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**COMMITTEE OF EXPERTS ON THE TRANSPORT OF
DANGEROUS GOODS AND ON THE GLOBALLY
HARMONIZED SYSTEM OF CLASSIFICATION
AND LABELLING OF CHEMICALS****Sub-Committee of Experts on the
Transport of Dangerous Goods**
(Twentieth session, 3-12 December 2001,
agenda item 11 (d))**GLOBAL HARMONIZATION OF SYSTEMS OF CLASSIFICATION
AND LABELLING OF CHEMICALS****Hazard communication****Study to evaluate the GHS Red Diamond Border Pictograms****Transmitted by the Expert from the United States of America****Introduction**

1. At the nineteenth session, the Sub-Committee considered whether the use of a red diamond shaped border surrounding a hazard symbol for certain hazards covered by the Globally Harmonized System for Classification and Labelling of Chemicals (GHS), but not by transport, created any safety implications for the transport of dangerous goods when they appear on a package that is offered for transport. The use of such a border was approved by the International Labour Organization (ILO) Working Group on Hazard Communication at their May 2001 meeting. However, the Working Group asked that, prior to taking a final decision, the Inter-Organization Programme for the Sound Management of Chemicals (IOMC) Coordinating Group on the Harmonization of Chemical Classification Systems request this Sub-Committee review this decision to consider any impact it may have on transport. This request was precipitated by concerns raised by representatives of the air transport industry, the ICAO Dangerous Goods Panel, as well as by the United States of America. The ILO, as the Secretariat for the IOMC Coordinating Group, provided an information paper for the nineteenth session to transmit this request (Inf. 26). The International Air Transport Association also provided an information paper (Inf. 27).

2. While the Sub-Committee was requested to provide their input no later than the conclusion of their December 2001 meeting, a vote was taken at the nineteenth session, and the Sub-Committee concluded that the diamond-shaped border proposed for use in GHS pictograms did not present any concerns for transport. The expert from the United States of America believes that the vote taken in July pre-empted full consideration and discussion of the issue.

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3. Most of the work on the GHS has been done on a consensus basis, and attempts have been made to have full discussion of all of the issues of concern. A number of the issues raised in July were not fully discussed, and consensus on the appropriate approach was not achieved. There are some indications that use of the red diamond may affect safety and we believe that the issue should be carefully considered and assessed. Therefore, the United States of America is undertaking a human factors study to assess whether the concerns raised are valid. These concerns will be described in more detail below.

4. The study is being conducted by an organization that has extensive experience in conducting human factors studies involving emergency responders, workers and consumers relative to matters of public safety. The study design will replicate the situation that will be in place in transport if the GHS is implemented using the diamond-shaped borders, i.e., transport workers and emergency responders will be trained regarding the differences between transport and non-transport pictograms, and then their ability to properly identify them and respond appropriately for the work situation will be assessed. The study will be conducted in such a way as to ascertain whether the workers and emergency responders are able to differentiate the transport and other sector GHS pictograms so that their safety and work are not adversely affected. A scientific study design will be used to ensure that the results are reliable. The results will be available by the July 2002 Sub-Committee meeting.

5. The expert from the United States of America would like to invite other countries to conduct similar studies, and would be happy to work with them in the design of such studies to ensure a consistent approach is taken. Objective evidence obtained in other countries will help make the results more credible and global in nature. Whatever the outcome of the study, the results should be useful in determining whether the GHS is comprehensible, and whether its requirements enhance or detract from the current requirements of transport. The timing of the results will allow adjustments to be made to the GHS before final adoption if such adjustments appear to be necessary.

Background

6. While the GHS has been developed over many years, the concept of using a diamond-shaped border was only introduced in January 2001 at a Drafting Group meeting. Thus there has not been much time to evaluate the impact of this approach. The purpose of using the border was to highlight the symbol itself, and the diamond shape was suggested in order to harmonize with the transport sector. The symbol would be black on a white background, and the diamond border would be red. These two features were suggested to differentiate the GHS pictograms from those used by transport. The GHS also addresses the interface or overlap with transport in several respects. For example, where both transport and other sectors cover the same hazards under the GHS, e.g., flammability, the transport pictograms will be used. In other words, there should be no duplicative pictograms required on a package for the same hazard.

7. There are three symbols which may appear on a package in transport that cover hazards not currently addressed under TDG recommendations. These are an exclamation mark (used for certain health effects); a new symbol for chronic hazards (not yet determined); and the dead fish/tree symbol for environmental effects. These could appear on a package in transport that also covers TDG hazards, or they could appear on a package that is not subject to TDG, but does have a covered GHS hazard.

8. While there are clearly many packages where GHS pictograms related to other sectors will appear on an inner packaging, transport pictograms will generally be on the outer packaging. No one really knows how many packages will cover the hazards for all sectors, and have the additional GHS pictograms in the diamond border on the packaging seen by transport workers and emergency responders. Certainly, packages of the size of a 55 gallon drum of chemicals will address hazards in all sectors. Many smaller packages will as well. For extremely large containers, such as a portable tank, freight container or tank truck, it is expected that countries will continue current arrangements where the information for

downstream sectors such as the workplace may not be displayed on the transport unit itself, but provided separately.

9. It has been suggested that where all sectors=pictograms are on the same container, there may be a size differentiation between those intended for transport workers and emergency responders, and those addressing the other GHS hazards. This suggestion has not been adequately explored, and may provide a partial solution to the problems that have been raised. The additional GHS pictograms are not specifically intended to be of a size that can be seen from a long distance; they are intended to appear with other GHS label elementsBtext on hazard statements, signal words, and precautionary statementsB and thus may be of proportionate size.

10. The Drafting Group recommendations regarding pictograms and other label elements were widely circulated in the United States of America earlier this year. At that time, many industry representatives and emergency responder groups, who had not previously been involved in the process, raised a number of concerns. The United States of America reported these concerns to the Drafting Group, and later to the ILO Working Group as a whole. Other members of the Drafting Group and ILO Working Group indicated that they had not received such concerns from representatives in their own countries. It is not clear why this is the case. One reason may be that the GHS draft documents were not as widely distributed for comment in some countries as they were in the United States of America. The United States of America believes that all international organizations and affected parties should have the opportunity to comment on this very important issue. This Sub-Committee was requested to provide further input on the potential problems or conflicts before the GHS is finalized. Since the last Sub-Committee meeting we have received additional comments and concerns from other potentially affected groups, including the International Association of Fire Chiefs and the Vessel Operators Hazardous Materials Association.

Current regulations limiting the use of the diamond shapes on packages in transportation

11. Current regulations, namely the ICAO Technical Instructions, the IATA Dangerous Goods Regulations and US Transport Regulations, restrict the use of diamond shaped labels and placards that can be confused with transport labels on packages. The purpose of these requirements is to avoid, to the greatest extent possible, confusion that may be caused by a package marking being taken as depicting a transport hazard while none was present. The study we are undertaking will evaluate whether the proposed GHS symbol could cause such confusion.

Specific GHS requirements that may impact transport

12. Implementation of the GHS hazard communication requirements, and introduction of the new health and environmental hazard pictograms, would result in substances or mixtures with the following types of hazards being identified by pictograms with red diamond-shaped borders on packages in transport:

- Respiratory or skin sensitization
- Germ cell mutagenicity
- Cancer
- Reproductive effects
- Target organ toxicity
- Skin and eye irritation

The transport sector has chosen not to cover these types of effects since they are not expected to be a concern for the types of potential exposures that may occur in transport. They may be related to repeated exposures, for example, or have minor transitory effects.

13. In addition, there may be situations where substances or mixtures pose a hazard regulated in transport, but they are exempt because of certain threshold requirements or other accommodations. These may still bear the red-bordered, diamond-shaped pictograms. These include:

- Type B self reactive substances and organic peroxides may be exempted from the explosive label under transport regulations but would still be required to bear a red-bordered diamond with an explosive symbol;
- Type F self reactive substances and organic peroxides would be required to bear a red-bordered diamond with a flame or a flame over circle when no UN transport label is required and when the substance is not transported in a bulk packaging;
- Substances that are not considered as toxic for transport, but which meet GHS oral toxicity or dermal toxicity category 4, would be required to bear a red-bordered diamond pictogram including a symbol such as an exclamation mark;
- Substances that can cause severe eye damage will be required to bear a corrosive label that will be very similar to the current transport label except that the border will be red and the bottom half will not be black;
- Packages of limited quantities of dangerous goods and consumer commodities which are excepted from bearing UN transport labels would bear a red-diamond bordered label with symbols such as skull and cross bones, flame, corrosive, etc.

14. These examples illustrate potential confusion that may arise. Of course, we recognize that these are worst case situations, and that competent authorities may adopt similar thresholds, or otherwise address these concerns. These concerns should be noted so that appropriate adaptations can be designed and implemented. Representatives from non-transport sectors may not be familiar with these regulatory accommodations, and the transport sector should make sure that the considerations that led to these conclusions are available to them as the GHS is implemented.

15. It is important to note that there are many more substances and mixtures that meet GHS criteria than those that are subject to transport requirements. By some estimates there are ten times more such substances and mixtures, but the true number is unknown.

Implications of the GHS system on the effectiveness of transport regulations

16. The full implications of the use of the GHS pictograms on transport safety cannot be predicted with certainty because the GHS hazard communication requirements allow for some competent authority discretion in the other sectors. Part of the concern is that the diamond shape itself indicates a hazard to transport workers and emergency responders, separate and apart from what is contained inside the pictogram. If red-bordered, diamond-shaped GHS pictograms appear on transport packagings, the expert from the United States of America believes that this could have potential adverse impacts in the following areas.

Emergency response implications

17. The appearance of non-transport GHS pictograms on packages in transport could compromise the ability of emergency responders to identify effectively the hazards of substances or mixtures that pose immediate safety threats when responding to dangerous goods incidents. The presence of diamond-shaped pictograms on packagings that do not pose an immediate safety hazard could result in emergency responders confusing substances or mixtures not subject to transport requirements as having immediate

hazards, and could result in emergency responders taking inappropriate or delayed actions. This could lead to increased environmental damage, higher cleanup and remediation costs, unnecessary evacuations, unnecessary highway closures, and the inefficient use of response resources.

18. While information on chronic hazards could under certain circumstances be valuable to emergency responders, awareness of these hazards is generally not necessary during the initial response to an incident assuming reasonable precautions are taken. For instance, the emergency response actions for a spill involving crystalline silica (*there is only a risk when it is used in a form where it is airborne in respirable dust form such as in sand blasting in which case it could be labelled as a potential carcinogen*) would be significantly different from the actions necessary to mitigate a spill of a substance or mixture that is acutely toxic by inhalation such as acrolein. In many cases the exposure conditions upon which a chronic hazard has been determined (e.g. repeated exposure through oral ingestion) are not relevant to transport because long term exposure potential is not an issue or an immediate threat to the public. Since responders need to take different actions depending on the hazards posed by the spilled chemical(s), potential confusion of hazard warnings could either result in no action being taken (e.g. the responder does not evacuate the vicinity and people are exposed to toxic fumes) or that the responder is overly cautious and needlessly evacuates a community, uses expensive and scarce response resources, or shuts down a major highway for an extended period.

19. While training could reduce the potential for confusion, many emergency responders are volunteers who do not receive training in dangerous goods on a routine basis, and encounter dangerous goods incidents infrequently. Without repeated experience, they may not recall the difference between a transport hazard and other GHS hazards. Even with extensive training, the problem of being able to distinguish between hazard labels when smoke, fire and debris are present will inhibit a responder's ability to identify and interpret the immediate hazards. From a human factors perspective, an emergency responder operating in an emergency environment may not draw the distinction between acute transport hazards and the chronic hazards that are addressed by the GHS.

Reducing the effectiveness of the diamond shape by wider use – “Label complacency”

20. A common concern in information schemes is *over labelling*, where users see something so often, it no longer has the effect of alerting them or causing a change in behaviour to avoid adverse effects. This dilution of the message through the use of diamonds on a wider range of hazards may lead to transport workers and emergency responders missing the immediate hazards conveyed, and not taking appropriate action.

Operational/Compliance/Transport safety implications

21. Use of the diamond shaped borders could complicate acceptance of packages by the air carriers as well as by road, rail and water carriers. Air carriers more than any other modal operators are held accountable for ensuring that dangerous goods offered for transport are in compliance with the dangerous goods regulations and are properly declared. A particular concern is undeclared dangerous goods. Air carriers are expected to take all reasonable steps to ensure that undeclared dangerous goods are not accepted for air transport. The air industry handles many millions of packages a day, and works diligently to minimize the transport of undeclared dangerous goods which are considered one of the most significant threats to air transport safety.

22. Common guidance to airline acceptance staff is to stop all packages that bear a diamond-shaped label, and set them aside for further inspection. GHS pictograms have the potential of calling into question many packages that are not subject to the transport regulations. This is particularly true in large sorting facilities that have high speed sorting equipment that rely on human visual identification of the diamond shape on packages.

23. It has been suggested that training can address these concerns. This may or may not be true. Package acceptance personnel at high volume sorting centers work under intense conditions due to the high package volumes. For example, postal service workers in the United States of America handle and transport more than 400 billion pieces of mail annually. Postal workers need a clear and concise means of distinguishing between chemicals that can and cannot be transported through the postal system. There is a significant effort underway to enhance mail handler awareness of dangerous goods shipments. Use of a diamond-shaped pictogram for chemicals other than those defined as dangerous goods by transport regulations may have a major impact on the postal services and could significantly complicate their work.

24. Use of a diamond border for hazards other than transport hazards could complicate segregation operations. International modal regulations such as the IMDG Code and the ICAO Technical Instructions, regional regulations such as the ADR and MERCOSUL regulations, and national regulations such as the US Hazardous Materials Regulations and the Canadian Transport of Dangerous Goods Regulations limit the types of dangerous goods that may be stowed together in the same transport unit to avoid dangerous reactions between incompatible substances. In Part 7 of the ADR for instance, it is stated the *APackages bearing different danger labels shall not be loaded together in the same vehicle or container unless mixed loading is permitted ...based on the danger labels they bear.* In all of these regulations segregation requirements are largely based on the labels that are affixed to the packages. Operations that are involved in loading freight containers rely on the labels as their means of complying with the segregation requirements. The presence of GHS pictograms on many additional packages that are not subject to the transport requirements could complicate compliance with the segregation requirements.

Enforcement implications

25. Enforcement personnel and security personnel from national governments, including customs agents, and local agencies have been trained to recognize the diamond shape of labels and placards that communicate the dangers posed by materials in transportation. In addition to direct enforcement of regulatory requirements pertaining to matters of the type addressed by the Model Regulations, many of these personnel participate in permitting or restricting access to ports, terminals, bridges, tunnels, and other transportation pathways. It may be difficult or impractical for enforcement personnel such as container inspectors to differentiate between transport labels and other GHS labels within dark containers or cargo transport units.

Sub-Committee considerations

26. As noted at the outset, the Expert from the United States of America recognizes that there was not sufficient time to develop these arguments, and obtain evidence to support or refute them, before the discussion at the nineteenth session. However, time still remains to ensure that the right decision has been made, and to provide guidance in the transport sector to ensure that all issues have been addressed about how the GHS requirements will be implemented for packages in the transport sector.

27. While there may be benefits to having the same shape used for all hazard pictograms, we do not believe the costs of those benefits have been considered by the Sub-Committee to date. It may be that the safety costs that may result from the effects on workers in the transport sector outweigh these benefits. More work is required to determine whether that is the case. If it is, these concerns could likely be addressed by having a different shaped border for the GHS pictograms.

28. The United States of America is undertaking the effort to conduct a human factors study, and as stated, would very much appreciate other countries conducting similar studies so the results are more global in nature. This study will help to allay the concerns that have been raised either by supporting them and indicating a need for refinement of the GHS requirements, or by refuting them and providing a basis to move forward with the support of all concerned. The Sub-Committee should consider whether additional

information is needed to ensure that the right decision has been made, and whether additional guidance is needed for the transport sector. We would welcome further discussion of these issues in the Sub-Committee, and the help of other countries in identifying areas that should be addressed.

Conclusion

29. The United States of America has been an active participant in the development of the GHS, and strongly supports its goals, and wide implementation of it around the world to accomplish those goals. However, we think that the process will be further promoted if additional work is done to ensure that the appropriate combination of requirements has been adopted. We have initiated a study that will attempt to assess the concerns raised in this paper as well as those presented by others during the Sub-Committee meeting in July. Our objective is to fully assess any implications to safety while considering the cost-benefit relation to affected parties. We invite other governments and affected parties to conduct similar studies and are willing to work with them in the design of such studies. Since the final adoption of the GHS will not be done until December 2002, time remains to address concerns raised, and provide further evidence of the appropriateness of the requirements. This will make the system stronger, and will not delay its adoption in 2002, or the beginning of the implementation process. We know that all countries want to make sure that the GHS is protective and effective, and that member countries will want to examine any objective evidence that addresses those concerns. We look forward to working with others to develop such evidence, and to ensuring that adequate planning and guidance is provided to facilitate implementation in transport as well as other sectors.
