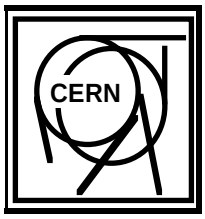
EDMS No. 330198



EUROPEAN ORGANISATION FOR NUCLEAR RESEARCH
ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE

TECHNICAL INSPECTION AND SAFETY DIVISION

CERN-TIS-2001-013-GS

TIS GENERAL SAFETY GROUP

ANNUAL REPORT 2000

edited by W. Weingarten

ABSTRACT

This report summarises the main activities of the General Safety (GS) Group of the Technical Inspection and Safety Division (TIS) during the year 2000, and the results obtained. The different topics in which the Group is active are covered: general safety inspections and ergonomy, electrical, chemistry and gas safety, chemical pollution containment and control, industrial hygiene, the safety of civil engineering works and outside contractors, fire prevention and the safety aspects of the LHC experiments.

Geneva, Switzerland
October, 2001

1. CONTENTS

2. ORGANISATION AND MAIN ACTIVITIES

The structure of the General Safety Group remained essentially the same as in previous years, comprising five sections that pursue the following main activities:

- the Safety Inspections and Ergonomy (SI) section is in charge of periodic inspections and follow-up related to general safety and ergonomy, and acoustic measurements related to personnel and the environment;
- the Electrical Safety (ES) section is responsible for the control of electrical safety on the site as well as non ionising electromagnetic radiation (except lasers), EMC and level 3 alarms;
- the Chemistry, Gas and Industrial Hygiene (GC) section is in charge of ensuring that Swiss and French legislation on chemical substances and work hygiene are respected; accordingly conducts safety inspections and spot checks, is in charge of the elimination of PCB from the CERN site and gives advice to members of CERN personnel and contractors on chemical substances;
- the Civil Engineering (CE) section checks the civil engineering work as well as the work of outside contractors in general on the CERN site and makes certain that it conforms with the laws of the Host States; in addition the safety co-ordinators for LEP dismantling, the installation of the LHC experiments and the machine elements are administered by the group;
- the Fire Prevention (PI) section collaborates closely with the technical services (ST Division) and the Fire Brigade with respect to fire risk analysis and mitigation, checks operational and preventive measures (evacuation alarms and plans), and advises on fire safety for the LHC experiments.

Another important activity of the group is the promotion of safety for the LHC experiments: this comprises the co-ordination of safety activities inside TIS and participation in technical boards, formal safety hearings and safety working groups.

The total number of staff in the group on 31st December 2000 was eighteen, plus two technical students, one French “coopérant”, one electrical inspector working part-time, one “prestation de service” for waste collection, and three safety co-ordinators for dismantling of LEP and the installation of the LHC. An organizational chart of the group can be found in Annex 1.

The activities of the different sections and their results are presented in more detail in the following chapters.

The accident report was published separately [1] and for the sake of completeness shall be consulted together with this report.

3. SAFETY INSPECTION AND ERGONOMY SECTION

Annual Inspections

In 2000, the main goal of the section was to consolidate the efforts to improve the efficiency of general safety inspections. The computerisation started in 1998, was extended to new types of reports implying new templates and checklist to be developed (e.g. mechanical inspections). The safety inspection missions were clarified by the publication of the revised version of the Safety Instruction IS4[1] and some new internal procedures based on past experience were developed (topics template for safety inspection reports). In 2000 a total of 606 periodic inspections of buildings were done (678 total including installations) compared to 627 in 1999 (749 total). This slight reduction is due to the start of the LEP dismantling, associated with the responsibility for the safety coordination by the safety coordinators for that project (see Civil Engineering and Contractors Section). Even though the percentage of actions taken after the inspections is not yet checked quantitatively, the tendency is favourable and actions are on average taken more efficiently and more rapidly. The consolidation allowed assessing the necessary modifications and debugging operations on the software, but a computing specialist is needed for implementing any modifications.

Ergonomy and Noise

The demand for ergonomics assessments for the working place is growing. The noise level can often be reduced and the lighting improved. A comprehensive analysis was done for Building 40. It concluded that the reverberation time complied with the regulations in force and that the noise should be treated at the source, all actions envisaged such as damping the reflection of noise or closing the openings being considered as impractical or too expensive.
The new French legislation on noise for work sites asks for an effort to reduce the noise as far as reasonably achievable and to provide certified equipment. The classified installations such as the compressor halls shall emit a noise level up to maximum 3 dB above the background.
As to the LHC work sites there were still some complaints from local inhabitants due to sporadic excessive noise emissions, even after the creation of acoustic walls on most construction sites (access point 5, injection tunnel TI8).

Safety Counselling

One of the roles of the general safety inspectors is to do the safety coordination for the modification of buildings and installations when the ST division does not supervise the project. The installation of the TOF facility located downstream the PS and the modification of the COMPASS experiment were the two main projects in 2000. Several halls were prepared for the assembly and testing of sub-detectors of ATLAS (180, 185, 191) and CMS (point 5). In the mean time the projects were followed by the participation in meetings for the infrastructure of ATLAS and CMS.

[1] CERN Safety Instruction IS4: Safety Inspections

Computer Fluid Dynamics

The work continued on a computational fluid dynamics study of the accidental spill of liquid argon in the ATLAS cavern and the associated hazard of asphyxiation and/or exposure to low temperature. Computer simulations were performed to assess the importance of various parameters in particular for open detector geometry. Then, an experiment was carried out in the West Hall (180). A room consisting of concrete blocks (10x5x5 meters) was built, equipped with a ventilation system similar to the one of the cavern (Fig. 1). Liquid argon was poured from the ceiling while temperature and oxygen concentration were monitored by a data acquisition system. These tests were then modelled using the same simulation program and compared with the real results. This process revealed some discrepancy in the computer model especially in the centre of the room below the leak. This could be reduced greatly by taking into account the latent heat of vaporisation of part of the argon. Many computer models on the ATLAS cavern were made, and the results were presented at an international conference [2].

CERN Stores

All safety signs sold via the CERN stores were reconsidered and upgraded if necessary. This task is now completed and in the near future all the personnel protection equipment will be renewed. The templates and kits for fixing the evacuation plans for buildings and underground works have been made available in the CERN stores.

Safety Documentation

This year a major effort was done to upgrade the safety documentation available inside the group. Both the French and Swiss legislation are now up to date and by the mean of subscriptions will be kept in good shape in the future.

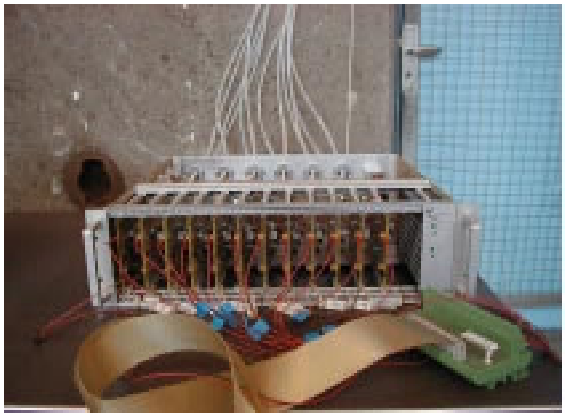
Public Events at CERN

The dismantling of LEP implied the closure of the most interesting sites for visitors. In collaboration with the visits service, some new circuits were studied and set up on the LHC work site, detector assembly halls and in test zones (CMS surface hall, ATLAS work site, Hall SM 18, Antiproton Decelerator, COMPASS, and others).
In 2000, the organisation of several artistic performances on the CERN site by the ETT Division provided the occasion to define a new policy for such events (LEP fest, Mimescope, Physics on Stage).

Fans (3200 and 1000 m3/h)

Diffusers

Heating (1200 W)



Zirconium Oxygen detectors

Thermocouples type J

LabView DAQ

Fig. 1 : Concrete shack for validating the computer fluid dynamics calculatons for an accidental spill of liquid argon in the Hall 180

4. THE ELECTRICAL SAFETY SECTION

The mission of the Electrical Safety Section encompasses notably receptions and periodical inspections of high voltage installations, follow-up of electrical accidents, check of alarm systems and electrical safety training and consulting.
In total, 201 inspection reports have been issued. The procedure for the reception of level 3 alarm systems was established according to the Safety Instruction IS37[1], and 9 reports have been issued.
A major effort went into preparing the LEP dismantling that required a large number of detailed safety protocols to be evaluated and countersigned in collaboration with the group SL-MR.
The technical specifications of the LHC power circuits and converters were prepared for the tendering process. The refinement of the electrical circuits to be used in the experimental programme of the LHC required extensive consulting on earthing, common-mode, electrical safety proper and operational constraints (ALICE and LHCb power converters, COMPASS magnet for polarized target, power converters and controls for the ATLAS and CMS magnets).
The updating of safety instructions and notes was continued (IS5, IS48, NS24)[2], and the mandatory procedures for following the safety publication UTE C 18 510 were put into service around the laboratory.

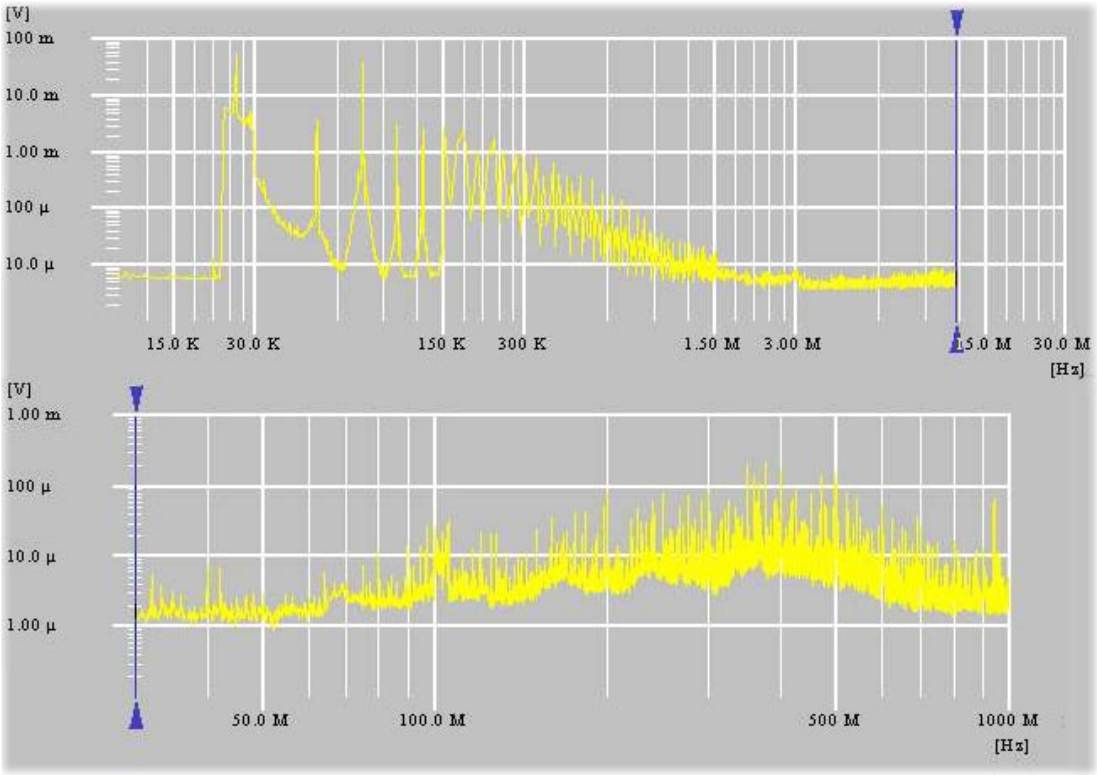


Fig. 2: Comparison of industrial domain bldg. 867 to computer centre bldg. 513

[1] CERN Safety Instruction IS37, Alarms and Alarm Systems

[2] CERN Safety Instructions IS5 Emergency Stops, IS48, Fire prevention for cables, cable trays and conduits and CERN Safety Note NS24, Removing unburied ELV and LVA electrical conduits.

EMC-work concerned the determination of exposure of persons to electromagnetic radiation for buildings that are open to public visits or CERN personnel and house special electrical equipment such as transformers, coils, high voltage lines, etc. [3]. Exposure of equipment to electromagnetic radiation was assessed for accelerator installations (compensating coils near building 905, laser amplifier for the PS division[1]), and experiments such as CMS [4]. A first concept of a CERN-wide EMC-policy was also proposed [5]. Work on a prototype EMC monitor for site surveillance has started [6]. Fig. 2 shows the exposure in bldg. 867 (above), where a soldering apparatus was operated for about 2 minutes at 25 kHz, and the one in the computer centre, bldg. 513 (below). It is remarkable that in bldg. 513, radio frequency from computers (300-500 MHz) exceeds the GSM generated RF-exposure at 950 MHz (below).

Concerning alarm level 3 installations the section is involved in the CERN safety alarm-monitoring project (CSAM) and contributed to its functional safety analysis [7]. Lack of EMC is suspected to be the cause of a part of the three false level 3 alarms experienced in average every day. In co-operation with professional EMC-firms the section has started work to precisely determine the reasons for these false alarms so far classified as "undetermined". Subcontracted measurements will be the logical follow-up of this work. AS Division implemented a new information technology version of disabling level 3 alarm systems in close collaboration with the section.

Training courses were held on electrical safety recycling (habilitation), electrical safety for TSOs, and on EMC in the framework of the summer student lectures.

5. THE CHEMISTRY, GAS AND INDUSTRIAL HYGIENE SECTION

The identification of asbestos in buildings on the site was carried out in collaboration with the ST Division, as was the safe removal of asbestos during maintenance work and the arrangements for protection of personnel and the environment. The main work was in Buildings 3 and 60 and in the PS ring, as well as dismantling of the asbestos cement packing in cooling towers on the SPS sites.

The elimination of dangerous wastes continued to be of great importance (see Annex 2, Table 2.1) although none of the remaining equipment containing PCB was sent for elimination. Preparations were made to eliminate dangerous wastes from the LEP dismantling programme (mainly oils from electrical apparatus and Halons from fire extinguishing systems).

A survey of the CERN Meyrin site was carried out to identify areas polluted by PCB, in collaboration with ST Division, the Geneva Authorities and the firm CSD Ingénieurs Conseil SA [8]. The firm Epteau[2] carried out the second survey of the watercourses, which could be threatened by pollution from the LHC work sites, and it showed that the water in the rivers was more polluted than that entering from CERN's activities.

---

[1] Delivered from ITEP, Moscow (Russia)

[2] http://cernenvironment.cern.ch/Pages/E/Themes/Water/AnalyseEau.html; Epteau, F-38280 Villette d'Anthon.

Safety training in gas and chemistry was continued for persons using these products[1], and arrangements were made for future safety training needs through a Safety Training Working Group.

The OPAM[2] report and the intervention plans for sites falling under the OPAM regulations were brought up-to-date and distributed to the managers and TSOs of the installations, the Fire Brigade and the relevant Swiss and French Authorities.

A Working Group, ”FAGIA” (Fire and Gas inside ATLAS), was formed, and the section took part in the deliberations and studies to enable a report to be made to the ATLAS project leader [9].

Help was given to EST Division in the safety aspects of cutting up the L3 large tube by plasma cutting.

Work began on the preparation of the 3rd High Energy Physics Technical Safety Forum at Fermilab held in May 2001.

A HAZOP[3] study of the flammable gas system for the ATLAS TGC[4] chambers was initiated by the LHC Experiments Gas Working Group and carried out in conjunction with the firm HAZMAT [10], and arrangements were made for a follow-up Fault Tree Analysis.

The solution of safety problems with chemicals and gases continued throughout the year and, in particular, the membership of the LHC Experiments Gas Working Group enabled safety problems to be identified and rectified at an early stage.

6. THE FIRE PREVENTION SECTION

The Fire Prevention Section took part to several studies, tests, inspections and field activities.

In collaboration with the CMS experiment the ‘pre-shower’ detector containing iso-paraffine that is not conform to the CERN rules was assessed for safety risks. A qualitative risk analysis was performed, in order to identify the response to the possible ignition sources during both service and maintenance. The additional risk introduced by the material was evaluated and design and exercise recommendation were issued under form of a proposal for derogation to IS41[5].

---

1 “Sécurité chimique (Base)” organized by “Office Cantonal de l’Inspection et des Relations du Travail (OCIRT)”

2 Ordonnance du 27 février 1991 sur la protection contre les accidents majeurs (Ordonnance sur les accidents majeurs, OPAM).

3 HAZOP = HAZard and OPerability

4 TGC = Thin Gap Chambers

5 CERN Safety Instruction IS41, The use of plastic and other non-metallic materials at CERN with respect to fire safety and radiation resistance

Fast reaction in case of fire in the ATLAS experiment was studied in the FAGIA working group [9] organized by the GLIMOS. It was made sure that the human access in whatever part of the experiment can be always made in a safe condition, allowing fast and proper emergency reaction. Specific knowledge on fire behavior was given to ATLAS personnel, in order to give them awareness of the threat of fire for the experiment, and the magnitude of the possible damage in the various scenarios.

An experiment was performed to spread high expansion foam into a large experimental pit (BA5) in order to verify the dimensioning of the water storage and foam generators, the wetting of closed electronic racks, and the time needed for a complete fill of the pit. This system shall be installed for ATLAS and CMS and is complementary to the rest of fire protection system. It should prevent the fire brigade to have to stay in the cavern, and to preserve as an ultimate line of attack at least part of the experiment and the environment in the case of an uncontrollable fire.

A performance test was made to evaluate a wireless automatic fire detection system ("MOBS" system) in underground premises, which revealed its limits for the envisaged application as a protective measure for temporary applications (no alert to the Technical Control Room in case of a failure).

Inspections and review of plans of surface buildings for the LHC was performed in collaboration with the assigned user group and ST/AA, in order to asses the level of risk for people, and to define TIS requirements on automatic fire detection and evacuation [11]. Advice to the user with regard to property protection against fire was provided as well.

A project of fire safety upgrade for the main building was elaborated with ST/TFM, in order to achieve a high standard of protection for the workers and the occasional visitors during both normal working hours and public events like conferences, spectacles, expositions, etc. The project got final approval and its execution was completed during the early 2001. A similar project was also elaborated for building 54.

Evacuation exercises were performed for public buildings (kindergarten), office buildings (30) and for those presenting a particular risk (galvano-plastic and chemical polishing workshop, underground works of the interaction points) in collaboration with the DSO and the Fire Brigade.

An exhaustive test of the smoke extraction systems was initiated for all the LHC tunnels and underground installation, in order to check response of the system to the activation commands in the various locations (remote, surface, underground, etc.).

Automatic fire detection acceptance tests in a number of buildings were performed in collaboration with the Fire Brigade and the ST Division (cf. also chapter 4).

Templates for evacuation plans were created that should be placed inside CERN public, office and multi-storey buildings as well as underground works. A campaign to fix them up has been started in 2001, as soon as the templates have been made available in the CERN stores (cf. also chapter 3).

7. CIVIL ENGINEERING AND CONTRACTORS SECTION

Activities of Contractors

The section's mission consisted in integrating safety into the large projects such as LHC and CNGS[1] as well as all other ones that CERN has entrusted to external contractors. The total volume of work accomplished in 2000 has been progressing by 16 % compared to 1999 and subdivides as shown in Annex 3, Table 3.1.

Safety Coordination

The rules of safety coordination are applied in two categories as defined in the safety rules [12]. Several large projects such as LHC, CNGS, the storage building for radioactive waste and the project of restructuring the water ducts belong to the first category and as such are followed up by professional safety coordinators, provided by external firms and in possession of the necessary certificates (Annex 3, Table 3.2).

In addition, the dismantling of the LEP accelerator and experiments belongs to the first category of work of the LHC project. In this context, the safety plan for the dismantling of LEP and its experiments was finished and the safety protocols established before the start of the work end of 2000.

As to the second category of work for maintenance contracts, industrial support and operation, the ST and EST Divisions have started, with the help of TIS, to elaborate the prevention plans [13].

The section followed the project of installation fire detection measures and improving the evacuation in the main building as well as a diversity of other projects (renovation of lifts, extension of the computer building and the cooling towers).

The Safety Instruction IS39[2], Notice of Start of Work, has been revised with the aim to incorporate the notion of safety co-ordination. A total of 250 "Opening of a work site", according to IS39, have been processed by the section and followed up in close collaboration with the work supervisors in the divisions concerned.

The section took part, after the first safety coordinator had declined his contract, in the selection and appointment by GTD/APAVE of the new safety coordinators for replacement and engagement. Three were operational at the end of 2000.

Participation in Committees

Study Group for Contractors' Occupational Safety Conditions (CECSTE)

The CECSTE committee has held two sessions in 2000 (11 May and 19 October 2000). The main topics were among others: the accident statistics during 1999 and 2000 the increase of their num-

[1] CERN Neutrino Gran Sasso Project

[2] CERN Safety Instruction IS39: Notice of Start of Works

ber [1], the difficulties to recruit safety coordinators for installation work, the status of the LHC project civil engineering work and the presentation of new projects (CNGS), the campaign to carry personal protection against noise, the malfunctioning of lifts in certain pits, the new regulations in force in the host states[1], the accidents treated by a fact finding group[2], the impossibility by CERN to fully respect the deadline for conformity of machine tools of 31 December 2000, the setting up of an inventory of buildings containing asbestos to avoid unforeseen problems during maintenance work, and the transformation of the ISR tunnel into a storage area for radioactive material. A dedicated session was held on 21 November with regard to the LEP dismantling work.

Special Health and Safety Committee (CSHS)
Three sessions were held in 2000, for which the subjects treated and observations made during work site inspections were issued in official reports (Annex 3, Table 3.3).

Inter-Contractor Safety, Health And Working Conditions Committee (CISSCT)
In its quality of representing CERN as ”maître d’ouvrage” for safety controls, TIS/GS/CE participates as consultant in the works and formal meetings established for the LHC project. There are at present four such committees attributed to the four batches of work in civil engineering[3], which treat within a general agenda items such as work site inspections and comments thereafter, follow up table of PPSPS[4], and measures for safety co-ordination. In total, 16 meetings were held in 2000.

One Inter Contractors Committee has been established for the LEP dismantling and LHC installation works that gathered four times in 2000.

8. SAFETY OF LHC EXPERIMENTS

The control of the measures taken for the safety of the LHC experiments is entrusted to the TIS-GS group leader as safety link-person. Two kind of meetings have been organized in this context. The members of a working group[5] prepare the subject and canalize the requirements of TIS to the persons in charge who will take the appropriate decisions. A “Safety Forum” unites the members of the working group and others, that are in charge of the technical coordination of the LHC experiments, in order to disseminate the recommendations and to guarantee a correct follow up. The Working Group meets twice per months, and the Safety Forum several times per year. The main topics treated are summarized in Annex 4, Table 4.1.

---

1 Transport of dangerous goods, asbestos, electromagnetic compatibility, certified organisations to work place safety, weekly working time in France of 35 hours

2 Uranium fire, Weak contamination by radioactive materials (ISOLDE)

3 No.1: LHC Point 1 (ATLAS); No.2: LHC Point 5 (CMS); No.3a: LHC other works except TI8; No.3b: LHC TI8

4 PPSPS: Plan particulier de sécurité et de protection de la santé

5 Working Group on the co-ordination inside TIS of safety issues for the LHC experiments: TIS experts, the GLIMOS of the LHC experiments and a linkperson to EST-LEA

Specific reviews that were organized by the persons in charge of the (sub)detectors (Technical coordinator, GLIMOS, etc.) and in which the group participated are listed in Annex 4, Table 4.2

9. OTHER ACTIVITIES OF THE GROUP

Other activities of the group concerned topics that needed the input of all sections, and hence they were co-ordinated by the group leader. Such topics concerned for example the setting up of procedures for better defining responsibilities for writing inspection reports and commenting on tender documents, or criteria for an enquiry report to be written, when a major accident or near miss has happened and an accident declaration is considered to be insufficient, or projects like the improvement of the safety in buildings open to the public such as the amphitheatre.

During 2000, the Spanish court external auditors looked more closely into the activities of TIS. Concerning TIS-GS, they "verified that, in general, the recommendations of the [inspection] reports have had a good level of implementation". They encouraged CERN to go on with its control in this area. They detected, however, that the coverage of the annual inspections is not totally in accordance with the Safety Inspection IS4, Safety Inspections and they recommended improvements. A second item they detected concerns the evacuation diagrams and signs. They stated that "in general, the diagrams, exit arrows and fire instructions are in accordance with the Instruction [Safety Code E, Fire Protection]". They found out, however, "a few cases of non total fulfillment with the rules concerning evacuation diagrams in the case of buildings to which members of the public have access". They suggest CERN "to reinforce the control in this sensitive area".

TIS-GS has had the opportunity to react on these observations. The missing inspections have been performed in the meantime and measures to implement the evacuation diagrams have been taken.

The group organized also visits of experts from outside CERN. There were several presentations on electrical safety from the American viewpoint[1], fire extinguishing systems foreseen in the large underground laboratory of Gran Sasso[2], receipt of a movie on an unforeseen carbon dioxide discharge causing several victims (cf. Chapter 5)[3]. Contacts with DESY / Germany and Fermilab were also enforced by the participation of experts from there in several safety reviews[4].

By the end of 2000, the responsibility for safety training was outside the group. However, in the year 2000, a vacancy was opened for a person to be engaged in TIS-GS for safety training. The selection board took place and this person took up the work in 2001.

---

[1] Referee from Fermilab, Batavia, Illinois, USA: K. Schuh

[2] Referees from Gran Sasso National Laboratory, Italy: D. Franciotti and G. Daquino

[3] National Engineering and Environmental Laboratory in Idaho, USA, contact person Mr. Tess

[4] Safety review on ATLAS gas and cryogenics systems; participants were H. Sindt (DESY) and W. Soyars (Fermilab), respectively.

Safety Documents under revision and published in the meantime are summarized in Annex 4, Table 4.3. A new Safety Note, NS 28, treating exhibitions at CERN and their fire safety, will be published in 2001. In collaboration with AS Division, the disabling procedure for level 3 alarm systems (IS37) and the demand for hot work (Fire Permit) was incorporated in the CERN EDH3[2] system.

Concerning bidders conferences, TIS-GS has transferred – in view of clearly attributing the responsibility for safety – the task of presenting the safety rules to the project engineer in charge of the contract. TIS-GS keeps on being present if possible on demand of the project engineer to answer questions in the bidders conference.

On demand of the Director of IRAM, Institut de Radio Astronomie Millimétrique[3], the group has participated in a safety audit for the institute's observatory located on the "Plateau de Bure[4]" in the French Alps [14].

---

1 ELV = Extra Low Voltage, LVA = Low Voltage A

2 Electronic Document Handling

3 Institut de Radio-Astronomie Millimétrique (IRAM), 300 rue de la piscine, Domaine Universitaire, F-38406 Saint Martin d'Hères, France

4 Plateau de Bure, Observatoire du Plateau de Bure, Institut de Radio-Astronomie Millimétrique (IRAM), F-05250 Saint-Etienne-en-Dévoluy, France.

10. ANNEXES

Annex 1 Table 1.1 : General Safety and Hygiene Group TIS-GS as of 31.12.2000

Name	Function
W. Weingarten	Group Leader, LHC Experiments Safety Linkman
C.W. Nuttall	Deputy Group leader
C. Negri	Secretary
C.W. Nuttall	Chemistry, Gas & Industrial Hygiene Section Leader (GS-GC), Risk analysis, flammable gas
C. Bertoux	Confined spaces, Industrial Hygiene & chemical inspections
J. Gulley	Chemical installations & inspections
B. Crépieux[a]	Waste collection
R. Magnier	Waste & chemical pollution control & chemical installations inspections
F. Szoncso	Electrical Safety & Inspections Section Leader (GS-ES), Adjoint LHC Experiment Safety Linkman
A. Chouvelon	Electrical inspections low power installations, Level 3 Alarm / safety systems, Inspections LHC, INB visits
G. Salomon	Inspections electrical power installations & distribution, Accidents
R. Dessens (AIF)[a]	dto.
D. Boudikian[b]	EMC site survey
M. Vadon	Safety inspections & Ergonomy Section Leader (GS-SI); Accident statistics; Contact person for cooling, ventilation and cryogenics; Inspection reports
B. Perea, J. Manteca-Menendez[c]	Computional Fluid Dynamics calculations
P. Beynel	Inspections SL & ergonomy
J. C. Carlier	Inspections EP and experiments (LHC&LEP), TH
B. Pichler	Inspections IT, TIS, EST, experiments EP (non LHC&LEP)
A.P. Bernardes	Inspections AS, FI, PE, SPL,DG / DSU,PS & ergonomy
J. Fivet	Fire Prevention Section Leader (GS-PI); Underground bldgs. LHC, projects
R. Cambarrat	Fire prevention & evacuation, Surface buildings LHC
M. Danesin	Civil Engineering & Contractors Section Leader (GS-CE); Civil engineering and Safety Coordination
C. Pividori	Inspections ST, Contractors
J. Weber, E. Paulat, J. Etheridge[a] (GTD / APAVE)	Safety Coordinators for the dismantling of LEP and the installation LHC machine and experiments

[a] Prestation de service
[b] Coopérant
[c] Technical Student

Annex 2 :

Table 2.1 : Déchets spéciaux expédiés à la station des Cheneviers en 2000

CODE ODS[a]	Produit	Tonnage
1010	Acide avec metaux lourds	6.04
1010	Acide nitrique	0.70
1010	Acide phophorique	91.97
1010	Acide phosphorique + n-butanol	0.80
1010	Acide sulfamique + n-butano	5.17
1010	Acides divers	10.86
1010	Bain galvanopastie	1.03
1010	H2SO4 + HF	0.90
1011	Perchlorure de fer	7.36
1020	Alcalins non cyanures	6.40
1052	Acide chromique	4.00
1070	Bains cyanures	0.13
1084	Produits photographiques	5.97
1088	Eau de lavage de four	2.50
1212	Solvants chlores	2.55
1222	Solvants inflammables	7.63
1411	Eau blanche	47.85
1460	Huile transformateur non chloree	33.66
1470	Huile de vidange	1.00
1470	Huile hydraulique	6.98
1480	Huiles diverses non chlorees	12.15
1491	Bain de degraissage alcalin	29.80
1500	Eau + huile	30.80
1500	Eau + hydrocarbures	73.40
1620	Colles + peintures	1.01
1741	Eaux grasses de restaurant	105.00
1850	Plaques fibrociments	1.00
2640	Sacs de chaux perimes	1.00
3020	Absorbants souilles	1.64
3020	Charbon actif	0.47
3020	Chiffons + breox	0.30
3041	Terre souillee par produits petroliers	5.06
3051	Bidons souilles	0.85
3220	Piles usagees	2.15
3222	Batteries Ni-Cd	32.00
3261	Lithium, sodium, cesium, potassium	0.03
3261	Produits avec indications des substances	0.70
3270	Dechets medicaux	1.17
9100	Sacs de routes	20.00
	TOTAL	**562.03**

a. Ordonnance sur le traitement des déchets spéciaux

Annex 3:

Table 3.1: Categories of work and their volume

Project	Volume of work [Million hours]
Service contracts, maintenance and operation of installations, modification of existing installations	**2.1**
Civil engineering for LHC	**0.45**
Installation of LHC	**0.23**
Total	**2.78**

Table 3.2: First category work

Project	Number of safety coordinators	Modalities
Civil engineering for LHC	**3 (COSSEC/WATERMAN)**	**Full time**
Installation work for LHC	**3 (GTD/APAVE)**	**Full time**
Restructuring of water ducts	**1 (COSSEC/WATERMAN)**	**Part time**
Civil engineering CNGS	**1 (AFICOR)**	**Part time**
Storage building 954	**1 (COSSEC)**	**Part time**

Table 3.3: Activities of the Special Health and Safety Committee (CSHS)

Date	Subject	Agenda
20th Meeting (13/4/2000)	**Various works on the CERN sites**	**Pr vessin:** Storage zone for the dismantling of LEP Installations and pipe work in bldg. 867 **Meyrin:** Restructuring of water ducts network Renovation of ground floor and 1st floor of b. 57
21st Meeting (15/5/2000)	**Long term contracts of EST Division (presentation of Safety Rules)**	Accident statistics Safety Rules in force Prevention Plan
22nd Meeting (14/12/2000)	**Various works on the CERN sites**	Restructuring of water ducts network Inspection of bldgs. 862, 963, BA6, 2, 3 Replacement of raw water circuit in bldgs. 255 and 355 Tightening of roof and renovation of electrical transformer station in bldg. 250 Total renovation of bldg. 568

Annex 4:

Table 4.1: Main topics of the LHC Safety Coordination Meetings

Safety item	Topic	Result
Access	**Access to ATLAS barrel structure**	**Requirements were defined**
Cryogenics	**LAr spill simulations and experiments in West Hall for ATLAS**	**Invited paper presented to Cryogenic Engineering Conference 2001 Madison/USA**
Electrical safety	**Electrical cable fire tests to define layout of linear temperature sensors required by new IS 48**	**Specification written**
Fire prevention	**Fire detection in LHC surface buildings**	**Report issued and accepted by LHC TCC**
	High expansion foam test in UA pit	**Technical specifications validated**
Materials	**Halogen free laminates for printed circuit boards — fire tests**	**Several commercial products were qualified**
Mechanical safety	**Seismic regulations**	**To be issued in new mechanical safety code**
Organisation of work	**First accident intervention team Pt 5, 6**	**Being implemented**
Non ionising radiation	**Permit to work for lasers**	**Procedure defined**

Table 4.2: Participation of TIS-GS in safety discussions concerning the LHC experiments

ATLAS Safety Systems Reviews (ASSR)	CMS Reviews on Engineering Design (EDR) or Procurement Readiness (PRR)	ALICE Initial Safety Discussions (ISD)	LHCb Initial Safety Discussions (ISD)
Laser Systems (29 February 2000)	Electromagnetic Barrel EDR (18-19 April 2000)	Time of flight detector (28 January 2000)	RICH detector (18 July 2000)
Gas systems (24 March 2000)	Tracker Silicon sensors and modules PRR (15-16 June 2000)		Calorimeter (25 July 2000)
Cryogenic systems (17 July 2000)	Silicon Strip Tracker EDR (15 – 17 November 2000)		
Grounding (23 November 2000)	Electromagnetic Calorimeter (ECAL) and Preshower (SE) Endcap EDR (28-29 November 2000)		
	Muon Alignment EDR (30 November – 1 December 2000)		
	Forward Shielding EDR (4-5 December 2000)		

Table 4.3: Safety documents revised in 2000 and published since

Document No.	Title
Safety Code A2	Reporting of Accidents
Safety Instruction IS4	Safety Inspections
Safaety Instruction IS5	Emergency Stops
Safety Instruction IS39	Notice of Start of Works (AOC)
Safety Instruction IS48	Fire prevention for cables, cable trays and conduits
Safety Note NS3	Fire Prevention for enclosed spaces in large halls
Safety Note NS24	Removing unburied ELV and LVA[1] Electric Conduits

[1] ELV = Extra Low Voltage, LVA = Low Voltage A

11. REFERENCES

[1] M. Danesin, A. Kerhoas, C. Pividori, M. Vadon, Accidents du Travail et Mesures de Prévention, Année 2000, CERN-TIS-GS/2001-04.
[2] Invited talk Cryogenic Engineering Conference and the International Cryogenic Materials Conference (CEC-ICMC), 2001, Madison, Wisconsin, USA in preparation; F Balda and M. Vadon, Simulations of argon accident scenarios in the ATLAS experimental cavern: A Safety Analysis, CERN-TIS/2000-009/GS.
[3] S. Prigent, CERN - Université de l'Alsace, IUT de Colmar, Département HSE, Rapport de Stage (3 avril - 9 juin) et livret de mesures.
[4] F. Gonzalez-Arteche, Thesis, in preparation.
[5] F. Szoncso, Electromagnetic Compatibility and non-ionising Radiation at CERN CERN-TIS-GS/TM/2001-03.
[6] D. Boudikian, Report in preparation.
[7] Application of Risk Management for Control and Monitoring System, CERN-ST-2001-044. S.Grau, L.Scibile, F.Balda, A.Chouvelon.
[8] CSD Ingénieurs Conseils SA (Mai 2000): CERN, Site de Meyrin, Investigation historique au sens de l'ordonnance sur les sites contaminés relative aux PCB.
[9] Final report of the ATLAS FAGIA Working Group, in preparation; and TIS assessment of FAGIA report, TIS/GS/WW-cn (2001-08).
[10] Hazards and operability study of thin gas chambers gas system, ATLAS muon spectrometer, part 2, final rept, HAZMAT Ltd. Rosh-ha'ayin, Israel, September 2000.
[11] F. Corsanego, R. Nunes, Automatic Fire Detection Requirements for the LHC Surface Buildings, CERN-TIS-GS/TM/2000-04.
[12] Safety Regulations Applicable to the Work of Contractors at CERN, CERN/TIS-GS/98-10, May 1998.
[13] C. Jacot, M. Danesin, C. Pividori, O. Prouteau, L. Symons, Guide pour l'Etablissement des Plans de Prévention de Sécurité des Entreprises Extérieures, Travaux et Prestations de Catégorie 2, CERN-ST-2000-058, 12 juillet 2000.
[14] C. Margaroli, F. Szoncso, W. Weingarten, Audit de Sécurité IRAM, 9-11 mai 2000, CERN-TIS-GS/TM/2000-03.