike with other DGs, where a plan is advised) which, includes the following:

- Those responsible for the security of the HCDGs must have the authority and competency to carry out their roles.
- There must be a confidential method for recording the movement of HCDGs and protection of information relating to the plan.
- There must be continuous assessment of the security risks caused by various stages of the transport operation.
- There must be a well-defined process to enforce security. For example, by undergoing frequent training refreshers, new employee verification, careful selection of the driving route or use of technology to reduce security risks. Technology should always be functional but should not hinder emergency response.
- There must be an efficient reporting process to periodically update, identify and resolve security issues.

Further information on the security plan, including a full breakdown of the required elements, is covered in Section 1.10.3.2.2.

If you are one of the people within your company responsible for creating the security plan, then you should also feedback and cooperate with other parties involved in transport, i.e., carriers, consignors and consignees, and the Competent Authorities. This is to relay discoveries during normal operations (i.e., areas that could be improved), as well as exchange threat information, apply appropriate security measures and respond to security incidents with the purpose of increasing public safety.

If you have any questions on the reporting requirements of ADR 1.10 or other regulatory obligations, please contact the DfT at dangerousgoods@dft.gov.uk or call 020 7944 2271 / 2058.

We hope you found this newsletter useful and informative. If you have any questions regarding the information in the newsletter, please contact us at ncec@ricardo.com.

Bulletin 3 (sent 25/09/2023)

NCEC is conducting a project on behalf of the UK Department for Transport (DfT), part of which aims to raise awareness and promote the reporting requirements for dangerous goods incidents that occur on the road network.

Welcome to our third quarterly newsletter to support this.

Road (ADR) Incident Reporting Requirements

What would you do in this scenario?

The police contact your head office to inform you that one of your tankers, carrying UN1011 BUTANE, has been involved in a road traffic collision causing a major A road to be closed while they assess the scene. There are no injuries, but the tanker is badly dented and there are reports of a hissing sound of escaping gas. They are looking for your company to aid with resolving the leaking tanker so they can reopen the road. Your company rapidly provide a replacement tanker and arrange recovery of the damaged tanker. The road remained closed for 4 hours and there was a lot of chatter on social media.

Later that week, after a debrief about the incident, your transport manager asks if the high publicity of the incident and involvement of the emergency services means that the Competent Authority has already been informed of what happened. Your answer should be: 'we must conform to the International Carriage of Dangerous Goods by Road (ADR) notification requirements, by independently reporting the facts of the incident to the Competent Authority, regardless of whether they are aware via social media'. You refer your transport manager to this bulletin, and earlier editions, to give them more awareness of the reporting requirements.

The Agreement concerning ADR states that it is a legal requirement to report certain serious incidents involving dangerous goods to the Competent Authority when they meet the criteria outlined in ADR 1.8.5. In Great Britain, this authority is the Department for Transport (DfT). In Northern Ireland, operators would be required to report to the Health and Safety Executive for Northern Ireland (HSENI). It must be reported within **one month** of the incident occurring. To ensure that your organisation is accurately fulfilling its legal responsibilities, you may implement an internal best practice incident reporting process so that key stakeholders are promptly alerted when an incident meets the criteria outlined in ADR 1.8.5.

A report is required when an incident involving dangerous goods fits into one of the following events **AND** it is serious enough to meet at least one criterion.

Event	Criteria
Immediate risk of, or confirmed loss of product	• Transport category 0 / 1: > 50 kg or litres • Transport category 2: > 333 kg or litres • Transport category 3 / 4: > 1,000 kg or litres *There are also additional stipulations for Class 6.2 and Class 7 materials.*
Personal injury or fatality	• Death • Unable to work for at least three consecutive days • Hospital stay of one day or more • Intensive medical treatment
Material or environmental damage is sustained	• Damage value more than €50,000
Involvement of the authorities	• Evacuation or route closure for three hours or more

This table provides a brief summary of criteria, however for full legal definitions please refer to ADR 1.8.5.

ADR 1.8.5 covers more than the movement of goods on public roads. It also encompasses **loading and unloading operations.** Therefore, there may be reporting obligations on the loader, filler, carrier, or consignee.

Some scenarios that may require reporting to the DfT (or other Competent Authority) are detailed below for you to consider. They are designed to demonstrate the breadth of dangerous goods incidents that must be reported.

- A tanker was leaking a continuous flow of nitrogen gas due to a welding fault. The leak was noticed due to frosting on the tank while the driver stopped at a service station for a rest break. Although the leak was small (estimated to be 2 litres a minute), the structural damage to the

container means that the incident should be reported to the Competent Authority due to the imminent risk of product loss.

- A curtain sided lorry carrying a shipment of UN3480 LITHIUM ION BATTERIES spontaneously ignited on a major motorway near Cambridgeshire. No injuries were reported but the smoke plume and subsequent damage to the tarmac caused the northbound carriageway of the motorway to be closed by the fire and rescue service (FRS) for approximately 5 hours. Due to the attendance of the authorities and the road closure for greater than 3 hours, the Competent Authority would need to receive a report of this incident.

- A culture sample of UN2814 INFECTIOUS SUBSTANCES, AFFECTING HUMANS, (EBOLA), was damaged in transport on the way to a university. As this is a Class 6.2 substance, the size of the product release does not matter, and the incident must be reported to the Competent Authority because of the possibility of the disease spreading throughout the population.

- A mechanical failure caused the brakes on a road tanker to lock on and the subsequent loss of control resulted in the tanker lying against a dry, grassy embankment. The heat from the brakes set fire to the grass. The tanker contains UN1086 VINYL CHLORIDE. Although there is currently no escape of the product, there is a risk of a boiling liquid expanding vapour explosion (BLEVE) due to the heat and the product's potential to polymerise. Therefore, a 1.6 km evacuation zone is created, causing several hundred households to leave their homes while the emergency services make the scene safe. This would require reporting to the Competent Authority due to the presence of the emergency services and the evacuation of residents for greater than 3 hours.

- During loading, approximately 5L of UN3257 ELEVATED TEMPERATURE LIQUID, N.O.S splashed on to an operative causing second and third degree burns to their hands, arms and chest despite them wearing the appropriate personal protective equipment. They were initially placed into a coma at the hospital and treated for a week to reduce the effects of swelling from the burns. As the employee was in hospital for greater than one day, the Competent Authority should be notified.

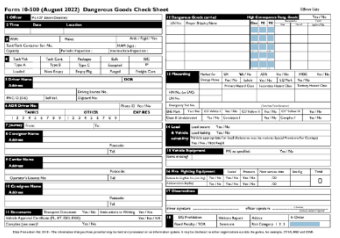
If you are the person responsible within your organisation for reporting dangerous goods incidents to the Competent Authority, you should familiarise yourself with the full criteria of ADR 1.8.5, which defines when you need to submit a report. It is a legal requirement for incidents and accidents meeting the requirements of ADR 1.8.5 to be reported to the Competent Authority who, on receipt of the report, are entitled to request further relevant information. The online reporting form for Great Britain can be found here:

Transporting dangerous goods - GOV.UK (www.gov.uk)

If an incident occurs during an international journey covered by ADR 1.8.5, a report must be submitted to the Competent Authority of the territory where the incident occurred.

If you have any questions on the reporting requirements of ADR 1.8.5 or other regulatory obligations, please contact the DfT at dangerousgoods@dft.gov.uk or call 020 7944 2271 / 2058.

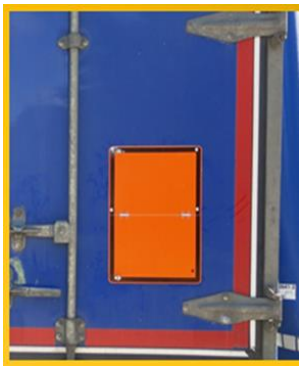
Emerging Trends in Enforcement Issues



There are many elements to a roadside inspection and a 10/500 form is completed at the roadside by police. The structure of this form allows industry to understand what is required. However, enforcement agencies have noticed several emerging trends, whilst conducting compliance checks on vehicles carrying dangerous goods.

ADR Orange plates

Whilst ADR orange plates have been an issue for some time, particularly in terms of them being unclean, poorly fixed, not visible, or incorrectly oriented, there is an emerging trend towards the use of magnetic plates. ADR 5.3.2.2.1 covers the specification and size requirements for these plates, which includes that the plate shall not become detached from its mount in the event of 15 minutes engulfment in fire. Research has shown that magnets lose their magnetic properties at around 80 degrees Celsius so, unless the magnetic plates are of a porcelain variant, they will likely not comply with ADR stipulations.



ADR also states that these plates must be displayed in the vertical plane, but some companies are putting them on the bonnet of vans, which again is not compliant. It has been noted that companies are using these on hire vehicles, where the hire companies do not know their vehicles are being used to carry dangerous goods. It is important that orange plates conform to ADR stipulations and are placed correctly.

Electronic transport documents

The development and implementation of electronic transport documents is progressing well, and they are becoming a popular choice amongst hauliers carrying dangerous goods. ADR already copes neatly with their use, but it has been noted by enforcement agencies that with new opportunities come new risks. Common trends identified include the driver not knowing how to access the documents, the device present not producing all the information required under ADR or an unserviceable / missing device (low battery or damaged / stolen).

Whilst there is no need for this documentation to be immediately accessible like Instructions in Writing, ADR 1.8.1.2 does require participants to provide the necessary information without delay so it is imperative that the driver must be able to gain access during an enforcement check. It is therefore important that drivers are well trained and that there is a contingency plan in place in case there is an issue with the device itself. Packaged goods can be very difficult to identify without the information

contained within these documents, which can create significant problems if there is an issue with the load.

Lack of Dangerous Goods Safety Advisor (DGSA) notification following an enforcement check

It has become apparent that many DGSAs are not being alerted to positive or negative roadside interactions with enforcement agencies, which in turn makes it difficult for them to produce accurate annual reports and know when they need to undertake company visits.

Enforcement Officers are therefore being encouraged to ask for the name of the appointed DGSA from the transport manager of the company, prompting a phone conversation, but it is alarming that many do not actually know who their DGSA is.

This is part of an initiative called Closing the Gap, which forms part of Vison Zero (a national police initiative for zero road deaths), as a breach to ADR poses a risk to the community. This promotes an early intervention to save lives and prevent unnecessary injuries. This is a small part of this overall campaign but critical due to the harm this type of incident can cause.

Note: Our sincere thanks to Terry Harvey, Suffolk Police / Chair of the Carriage of Dangerous Goods Practitioners Forum and Jason Dearsley, Essex Police / Vice Chair of the Carriage of Dangerous Goods Practitioners Forum for providing the content of this article.

Lithium-ion Batteries – A Changing Landscape

Does your company transport lithium-ion (Li-ion) batteries or goods that contain Li-ion batteries? Are you aware of the risks of Li-ion batteries and handle them appropriately? Would you be able to identify a damaged Li-ion battery and know what measures to take?

There is an urgent need to develop new sources of energy and energy storage solutions to reduce dependency on fossil fuels. Li-ion batteries are a relatively new technology, yet there has been an increase of Li-ion batteries in domestic and commercial electrical equipment because of their high energy density. They have a wide range of uses from mobile phones to electric scooters to energy storage systems supplying the National Grid. However, these batteries can present a significant risk if they are not handled, packaged, classified, and declared appropriately. This article intends to promote awareness of the inherent risk of thermal runaway in Li-ion batteries and the provisions defined for their transport by road under ADR.

There are many different chemistries of lithium batteries and cells, but they generally fall into two categories: lithium metal batteries and Li-ion batteries. They are all transported as Class 9 dangerous goods. However, each are assigned different UN numbers in Table A of ADR, depending on whether not they are contained in or packed with equipment (UN 3090 and 3091 for lithium metal and UN 3480 and 3481 for Li-ion). The primary difference between these categories is that Li-ion batteries are rechargeable and do not contain lithium metal. Li-ion batteries can also form part of vehicles which would fall under the dedicated UN numbers UN 3166, 3171 and 3536 – see ADR Table A for further detail. However, this article will focus on Li-ion batteries transported under UN3480 and UN3481:

UN Number	Proper Shipping Name	Special Provisions
3480	LITHIUM ION BATTERIES (including lithium ion polymer batteries)	188, 230, 310, 348, 376, 377, 387, 636
3481	LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT OR LITHIUM ION BATTERIES PACKED WITH EQUIPMENT (including lithium ion polymer batteries)	188, 230, 310, 348, 360, 376, 377, 387, 390, 670

Thermal runaway

The increase in transport of Li-ion batteries has seen an increase in the number of fires involving Li-ion batteries and their chemical properties present an unusual hazard: thermal runaway. Each battery contains several cells which are connected to provide the electrical output. The cells are composed of a Li-ion electrode, a graphite electrode, and an electrolyte. The Li-ion and graphite electrodes have different charges so must be kept apart physically by a separator. When one cell within a battery is compromised such that the separation between the electrodes fails, it short-circuits and releases a significant amount of heat energy. If the energy cannot dissipate, it will uncontrollably propagate between cells in thermal runaway. The heat from one battery can cause other batteries to undergo thermal runaway. Heat vaporises and decomposes the electrolyte into a toxic, corrosive, and flammable mixture which will increase the pressure inside the battery, until it ultimately explodes. The vapour released from

the battery can immediately ignite leading to long, directional flames. Alternatively, the vapour cloud can concentrate within a confined space, reach an ignition source, and produce an extremely dangerous vapour cloud explosion.

Due to the positive feedback loop involved in thermal runaway, it is extremely difficult to control a Li-ion battery fire. Water has a high heat capacity so readily cools the fire but does not prevent the chemical reaction from continuing. Equally, preventing the chemical reaction using powder further contains the heat, so chance of reignition is high. Foam formulations are being developed and investigated as a future

A curtain-sided lorry carrying Li-ion batteries spontaneously caught fire on one of the busiest motorways in the UK, causing closure of the motorway for more than 6 hours while the FRS brought the fire under control. The trailer was burnt to a shell. The driver successfully uncoupled the cab and was unharmed. The cause of the fire is likely to have been a Li-ion battery that short-circuited.

option, but it must completely smother the fire and specialist foams are unlikely to be rapidly available on the road network. There is currently no industry standard to fight a Li-ion battery fire.

Causes of thermal runaway

Due to the difficulties in fighting an established Li-ion battery fire, it is best to prevent damage to a Li-ion battery before it occurs. Studies have identified common causes of thermal runaway:

- Internal manufacturing defects - contamination
- Physical damage - mechanical abuse e.g. bending or thermal abuse
- Substandard quality - unstable chemistry within the cells
- Electrical abuse - over-charging / discharging
- Internal electrical failure i.e. a short-circuit.

ADR 2.2.9.1.7 describes the conditions that all Li-ion batteries must be tested to in order to reduce the likelihood of Li-ion battery failure. One of these requirements (2.2.9.1.7a) is that manufacturers should ensure the batteries pass the physical and chemical tests according to the UN Manual of Tests and Criteria, Part III, Section 38.3, which vary slightly according to whether they are classified as UN3480 or UN3481. The manufacturer should then submit a Li-ion Batteries Test Summary Certificate verifying the test results.

Other incidents can arise from packaging failures, non-declaration, or mis-declaration of Li-ion batteries. They should be labelled on the outer packaging with Class 9A labelling or marked according to ADR 5.2.1.9.2 if Special Provision 188 (the cells have a Watt hour rating of <20Wh and the battery has a Watt hour rating of <100Wh) applies. In addition to the typical packaging requirements that determine the material performance levels, there is an additional requirement that cells or batteries must be protected against short circuit for all UN3480 / UN3481 applicable packaging instructions (P903, P908, P909, P910, P911, LP903, LP904, LP905, LP906). The level of danger posed by damaged Li-ion batteries is known, as ADR requires such Li-ion batteries to be transported under Special Provision 376. This also mandates that any severely damaged Li-ion batteries (for example, those leaking electrolyte) must be transported in more sturdy packaging (P911 compared to P903, for example) that amongst other prescriptions, must withstand projectile damage due to the heightened risk of explosion.

Measures to prevent thermal runaway

Methods to verify the integrity of the Li-ion batteries and maintain safety during transport could include: handling with care; visual checks of the batteries to notice any obvious bulging, visible leaks, smoke / “steam” of a vapour cloud or flames; ensuring packages are not ruptured nor show signs of damage and conform to relevant packaging instructions; obeying relevant labelling and marking standards; or preventing the load from exceeding ambient temperature during transport (recommended maximum 40^{o}C). There is an element of reliance on the manufacturer producing suitably high-quality batteries, but this can be mitigated by knowing your customer and ensuring compliance with the UN Manual of Tests and Criteria.

Industry standards, transport regulations and codes are slowly being updated to prevent incidents occurring in the future, however there are several actions that could be carried out today to improve safety and protect people, the environment, assets and reputation (PEAR) during the transport of Li-ion batteries. We would first encourage you to raise awareness within your company of the inherent risk of thermal runaway. You could also assess your vulnerabilities to thermal runaway, implement a best practice guide on handling shipments containing Li-ion batteries as well as develop an emergency response procedure that mitigates the risks and hazards of thermal runaway – including the release of toxic, corrosive, and flammable gases which, if not immediately ignited, may produce a vapour cloud explosion.

If you have any questions on the ADR requirements for lithium-ion battery transport or other regulatory obligations, please contact the DfT at dangerousgoods@dft.gov.uk or call 020 7944 2271 / 2058.

Celebrating 50 years of Emergency Response

The National Chemical Emergency Centre (NCEC) was formed in 1973 at a time of increasing activity within the chemical sector, with an associated rise of incidents related to the transport of Dangerous Goods. When an incident involving a road tanker transporting oleum (highly concentrated sulfuric acid), resulted in a fatality, arrangements were put in place to ensure that emergency services would have fast access to the information they may need to keep themselves and others safe if a similar incident were to happen in the future.

NCEC work with the Department of Transport (DfT) and Chemical Industries Association as part of the Chemsafe scheme, providing support to the UK emergency services when they are dealing with incidents involving hazardous materials through a 24/7 hotline.

We thought it would be interesting to provide a few examples of the type of transport incidents involving dangerous goods that we have provided advice on. Of course, you can consider which of these incidents would require notification under the requirements of ADR 1.8.5 – answers are at the end of the article.

700 litre ink trail

As indicated in our earlier bulletins, load security is a significant issue in the carriage of dangerous goods. In this call, two containers of UN 1210, Printing Ink, Flammable, PG III, had come loose from their tethers within a curtain-sided heavy goods vehicle (HGV). The movement had caused one to become damaged and leak approximately 700 litres of product, resulting in a trail for an unknown distance of the HGV's journey between Manchester and Bristol, as the spill was only noticed when the driver stopped in a lay-by on the A4174. The leak was ongoing, pooling in and below the HGV while in the lay-by. The containers had originated from Germany and the product name was described as Druckfarbe. There was no placarding on the outside of the vehicle, but the container displayed a hazard warning diamond.

The FRS had already placed a 30m cordon around the HGV and closed the A4174 and the Environment Agency and the Health and Safety Executive had already been notified of the incident. However, the Fire Officers still required additional advice from NCEC regarding spill remediation, specifically if they should contain the spill or dilute it and wash to drain.

We informed the caller that without a trade name (Druckfarbe translating to "printing ink"), we would expect the product to be a type of organic solvent with pigment suspended in it, and therefore the main hazard of the material would be flammable vapours. However, the packing group indicated that this was at the less hazardous end of the flammability range (flash point between 23 and 60^{o}C). Still, we clarified that ignition sources should be removed and, since the organic vapours may produce a narcotic effect when inhaled, breathing apparatus should be worn in areas where the vapours could accumulate e.g. the load area of the vehicle. We counselled against washing the product to drain due to environmental risks posed by an organic material and the potential for a vapour cloud and subsequent explosion in the drains. Instead, we recommended that the spill should be absorbed in inert material where practicable, and the damaged container sealed with putty to prevent further leakage.

Multi-load Bridge Strike

A curtain-sided HGV had collided with a railway bridge on a major A road in Leicestershire and had become wedged underneath. The HGV had suffered substantial damage in the collision which caused the curtain to tear and damage to the receptacle(s) being carried, resulting in the load leaking across the road. A corresponding solvent-type odour could be smelt by the fire officers present. The road was closed due to the incident and a provisional 50-metre cordon was in place.

NCEC was contacted by the FRS as they required specialist advice on the potential for a reaction between the various mixed load products carried on the HGV. There were 13 products on the HGV, which were only described by their UN number and proper shipping name:

UN Number	Proper shipping name
1170	Ethanol
1263	Paint
1719	Caustic Alkali, Liquid, N.O.S.
1805	Phosphoric Acid, Solution
1824	Sodium Hydroxide, Solution
1903	Disinfectant, Liquid, Corrosive, N.O.S.
3077	Environmentally Hazardous Substance, Solid, N.O.S.
3082	Environmentally Hazardous Substance, Liquid, N.O.S.
3262	Corrosive Solid, Basic, Inorganic, N.O.S.
3264	Corrosive Liquid, Acidic, Inorganic, N.O.S.
3266	Corrosive Liquid, Basic, Inorganic, N.O.S.
3295	Hydrocarbons, Liquid, N.O.S.
3469	Paint, Flammable, Corrosive

In addition, hydrogen peroxide and peroxyacetic acid were due to have been packed onto the HGV but it was not initially clear if they had been left behind at the depot, which illustrates how not following ADR to the letter results in confusion.

We observed that the shipment primarily consisted of a large quantity of solvent, paint-based hazardous materials (UN 1170, 1263, 3295 and 3469), which would pose a flammable risk, a risk that would be further exacerbated if the oxidising peroxide-like substances were included in the shipment. We noted the incompatibility of the acids (UN 1805 and 3264) and alkalis (UN 1824, 3262 and 3266) and provided advice on how to use a thermal imaging camera to pinpoint unexpected heat generated by an ongoing chemical reaction. Furthermore, we predicted that any gases created from reactions would be rapidly evolved, although we did not think it likely that there would be any toxic gases (such as chlorine) produced.

After a discussion with the FRS, we concluded that their monitoring equipment should be used to check the safety of the scene. In addition to the thermal imaging camera, they also deployed a gas monitor, which showed no hazardous gases had evolved from the spill. Due to the presence of environmentally hazardous substances (e.g. UN 3077 and UN 3082) and the risk of creating heat of mixing, we advised that the spill should be contained or absorbed in sand and not diluted and washed to drain.

Whist we were able to provide advice to resolve this incident, there were many aspects of this carriage operation that could have breached the legal requirements and therefore the enforcement authorities may have taken action against the operator and/or driver.

Corrosive Leak from a Curtain-Sided HGV

An unidentified substance was leaking from a curtain-sided HGV on the eastbound carriage way of a strategic motorway, causing the closure of all but one lane of the motorway. The HGV was carrying different Class 8 (corrosive) materials in various sized containers (including 950-litre intermediate bulk containers (IBCs)) and it had not been established exactly which of the containers on the load were leaking.

The chemicals being carried were:

UN Number	Proper shipping name	Trade name
1760	Corrosive Liquid, N.O.S., PG III	Circopure N SFM (Sulfuric Acid, Methane Sulfonic Acid)
2031	Nitric Acid, With Less Than 65 % Nitric Acid, PG II	Acidsan 26% w/w Nitric Acid Solution
3265	Corrosive Liquid, Acidic, Organic, N.O.S., PG III	Lactic Milchsaeure DL

The police intended to open the curtain side of the HGV to assess the extent of the spill and determine how best to contain the material so that the vehicle and its load could be moved so they could look to fully open the motorway to traffic. Before they did so, they contacted NCEC for assistance in identifying the possible leaking product and any relevant hazards.

NCEC began by recognising a common risk with mixed loads of Class 8 substances, i.e. if acids and alkalis are mixed, they will undergo an acid-base reaction which will produce a lot of heat and potentially toxic gas or vapour by-products. As more information became available about the load, we determined that all the products were acidic and therefore an acid-base reaction would be unlikely. We recognised that strong acids and metals inside the HGV may be incompatible and react to produce hydrogen, adding a further hazard of flammable gas to the acidic liquid and vapour. We also highlighted that the nitric acid could increase fire risk in contact with combustible material, such as wood, paper, or cellulose.

We discussed the most practical remediation options and recommended using a chemically inert material (such as sand or earth) to absorb the spilled material, which would make it more manageable to collect and dispose of as hazardous waste. We explained that the Environment Agency would need to be contacted to carry out pH monitoring if the police intended to wash the residues to drain with water as, despite dilution, the wastewater would remain acidic.

The police ultimately took the decision to open the curtain and inspect the load. They discovered that it had completely shifted and there were several damaged containers that required removal, along with a re-assessment of the integrity of the remaining load before the HGV could continue its journey. Due to the location of the incident, the management of specialist clean-up was passed on to National Highways.

Reporting serious incidents during loading, filling, carriage, or unloading is required under ADR regulations in the UK. Understanding where and how incidents occur through accurate reporting is key to further developing policy and response practices. For transport related calls taken on the Chemsafe line, NCEC immediately warns DfT of any significant disruption to the transport network. In addition to

this, we conduct transport mapping of incidents notified to us to highlight any patterns or trends in incident occurrence.

NCEC is proud to still be supporting the emergency services through Chemsafe 50 years on and, whilst it is no substitute for individual company emergency response arrangements, it does provide a safety net for first responders and prevents escalation.

Answers to the above calls:

Only one of the incidents would likely not be reportable:

- *700 litre ink trail: As this is a transport category 3 substance, it would not be reportable as the volume of product lost is below the reportable threshold.*

Both the other incidents would likely be reportable for the following reasons:

- *Multi-load Bridge Strike: This would almost certainly require reporting due to the road closure, which was likely to be protracted, given the situation.*
- *Corrosive Leak from a Curtain-Sided HGV: This would likely be reportable due to the volume of product at immediate risk of, or confirmed, loss from multiple 1000 litre containers of Category 2 and 3 substances.*

We hope you found this newsletter useful and informative. If you have any questions regarding the information in the newsletter, please contact us at ncec@ricardo.com.

Bulletin 4 (sent 17/11/2023)

NCEC is conducting a project on behalf of the UK Department for Transport (DfT), part of which aims to raise awareness and promote the reporting requirements for dangerous goods incidents that occur on the road network.

Welcome to our final newsletter to support this.

Road (ADR) Incident Reporting Requirements

Imagine you are the Dangerous Goods Safety Advisor (DGSA) for a haulage company that (among other shipments) has stored a shipment of 40 x 1000-litre intermediate bulk containers (IBCs) of UN2031 that contain 68% nitric acid. During its temporary storage, the nitric acid begins to unexpectedly leak from the valve assembly of approximately half of the IBCs, pool on the floor of the warehouse, destroy nearby products and corrode the metal racking. Several employees inadvertently inhale the acidic vapours when they discover the leaking containers and need medical treatment, including hospitalisation for two days. After a successful clean-up, an investigation reveals that the nitric acid was packaged in incompatible IBCs, with metal fixtures in the valve. You estimate the loss to your business to be £1 million due to clean-up costs, replacement of the racking and loss of revenue.

From your training and information contained in previous versions of this bulletin, you are aware that your warehouse is part of the transport chain. Due to the required hospital stays of the injured employees and since the damages you suffered amount to more than the €50,000 threshold, you report this incident to your Competent Authority.

The Agreement concerning ADR states that it is a legal requirement to report certain serious incidents involving dangerous goods to the Competent Authority when they meet the criteria outlined in ADR 1.8.5. In Great Britain, this authority is the DfT. In Northern Ireland, operators would be required to report to the Health and Safety Executive for Northern Ireland (HSENI). It must be reported within **one month** of the incident occurring. To ensure that your organisation is accurately fulfilling its legal responsibilities,

you may implement an internal best practice incident reporting process so that key stakeholders are promptly alerted when an incident meets the criteria outlined in ADR 1.8.5.

A report is required when an incident involving dangerous goods fits into one of the following events **AND** it is serious enough to meet at least one criterion.

Event	**Criteria**
Immediate risk of, or confirmed loss of product	• Transport category 0 / 1: > 50 kg or litres • Transport category 2: > 333 kg or litres • Transport category 3 / 4: > 1,000 kg or litres *There are also additional stipulations for Class 6.2 and Class 7 materials.*
Personal injury or fatality	• Death • Unable to work for at least three consecutive days • Hospital stay of one day or more • Intensive medical treatment
Material or environmental damage is sustained	• Damage value more than €50,000
Involvement of the authorities	• Evacuation or route closure for three hours or more

This table provides a brief summary of criteria, however for full legal definitions please refer to ADR 1.8.5.

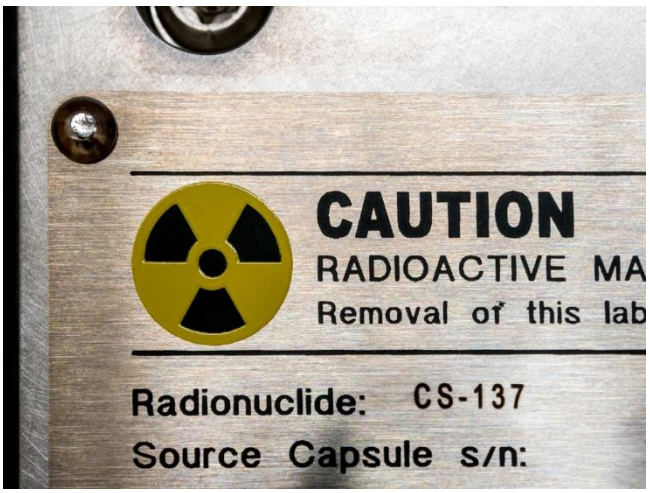
ADR 1.8.5 covers more than the movement of goods on public roads. It also encompasses **loading and unloading operations.** Therefore, there may be reporting obligations on the loader, filler, carrier or consignee.

Some scenarios that may require reporting to the DfT (or other Competent Authority) are detailed below for you to consider. They are designed to demonstrate the breadth of dangerous goods incidents that must be reported.

- A tradesman's van that contains a 30-litre acetylene cylinder is involved in a road traffic collision and becomes involved in fire. Despite the subsequent explosion of the cylinder, there are no injuries. Although the road was closed to contain the incident, as the acetylene is designed for professional use to support the tradesman's job, the carriage of acetylene is exempt from ADR under 1.1.3.1(c) and therefore the Competent Authority does not need to be made aware of the incident.

- A dark-coloured 250-litre drum of UN 2014 HYDROGEN PEROXIDE, 50%, is transported to a warehouse ahead of distribution to the final customer. It is stored outside in direct sunlight on a hot summer's day. The peroxide begins to decompose and pressurise the container until it explodes, and the blast injures a passing worker who is hospitalised for two days. Despite the low quantity involved in the incident, it would need reporting to the Competent Authority due to the hospital stay of the employee.

- A radioactive capsule containing Caesium-137 was lost during transport. It is not known how it escaped its original containment within the vehicle as its absence was only discovered during the unloading process. Although the capsule was found undamaged, further shielding and containment had to be reapplied to the capsule to allow it to resume its journey i.e. it was placed inside a lead-lined container. As additional safety measures were applied to the radioactive capsule, the Competent Authority would need to receive a report of the incident. In addition to notifying the Competent Authority, further stipulations on the transport of Class 7 materials means that the Office for Nuclear Regulation (ONR) must be notified without delay by phone or email, and the incident must also be reported using the ONR incident notification form (INF1) at www.onr.org.uk.



- Embrittlement on a compressed hydrogen (UN 1049) tanker valve caused a low-level leak that was only noticed when the vehicle's pressure alarm activated. The high flammability of hydrogen meant that the fire service closed the road to remove potential ignition sources from the area. Although a replacement tanker could be readily found, the load was unable to be transferred across due to the lack of grounding equipment. It was decided to allow the hydrogen to vent, resulting in a road closure for 14 hours. This must be reported to the Competent Authority for several reasons: the loss of thousands of litres of hydrogen and the prolonged road closure. Hydrogen is looked at in more detail here.

- UN 1823 SODIUM HYDROXIDE, SOLID has spilt from a damaged 25kg bag and out of the side of a curtain-sided lorry, causing a small trail along the road. The incident will not need reporting to the Competent Authority as the spill is not large enough for a transport category 2 dangerous good.

If you are the person responsible within your organisation for reporting dangerous goods incidents to the Competent Authority, you should familiarise yourself with the full criteria of ADR 1.8.5, which defines when you need to submit a report. It is a legal requirement for incidents and accidents meeting the requirements of ADR 1.8.5 to be reported to the Competent Authority who, on receipt of the report, are entitled to request further relevant information. The online reporting form for Great Britain can be found here:

Transporting dangerous goods - GOV.UK (www.gov.uk)

If an incident occurs during an international journey covered by ADR 1.8.5, a report must be submitted to the Competent Authority of the territory where the incident occurred.

The DfT, in conjunction with NCEC, has collated events such as this one into a study to gain an understanding of the types of incidents involving dangerous goods in transport, which is detailed in the final article of this bulletin, and would like to thank those who are fulfilling their legal obligations! If you have any questions on the reporting requirements of ADR 1.8.5 or other regulatory obligations, please contact the DfT at dangerousgoods@dft.gov.uk or call 020 7944 2271 / 2058.

The National Chemical Emergency Centre and UK Regulations – where it all began

On 8 December 1972, a serious incident occurred in a natural dip on the northbound carriageway of the M6, just north of the Skelmersdale link at Orrell. The incident happened shortly before 21:00 when a tanker carrying oleum (containing 80% sulfuric acid) travelling from St Helen's to Whitehaven, slowed to a stop because of traffic build up. It was a foggy evening, so visibility was poor, causing a container lorry travelling behind to swerve and collide with the back corner of the vehicle. Immediately, thousands of gallons of acid were released. A 48-year-old off-duty nurse from Birmingham had been travelling to Scotland with friends and family when she witnessed the collision. She left the safety of the car she was travelling in to try to assist.

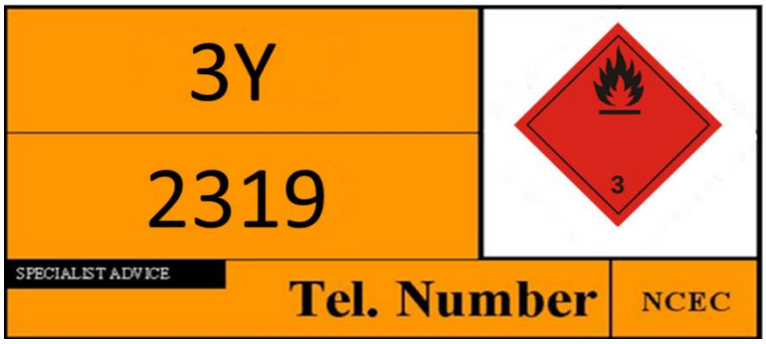
The driver of the tanker tried desperately to warn of the danger posed by the acid by banging on his cab windows and gesturing for people not to approach. Unfortunately, these actions were mistaken for cries for help, leading the nurse to approach the tanker closely. As it was a foggy night, the release of the material was not visibly obvious. It is thought that any gaseous material would have blended with the fog in the orange lights of the motorway and any liquid material would have looked like water. It is not entirely clear whether the lady was overcome by fumes from the acid and collapsed into a pool of the material, whether she slipped on the acid, or if she walked directly into the stream of acid spilling from the tanker. However, she was found in a pool of acid and sustained such serious injuries that she sadly passed away.

There were other casualties of the incident who sustained burn injuries, including the daughter of the nurse involved and the tanker driver. Cars also came to a halt behind the accident, with their occupants leaving vehicles to investigate the situation. Members of the emergency services attempting to help saw their footwear disintegrating as they walked in the acid. 20 people suffered minor burns as a result, but some required ongoing treatment for several years.

The oleum involved was for use in the detergent industry. The vehicle owners, Leather's Chemicals from St Helen's, sent 10 tonnes of soda ash to neutralise the acid but the clean-up process took over 12 hours and the motorway was closed until 13:00 the following day.

This prompted a call from the local MP for a full Whitehall investigation into the cause of the incident and a thorough review of the risk posed by the transport of dangerous goods (DGs). Questions were also asked about the resources the emergency services had available for dealing with incidents involving dangerous substances. As a result, the UK Government decided that something had to be done with regards to substances like this being transported by road and emergency services not knowing what they were dealing with. New control measures were introduced to ensure that bulk loads of corrosive substances were properly carried in suitable vehicles, that the loads were properly marked and that measures were taken to alert other road users and the emergency services of the hazards involved. In 1973, the National Chemical Emergency Centre was set up by the UK Government to provide 24/7 emergency response support to incidents involving hazardous chemicals. Whilst NCEC was privatised in 1996 and has been a part of Ricardo for some time now, this core service is still provided under the Chemsafe scheme with funding support from the Chemical Industries Association (CIA) and the Department for Transport (DfT).

A working group was also set up to examine what could be done to reduce the risks of a similar event happening again and 3 key developments were introduced. Transport emergency instructions, commonly referred to as Tremcards, were initially introduced as a voluntary code of practice before being adopted as mandatory documents that contained important safety information about the vehicle's load. Hazchem plates Code displaying an Emergency Action (EAC) were also introduced, initially as a voluntary initiative. again a scheme was set up between 3 Lastly, association, the Freight Trade Association (FTA), now known as trade Logistics UK, the Road Haulage Association (RHA) and the CIA to introduce a voluntary scheme for DG driver training, which became known as the National (Dangerous Substances) Driver Training Scheme. Companies were encouraged to take part and CIA member companies would only accept tanker drivers that had gone through the training.



In the late 1970s/early 1980s the first substantial set of regulations for the transport of DGs in the UK by road and rail in tanks of any kind was introduced. These translated the Hazchem system into law and made driver training compulsory. It was still left up to individual companies to determine what constituted a satisfactorily trained driver, but guidance was issued in the form of Approved Codes of Practice (ACOP). The regulatory body at the time was the Health and Safety Executive. ACOPs were also produced for other areas, such as tank operations and tank testing. The requirement for driver training was later written into UK law but drivers of vehicles containing dangerous goods were subsequently required to hold an ADR Driver Training Certificate, so the UK implemented the Dangerous Goods Driver Training Scheme (ADR) to transition from the previous scheme and comply with the ADR regulations.

By the late 80s, it was clear that directives would come from the European Commission (EC) requiring all EU Member States, in the early 90s, to apply ADR as their national regulation. However, Member States highlighted that they had small national variations that would make direct application not practicable and possible, and four countries had substantive differences that they were not prepared to give up. The UK fought to continue to use Hazchem plates instead of ADR orange boards, which displayed a Hazard Identification Number in place of the EAC. It was thought that the extinguishing media and personal protective information contained within the EAC was preferable. As a result, the UK were allowed to keep this system domestically.

NCEC would like to thank Wigan Council Archives and Roy Boneham (New Alchemy Training and Consultancy) for their contributions to the content of this article.

Hydrogen: the alternative fuel of the future?

Hydrogen is currently a frontrunner for alternative-fuelled vehicles. It is the first and most abundant element in the known universe and has been used in numerous industrial sectors for hundreds of years. It is a component in the production of a variety of chemicals such as ammonia (an essential component of fertilisers), the processing of electrical semi-conductors and it is a vital ingredient in the food, pharmaceutical, and petrochemical industries; and, of course, within the energy sector. Until as recently as 50 years ago, it was a major constituent of 'town gas' in UK's domestic and industrial fuel network before it was removed over safety concerns. Indeed, several events over the years have contributed to hydrogen obtaining a marred reputation (the 1937 Hindenburg Disaster perhaps the most infamous), yet the industrial world is increasingly turning back towards hydrogen as a versatile and clean energy source. This is for several reasons: hydrogen has an incredibly high energy density per kilogram compared to typical petroleum-based fuels, when burnt it only produces water as a by-product, and the invention of hydrogen fuel cells have produced an efficient source of power. Therefore, for a more sustainable future and to reduce reliance on fossil fuels, it becomes paramount to ensure hydrogen's safe production, storage, and transport.

Hydrogen fuelled vehicles

Hydrogen can be used in internal combustion engines and within fuel cells. Fuel cells use the electrochemical properties of hydrogen and oxygen, encouraging them to react and produce water, which releases electricity that can be used to power a vehicle. While hydrogen contained in fuel tanks for the propulsion of vehicles is excluded from ADR by sections 1.1.3.2 and 1.1.3.3, an increase in hydrogen-fuelled vehicles (both domestic and industrial) will increase demand for hydrogen to be transported across the country. Indeed, the process of filling a hydrogen vehicle can occur in a similar manner to petrol, diesel, LNG and CNG powered vehicles: via a pump at a refuelling station. To maintain as much of the current infrastructure as possible, hydrogen would need to be transported by tanker to required locations. In the UK, hydrogen is most transported by road in its compressed form, although it may be transported under three different UN numbers according to different physical forms:

UN Number	Proper Shipping Name	Special Provisions	Tank Codes
1049	HYDROGEN, COMPRESSED	378, 392, 653, 622	CxBN(M)

			TA4, TT9
1966	HYDROGEN, REFRIGERATED LIQUID	-	RxBN TU18, TE26, TA4, TT9
3468	HYDROGEN IN A METAL HYDRIDE STORAGE SYSTEM or HYDROGEN IN A METAL HYDRIDE STORAGE SYSTEM CONTAINED IN EQUIPMENT or HYDROGEN IN A METAL HYDRIDE STORAGE SYSTEM PACKED WITH EQUIPMENT	321, 356	-

Note that UN 3468 has fewer restrictive special provisions associated with it. This is of importance as special provisions must be read and where appropriate, enforced to ensure that tighter control, or an exemption can be applied. Special provision (SP) 321 merely states that the product is assumed to contain hydrogen, and SP356 decrees that the Competent Authority of the manufacturer's country must issue a certificate determining that the metal hydride storage system and its packaging is approved for transport. The flexibility of SP356 is due to the relative newness of the metal hydride storage systems, but also their innate safety compared to storing hydrogen as a compressed or liquefied gas.

Hydrogen safety concerns

- Embrittlement

As it is the smallest molecule and the lightest element, hydrogen can permeate through materials and cause embrittlement, whereby it interacts with the lattice structure of certain metals, and affect their physical properties – notably reducing ductility and therefore tensile strength. Embrittlement is well understood within the established hydrogen industries because it shortens the life of their infrastructure. For this reason, pipe networks to move hydrogen would need constant monitoring, and are therefore considered a more challenging prospect. In road transport, it will shorten the working life of cylinders, storage vessels and road tankers etc., which would ideally be in operation for decades. To prevent having road tankers in use that may have been damaged by embrittlement, there are provisions in place for those transporting UN 1049 and UN 1966 to conform to the provisions of TA4 and TT9 which describe the tank construction and the nature of periodically pressure testing the tankers to ensure they are fit for purpose according to EN ISO 9712:2012 (except clause 8.1.3 type A).

In the UK, hydrogen is usually transported in compressed form in tube trailers which is at lower pressure than 1,000 bar carbon-fibre composite road tanks which are in limited use in other countries. Embrittlement increases as the hydrogen pressure increases and if hydrogen is to be bulk transported more regularly, transport companies will want to increase the quantity of hydrogen that can be delivered in a single tank, therefore will need to compress hydrogen to higher pressures. There are few suitable materials that can withstand the pressure (up to 1,000 bar) and are also resistant to embrittlement.

ADR does not explicitly account for the embrittlement of tankers, other than requiring periodic tank inspections and testing. At this time, UN 1049 road tank must conform to CxBN(M), meaning they must be suitable for compressed gases (and may be carried in multi element gas containers) which meet the necessary pressure tests of 4.3.3.2.5, be bottom filling/discharging with 3 closures and have a non-hermetically sealed safety valve. RxBN road tanks have the same conditions applied, although they must be suitable for refrigerated gases. Specialised materials are used in construction of hydrogen containers, such as 316 steel (as per the typical tube trailers used in the UK) or carbon fibre composites. The carbon fibre composites are often used for higher pressure containers, and while not yet widely used, they are able to transport a greater mass of hydrogen so are likely to become more commonplace. New technologies will need to be considered and subsequent derogations written into ADR for the maintenance of such tanks.

- Flammability

The greatest hazard of hydrogen, if it escapes containment, is its wide flammable range, between 4-77% fuel in air concentration. In addition, when hydrogen is present in the air at its optimum combustion ratio of 29%, the minimum ignition energy (smallest amount of energy required to begin combustion) is equivalent to the static discharge from synthetic clothing. Theoretically, the action of running your hand through your hair can produce enough static energy to cause an explosion. For comparison, the flammable range of petrol vapour is approximately 1.5-7.5% and it takes around 12 times as much energy to set alight. This risk is offset by the innate safety feature of hydrogen: it is extremely light, meaning it will readily disperse upwards and no longer be within its flammable range.

Liquified hydrogen is severely cryogenic and the second coldest (non-critical) liquid in existence. There are additional safety measures that must be accounted for when carrying UN 1966 HYDROGEN, LIQUIFIED as described by:

- TE26 – there must be an instant closing automatic stop valve on the tanker;
- TU18 – there is a limit to the degree of filling such that if the pressure increases inside the tanker such that the pressure release valve opens, the minimum ullage would equal 5% of the tanker's capacity.

These measures are designed to prevent excess cryogenic material spilling, reduce the risk of cryogenic burns and the evolution of hydrogen gas. The liquified hydrogen will rapidly boil off into its gaseous state and has the potential to cause asphyxiation in an enclosed space or create an explosion after dispersing to an ignition source.

Regardless of state, hydrogen is also odourless and unlike CNG and LNG, a stenching agent cannot be added because it will not 'travel with' the hydrogen molecules. If it does catch alight, hydrogen flames are invisible in daylight and produce very little radiant heat, so they are incredibly hard to detect. The predicted increase in vehicles powered by hydrogen and hydrogen transported around the country may see a change in the regulations to prevent the impact of hydrogen leaks. An example could be making hardwired and portable hydrogen sensors mandatory to be carried by those transporting hydrogen, so it can be readily detected in a leak or fire scenario.

The current landscape

The main challenge surrounding the increase in hydrogen for use in domestic and industrial application (and the corresponding increase in its transport) is the lack of familiarity with the element. This can be considered as general lack of awareness of the hazards and can potentially be dealt with by mass re-training of the public around good practice at fuelling stations; raising the profile of the hazards of hydrogen for emergency responders and staff working at fuelling stations; and increasing the level of guidance for ADR drivers who transport hydrogen.

It is intriguing to consider all the different areas where actions would need to be taken to ensure safety during mass transport. They may include identifying key risks during transport (i.e. filling and unloading) and applying control measures to mitigate these risks and their impact. Training of employees working with hydrogen as a fuel will also be critical. Increasingly in the UK, emergency responders such as the fire and rescue authorities have been campaigning to increase safety for emerging, clean energy technologies such as battery energy storage systems. However, there is no reason yet to believe that adopting hydrogen fuel cell technology will lead to regulation tailored to address the specific hazards it poses.

The expansion of hydrogen fuel cells into the domestic market will introduce a wider range of hauliers transporting such products. The current regulations are not specific around the transport of hydrogen – for example, there is little ADR regulation on types of tanks used for hydrogen transport and the dangers of embrittlement, although the risks are well known within industry. Equally, as more industrial vehicles become hydrogen-powered, it is possible that amendments to ADR 1.1.3.2/1.1.3.3 will be needed to account for the increased capacity of hydrogen fuel tanks powering vehicles that move dangerous goods.

If you have any questions on the ADR requirements for hydrogen transport or other regulatory obligations, please contact the DfT at dangerousgoods@dft.gov.uk or call 020 7944 2271/ 2058.

ADR Reporting and Data Collection Project

Under road transport (ADR) regulations, serious accidents or incidents that take place during loading, filling, carriage or unloading of DG must be reported to the Competent Authority, within one month of their occurrence. As current reporting levels to the Authority for Great Britain (the DfT) are low, it is suspected that there may be an element of underreporting. DfT wished to better understand the frequency, location and details of DG incidents that are occurring and encourage incident reporting where appropriate. NCEC therefore conducted a project on behalf of the DfT to achieve these aims.

The first phase of this was to collect data from different agencies to understand the level of reportable incidents that are likely to be occurring within Great Britain and understand how accurate the reporting levels to DfT are.

Department for Transport

NCEC RICARDO

Data was received and analysed from five different sources to identify 198 incidents involving DG transport on roads. It was noted that many of the incidents within the data sets were not true DG road transport incidents so they could be discounted for the purpose of the project, leaving 46 true DG incidents and a further 43 that were possibly true DG incidents. Due to the lack of detail and consistency in reporting between agencies and within a single agency, NCEC had to make several assumptions over incidents that were likely to be reportable. We split the true DG incidents into those we thought would definitely be reportable and those we thought would possibly be reportable. By considering within this only the incidents we felt were definitely reportable, we were able to conclude that the best case was likely to be 77% underreporting. However, this figure would rise to give a worst-case picture of 89% if we considered the possibly true DG incidents and all within both categories that were potentially reportable.

It was anticipated that a social value (with economic and environmental benefits) would result from the project, by enabling consideration to be given to measures that might reduce DG incidents. The low occurrence of DG incidents can be seen as a positive illustration that the current safety measures and regulations have the desired consequence in most transport movements. However, no real patterns in location were identified within the data gathered. A high proportion of the incidents identified involved Class 3 products, with Class 2 and Class 8 also prevalent.

As this was a very small data set and some agencies were very England centric, it would be beneficial to repeat the exercise with a higher number of agencies/over a longer period so a larger data set could

be analysed. We did encounter barriers in engaging with stakeholders and obtaining their data sets, which could also prove problematic in any future study. We also know that some agencies simply do not hold data of this kind in a consistent way at a national or local level.

The second phase of the project was to raise awareness of the reporting requirements in an engaging way as well as promote other subjects of concern. A key part of this was the production of this quarterly newsletter covering compliance issues, transport regulations and example incidents. If the project was run again, it would be useful to see if the reporting compliance improved because of the awareness activity conducted.

We hope you found this newsletter useful and informative. If you have any questions regarding the information in the newsletter, please contact us at info@ricardo.com.