



INTERNAL ACCIDENT REPORT

to be completed in accordance with Code A2 Rev. 3

To : Leader of the Safety Commission
 Leader of the .AB Department

Copy to: H. G. Menzel/SC-RP
 G. Roy/AB-SU
 T. Otto/SC-RP
 P. Carbonez/SC-RP
 J. Gulley/SC-GS
 I. Efthymiopoulos AB/ATB
 A. Fabich AB/ATB

From: H.Kirk/BNL-USA,
 K.McDonald/Princeton University-USA
MERIT Exp. Spokespersons

Subject: ACCIDENT FIRE POLLUTION "NEAR MISS"

(tick the appropriate box)

Date .5/2/2008..... Time .12:30..... Place ...TT2A Tunnel, FTN Beam line

Department(s) concerned.....AB, SC, TS.....

Contractor, Institute concerned, where applicableORNL, MERIT-Experiment

Person(s) concernedV.Graves/ORNL-USA, P.Spampinato/ORNL-USA, H.Kirk/BNL-USA,
 K.McDonald/Princeton University-USA

Witness(es) P.Carbonez/SC-RP, J.Letry/AB-ATB

Information on the above accident

1 Description of the accident (summary of facts & circumstances)

As foreseen in the overall schedule of the experiment, the emptying of the mercury inventory from the experimental equipment to the shipping flasks was performed. The Hg draining process utilizes flexible tubing and a peristaltic pump to transfer fluid first to an intermediate container and then to the shipping flasks. A manual valve on the exterior of the Hg system equipment is opened to allow fluid flow via the pump. Once the intermediate container is filled, the operating procedure states this valve should be closed prior to subsequent fluid transfer into the shipping flask. During the first flask transfer, this valve was inadvertently left open, which allowed the Hg experimental equipment to gravity-feed into the intermediate container, resulting in an overflow. This overflow allowed mercury spillage into the surrounding retention containers and partly on the concrete tunnel floor.

An extenuating circumstance is that the operators were in the process of transferring a small quantity of Hg into a separate container for spectroscopic analysis requested by CERN, which was a deviation from the standard procedure. While this deviation did not cause the valve to be left open, attention was drawn away from the intermediate container during the process, so the rising fluid level went unnoticed. The overflow condition was first noticed by non-participating observers. Once the overflow condition was recognized, the valve was immediately closed.

2 Injuries, if any (if the injured person is a member of the CERN personnel, form HS50 must also be completed)

NONE. Participants were exposed to mercury vapor during the spill, but respirators were in use by all participants during the draining and subsequent cleanup operations. Non-participating observers were requested to leave the area immediately after the occurrence.

3 Material damage or pollution

Total volume of mercury spillage was approximately 200 ml. Of that volume, approximately 50ml made it to the retention plastic, and a smaller percentage splashed to the concrete floor of tunnel. During subsequent cleaning operations, all visible liquid Hg was retrieved and returned to the shipping flasks. During cleanup operations, the mercury vapor level was a maximum 500µg/m³ at floor contact, but the measured levels were less than 50µg/m³ after multiple cleaning operations.

4 Fire Brigade called (time)

see SC/FB report 08/100, called at 12:38 aby T.Otto/SC-RP

Other Services called

SC/GS: J.Gulley for chemical safety

5 Immediate preventive action taken

Non-participating observers were asked to leave the area immediately and to inform the fire brigade. Participants were already wearing personal protective equipment and mitigated the incident impact by immediately starting spill cleanup procedures with adequate material prepared beforehand for such cases.

6 Risk of reoccurrence of the accident? Yes No

After initial cleanup operations were completed and CERN approval was obtained, the mercury transfer procedure was completed without further incident. No further mercury transfer is required.

7 Appendices

See also EDMS 891444: LESSONS LEARNED FROM INCIDENT OF MERCURY SPILL OF THE MERIT EXPERIMENT AND FOLLOWING ACTIONS

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Person concerned/witness signature: V. Graves/ORNL-USA

Date 27.02.2008

Group Leader's signature:

Date

MEMORANDUM

TO: TO THOSE WHO WANT TO IMPROVE
FROM: GHISLAIN ROY (CERN AB/SU), ADRIAN FABICH (CERN AB)
SUBJECT: LESSONS LEARNT FROM INCIDENT OF MERCURY SPILL IN THE MERIT EXPERIMENT
DATE: 2/27/2008
CC: VAN GRAVES (ORNL), PHIL SPAMPINATO (ORNL)

INTRODUCTION

During the removal of the experimental equipment of MERIT, which also includes the emptying of the mercury loop, mercury was spilled in an uncontrolled way. The incident happened on 5. Feb 2008. The accident report is filed as 08-100 (CERN SC/FB).

This memorandum summarizes the items which have been discussed with the people involved in the incident and AB representatives (see FROM and CC). It describes actions and conditions which caused the incident (negative lessons), but also items which reduced the extent of impact (positive lessons).

ITEMS TO BE LEARNED

- 1- The **procedure manual** should be available in place of handling during all operations. The manual allows even trained and experienced workers to verify the handling (also a checklist is of use there). It is hard to remember all steps of a procedure by heart.
- 2- Involving such hazardous chemicals it is mandatory to **follow steps described in the operations manual**. Also any actions are restricted to the ones described in there. An **extra step** in the work to be done was not added formally and before-hand in the procedure. Although this was not the root cause of the accident, we should be reminded that additional tasks must be written in an existing procedure and additional risks considered at that time. Performing an additional task which is not in the procedure dramatically increases the risk of failure. **Additional tasks** to be performed, which are not described in the procedure, should be discussed beforehand and **documented as any other handling**.
- 3- **Retention basins** should be placed in stable positions, designed and dimensioned to their function.
 - a. The intermediate container should have been centered in the retention tray. Also the intermediate container was too tall compared to the height of the tray sides, allowing for Hg droplets overflowing and falling from height onto the tray to bounce back above the tray sides and fall onto the floor. A larger tray would have been useful in preventing the secondary spill from the tray onto the floor.

- b. A layer of plastic was appropriately laid down on the floor but since the sides were not lifted up to form a “retention tray”, some Hg droplets could escape and rolled onto the concrete slab.

It is not excluded that some mercury traces could still be found under the base plate of the mercury loop/solenoid: the procedure for removing the base plate must take this into account. For further interventions in this area protective equipment should be properly used until the area is declared as clean from mercury.

- 4- The spill was noticed and signaled by an observer standing at a distance. The two operators were concentrating on the sampling bottle and had not noticed that the intermediate flask was overflowing.
Having an **extra person standing as observer** would be extremely beneficial: the role of the observer could be to oversee the process and check that all actions are conforming to the agreed procedure (**checklist**). The observer should have the same protective equipment as the operators but should in no way act as an operator.
- 5- The observers in this particular case did not have protective clothing and breathing equipment but were standing at a safe distance. Upon noticing the spill the operators immediately instructed the observers to leave the area. This was done without panic. The observers could then alert the Fire Brigade as soon as they got out. This was the proper reaction from all persons involved.
- 6- The operators immediately started collecting the Hg with the designated vacuum cleaner which was available on the spot thanks to appropriate preparations according to defined procedures. It is fully acknowledged that these **preparations allowed mitigating the situation** at hand and with no delay.