Draft Safety Code for Cryogenic Equipment

Compilation of the comments received

Comments have been received from: Ph. Lebrun, G. Passardi, L. Tavian, S. Claudet and V. Benda

We have identified three types of constructive comments:

1. Definitions

All reviewers have made remarks concerning the general definition of terms. In particular the term "Laboratory dewar" has not been understood the way it had been conceived by us. Further terms that made difficulties were e.g. "vessels", "fixed storage tanks" and "shut-down".

CCWG Reply: The term "Transportable vessels" has been taken over from the existing international standards in order not to create any confusion. In other words, a "transportable vessel" at CERN should signify the same and is to be treated the same as a transportable vessel anywhere in Europe.
The term "Fixed storage tanks" could in fact be changed to "Static vessels" as this is used in the standards. We had originally chosen a name that was more common at CERN.
We shall review the term "Laboratory dewar" and we shall clarify how a laboratory cryostat (as found in the cryolab) is to be classified.
The term "shut-down" should be replaced by "putting out of service". This should avoid confusion with the maintenance shut-downs.

2. Corrections

All reviewers have made valuable correction comments that we will happily include in the next version.

3. Questions and other comments

Reviewers have formulated questions, which shall be answered hereafter:

Is there an order of application for the generic reference texts?

CCWG reply: No, all must be applied.

Is the contractor's personnel under the authority of the DG?

CCWG reply: The phrase is a standard phrase in the safety codes. In SAPOCO 42 it is explicitly stated that contractors personnel has to obey to CERN safety regulations.

Cryogenic temperature range?

CCWG reply: This definition is taken over from the IS47 safety instruction.
In literature several definitions can be found:
Brockhaus -100°C
Encyclopaedia Britannica -150°C
Scott, Clintock -150°C
Bell -100°F
Zabetakis cryogens=fluids with critical temperature below RT
We have chosen a temperature that should cover most CERN applications at low temperatures even a LKr tank operated at 1.3bar.

English and French?

CCWG reply: This is CERN standard, however, we shall replace "instruction documents" by "safety instructions" to better clarify the extents.

Stability against tip over?

CCWG reply: This is not included in the standards and we have therefore added it to the general rules.

1/ But: Ce code avait été justifié par rapport aux craintes vis à vis de toutes les manips pas très bien contrôlées avec des dewars douteux qui se mettent en place dans certains labos du CERN. Ce code ne se concentre que sur les "Equipement built to purpose". La part revenant aux équipements de laboratoire étant en général contenu en quelques lignes sommaires. Je trouve donc un déséquilibre important entre le but avoué et le contenu de ce code.

CCWG reply: One of the basic principles of the code is NOT to repeat rules or regulations that have been defined elsewhere. If the standards that the code refers to are considered – e.g. the code EN1251 for "Transportable vacuum insulated vessels of not

more than 1000 litres volume" which comprises more than 100 pages – the part on "standard" equipment becomes much more important.

2/ "General definitions": Pourquoi les stations de compression chaude qui travaillent en général au dessus de -150 °C sont elles incluses dans ce codes ? Je les verrais mieux dans un code de sécurité de machines tournantes avec toutes les autres du CERN.

CCWG reply: The definition refers to the definition found in IS47. As a matter of fact also the vacuum enclosures, the warm storage tanks and many other components of cryogenic installations are normally at ambient temperature. These components have been included in the definition in order to ensure that they are considered in the safety review of the installation, e.g. warm parts can receive cold returns after power failures.

3/ "CERN Regulation": aucunes de nos instructions ne sont en Anglais et en Français.

CCWG reply: See reply to "English and French" above.

4/ Approvisionnement: EDH permet il cette approbation ?

CCWG reply: In principle yes, details must of course be defined.

4/ Specification file: Les programmes d'inspection de sécurité et de contrôle ne sont pas incluses dans nos spécifications et est en général un document fournit par la firme en début de contrat. Ce document ne pourra donc pas être approuvé par TIS avant la demande d'offres.

CCWG reply: Most specifications do list the type of tests that are required: e.g. material tests, pressure tests, leak tests etc. This is what we mean with "planned safety inspections and checks" and "planned quality control inspection". This should not be mixed up with "the safety inspection plan" and the "quality control plan", which is not requested at that point.

5/ Design review: Aujourd'hui, les "specification and desgin files" sont envoyés à TIS pour approbation. Ce que je vois dernière cette revue est une simplification du travail de TIS qui souhaite que le responsable technique (encore lui) leur mâche le travail pour leur simplifier la vie.

CCWG reply: The design is a common tool, which is used at CERN for many projects. The safety issue is only one, but an important topic of these reviews. We believe that it must be the responsibility of the "technical responsible" to call in the design review. It is the aim of the code to ensure that all safety aspects are addressed. In some cases, especially in the case of small projects, the "design review" will be done in one go together with the "specification review".

6/ "Laboratory dewars": Tous les dewars d'LHe sont équipés de vannes qui l'isolent, donc contraire au code Q1. Par contre tous ces dewars ont des soupapes de sécurité qui le protége en cas de fermeture prolongée de ces vannes.

CCWG reply: See point 1 definitions.

7/ Mise en service: Une clarification est nécessaire pour définir cette étape. Cela correspond il au début du démarrage par la firme, au début de la réception par le CERN, à la signature du certificat d'acceptation provisoire ? La liste des document de référence requis me semble pour autoriser la mise en service me semble irréaliste et risque de bloquer le démarrage de toutes nos installations. Aujourd'hui, je suis certain que le réfrigérateur 18 kW du point 1.8 qui est en exploitation depuis 1.5 ans ne possède pas encore tous ces fichiers de référence, en particulier le manuel opérateur dont les procédures sont établies en cours d'exploitation. Certain documents comme la description des modes opératoires et le manuel opérateur sont en perpétuelle évolution: Que doit-on faire vis-à-vis de ses changements ?

CCWG reply: At CERN nobody contests the necessity to perform pressure tests before the operation of any pressure equipment. We should like to spread a similar approach for cryogenic equipment. We believe that documents like "safety instructions", "risk analysis", etc. are indispensable before any operation of the installations. Unfortunately at CERN there are installations where some of the listed documentation is missing up to this day. However, this is an additional argument to list these documents, as the code shall support the project engineers in their battle with the suppliers. We shall nevertheless review the list in view of the comment.

We have intentionally chosen a word different to "commissioning" as the "putting into service" may be the first cool-down after a period of instrumentation tests and conditioning.

Peut-on être plus spécifique concernant les test et les inspections requis par TIS pour la mise en service ?

CCWG reply: The required tests will depend very much on the type of equipment. We have therefore avoided specifying them in order not to miss out something.

8/ Copie des dossiers de référence chez TIS: Encore de la paprasse supplémentaire.

CCWG reply: In order to align CERN with the European the documents must be stored in an archive. One possibility is to create such an archive at TIS, like this does exist for lifting equipment. A central archive would also facilitate re-testing of equipment even if the responsible has retired or the equipment has changed division.

9/ Qualification of personnel: C'est aussi la responsabilité du contractant pour du personnel non CERN.

CCWG reply: We will change the concerned phrase as follows: Verifying the correct qualification of the Personnel …

1. General Comments :

- In order to get people support to apply it correctly, it could be useful to explain what has changed lately to make this new code necessary: probably something like the drastic evolution of cryogenics at CERN in the recent years combined with new European rules in that field.

CCWG reply: This can in fact be done, should however not be included in the code.

- For the Scope, there is no reference to time except in the last annex, in particular the way to treat the large number of concerned equipment already at CERN. Probably a transition period should be indicated.
It could as well be explained why the retrofitting changes 30.05.2002 (probably CE marking compulsory date).

CCWG reply: Correct, the date is indeed the date when the EU/97/23 became compulsory.

2. Predominance of codes :

The specificity of Cryogenics as mentioned in this Draft is not so clear. It is sometimes not in accordance with existing codes, such as Code D2 for pressure equipment.

- For § 5.3.1, a design review committee is mentioned whereas the code D2 § 4.1 indicate that components with CE marking do not have to go through TIS approval! (please note as well that § 5.4 requests CE marking for "Cryogenic Equipment" which is a more global designation than "Equipment built to purpose")

CCWG reply: Section 5.4 requests CE marking for all equipment bought from an external supplier. Equipment built by CERN is not included. Please note that this is in line with European regulations. Please do note that there is no "bypass of TIS approval" as mentioned above. CE marking will only simplify the approval process according to D2 – the same will be true for cryogenic equipment.

- For § 7.3, visual inspections have to be made every two years whereas code D2 § 4.5 indicate only every three years! (please note as well that the table § 7.3 does not cover all cases, such as internal inspections for vessels periodically at room temperature or vessels without man-hole within vacuum enclosures)

CCWG reply: We have taken over the periodicity requested by the European standards.

3.Naming :

- The term "Fixed storage tanks" could be misleading: the terms "transportable vessels" or "Fixed vessels" are associated with storage of liquefied cryogens, whereas "storage vessels" (probably for storage tanks at ambient temperature) is listed as "Equipment built to purpose" but "Fixed storage tanks" is indicated for liquefied cryogens!

Probably keeping vessels for liquefied cryogens and tanks for room temperature could help.

CCWG reply: See point 1.

- in § 7.3, the equipment supervisor is mentioned; wouldn't it be appropriate to indicate in the document if it is the same as Responsible Technique d'Equipement RTE for which mandate or rules should already exist?

CCWG reply: This is the French translation and will be used in the French version of the code.

4. Applicability :
The following points do not dispute the content of the code but just underline the fact that similar procedures may already exists in some part of CERN or that its application could be more than difficult.
- Procurement (§ 5.2): "Any cryogenic equipment" would concern as well valves, piping, flanges that could be as well used for other gases… Is is really necessary to establish a filter at the level of any DAI or wouldn't it be more appropriate to link it with the 50kCHF for program controls?

CCWG reply: The setting of a lower limit risks in fact that the DIY physicists escape the controls. TIS can adjust the filter as required. This should not be defined in the code.

- Specification files (§ 5.3.1.1): the requested documents are to be supplied jointly by suppliers and CERN teams. For LHC, this is partly covered by the Specification Committee where TIS is represented, partly by project teams and partly by operation teams.

CCWG reply: We have chosen the name "specification file" as we believe that this is the file that is discussed in the specification committee. Specification committees are not applied for small size projects, chapter 5.3.1.1 ensures that TIS is in any case informed.

- Putting into service (§ 6): What is so specific to cryogenics compared with 3.3kV sub-stations for instance! We have certificate for pressure vessels, for electrical cabinets including grounding of elements and access have been validated during the design/integration phase!

CCWG reply: We propose that TIS is the organism that verifies, if all conditions for a safe putting into service are met.

- Reference file (§ 6.1.1): this is usually referred to as "Manufacturing files" which can sometimes be delivered several months after a system is operated, for instance when there is a set of identical units to be delivered periodically over 2 or 3 years!

CCWG reply: See reply to point 7 above.