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Occupational S&H in the Case of Large Public Facilities: a Specially Designed and Well Tested Approach

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Occupational Safety and Health (OS&H) appears to be a particularly complex topic in the case of large public facilities open to the patrons (Ministries, public offices) due to a number of quite typical characteristics that, consequently in many cases, can make inadequate the usual approaches to the OS&H problems suitable to the industrial activities or secondary educational institutions.
The paper discusses the results of a multidisciplinary work -made exhaustive thanks to the presence of highly qualified experts in the staff- carried out in cooperation by Italian Universities for the definition of a Guideline for the Occupational Risk Assessment and Management of employees and students in the Italian Universities.
The Guideline was specially conceived to substantially improve the continuous effort towards the OS&H management in a sound quality approach, and provide for each person the actual residual exposure to Hazard Factors, resulting from a consistent and undoubtedly updated System and Job analysis. The Guideline, since the very first step of the study, stresses the paramount importance of a detailed and unambiguous definition of the Line and Staff Organization upon which to base the approach composed by 3 basic hierarchical phases.
The Guideline was carefully tested both in terms of general approach and in some sub-applications to special critical topics. The importance of the presence, among the Universities teaching and research staff, of resources qualified on OS&H aspects should not be underestimated. Their deep knowledge of the local situation can be, in fact, a precious help both in the Occupational Risk Assessment and Management for complex problems, and in organization of Information, Formation and Training -IFT-.

1. Universities and OS&H problems

A preliminary survey on the Universities (Borchiellini and Patrucco, 2013) confirmed the presence of not negligible difficulties in applying the general OS&H rules for common and emergency situations. This is due both to the peculiarities of the Universities, particularly different from most of the industrial activities clearly covered by the OS&H Laws and Regulations, and to the general lack or incompleteness of special regulations. The main problems can be summarized as follows:

- the sometimes terrific number of different cultural, teaching and research coexisting areas, involving different facilities and laboratories, widens the number of Hazard Factors needing Risk Assessment and Management. Furthermore, it must be underlined that obviously the exploration of new fields (often with the use of equipment and machinery specially designed and constructed for research purposes for temporary use in laboratories) can involve physical, chemical, biological and carcinogenic risks requiring a very careful preliminary Hazard Investigation,
- the general delicacy in establishing a clear governance leads to problems when a clear chain of responsibilities and obligations should be unambiguously identified, this task becoming, unlike in the industrial activities, a quite complex one, due to the aforesaid heterogeneity of structures and staff. Moreover, no formalized and well tested Risk Assessment and Management technique special for the Universities has been found in standards or literature, even if it is clear that slapdash approaches and

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improvisation on demand are bound to dramatically fail the target to make available a representative and exhaustive Residual Risk Assessment for each person involved, and that the safety organization should be based on the consciousness of the Management and include, in support of OS&H staff, experts in the innovative research fields and the motivated cooperation of the managers of the different areas;

- the essential need of preservation of the historical and artistic value of a large number of European - and in particular Italian University settlements - often imposes a special non-invasive design of the safety structural measures and fittings, and even makes completely impractical the application of rules conceived for new buildings,
- due to social and contingent reasons the number of students and similar –in a growing percentage from foreign countries- can often be scheduled with difficulty, requiring a just in time organization partly based also on the availability and capacity of rooms and facilities; hence IFT also should be carefully planned in general, and in particular for people involved in research programs for a limited time span (fellows, PhD students, etc.);
- even if the Universities are obviously the “temples of advanced culture and technique”, the conscience on the OS&H aspects appears often to be at lower level, and, worse, some even elementary safety rules are sometimes considered a nuisance interfering with the research work. This being an obvious consequence of the lack of qualified and widespread professional teaching on the basics of the OS&H, and of a bureaucratic (paper safety and all-purpose procedures drafted in the absence of a preliminary effective risk analysis) instead of a substantiated approach. A drastic change course was therefore considered of substantial importance and is being implemented;
- finally, a number of security aspects typical of Universities should not be neglected, from general security: the patrons number oversize, some areas to free admission, the security of data and inventions or patents. As well known, security is often a more rigid system than safety, but the latter should be carefully adapted to grant in any case minimized occupational risk values.

As to the Italian situation, the D.M. 363/98 (Italian Regulation, 1998) was the first regulation, compliant with art.1, par.2 of D.Lgs. 626/94 (Italian Regulation, 1994, the former enforcement of the European "Framework Directive" 89/391/EEC (The Council of the European Communities, 1989) concerning the measures to encourage improvements in the OS&H), to introduce innovations in the application of the OS&H principia within the Universities. The D.M. 363/98 is still in line with the current safety standards: the D.Lgs. 81/08 (Italian Regulation, 2008) in art.3, co.2, foreshadows a list of facilities including Universities and Institutes of High Education for which the provisions of D.Lgs. 81/08 must be applied “where necessary through the adoption of further specific ministerial decrees”, which to date are unfortunately still pending. In such a situation the Universities and Higher Education Institutions, according to the D.M. 363/98, adopted internal regulation to establish the distribution of responsibilities and obligations at the different organization levels involved in the OS&H system.

2. An effective and well-tested Guideline for the Occupational Risk Assessment and Management special for Universities

The dictates proposed in the Guideline have been carefully field tested to verify the feasibility and exhaustiveness in different University situations of both the general approach and of each sub-phase developed for special problems. Basically the Guideline is based on the following assumptions in order of importance:

- **step one:** the well tested approach to an effective Occupational Risk Assessment and Management summarized in Figure 1 should be adopted, since it grants both exhaustiveness in the Hazard Identification phases even in complex situations, where other approaches can leave room for serious incompleteness, and guarantees the compliance to the Law requirements.
- **step two:** the awareness that in OS&H of Universities subjects univocally identified at various levels in a well defined chain of responsibilities and obligations should cooperate makes possible the definition of the General OS&H Policy, based on the assumption that a synergy of Management, Operating Line and Staff Organizations is essential. Moreover, an unbiased documental and technical information transfer based on input data on systematically updated schedules data sharing is of pivotal importance.
  Based on the comparison of a range of alternatives in terms of efficiency and coherence with the existing Italian organizations, in the Guideline the Rector has been identified as the leading subject, and the line includes the Heads of the various Areas (Departments, Administration and Logistics), the Technical Responsibles of Laboratories, and other depending staff for both technical support and safety advising. The information on OS&H criticalities is transferred to the OS&H System, where the Risk Assessment and Management is carried on, control measures are designed in a PtD approach (see Figure 2) in technical, organization, and procedures terms, and the associated cost assessed. A validation with the

Director of the area follows, and then the control proposals are submitted -in a strict risk hierarchy- for funding. The residual risk is then recorded both for typical jobs and for each involved subject.

A - from the usual definition:

RISK = predictable damage due to the event M × expected frequency of occurrence P

since in the industrial activities not covered by the EC 2012/18/UE Directive, such as in our case, we can write:

$$M = PD \cdot FC$$

where:

PD = seriousness of the possible damage (death, injuries and health impairments, etc..);

FC = interference (or contact factor) is function of the percentile exposure time to potentially hazardous operations or situations compared to the working cycle;

then:

$$RISK = PD \cdot FC \cdot P$$

B - a numerical risk evaluation unbiased by subjective estimation can then be reached, where:

- PD is expressed e.g. in terms of lost days according to Italian standard UNI 7249/2007 (work related accident statistics – injury frequency/severity rates) and Italian law D.M.12/07/2000 (dispositions for worker's disability insurance);
- FC can be estimated in terms of % of the work shift involving the exposure to Hazard Factor;
- P, i.e. the possibility of deviation from the correct work organization/development, can be numerically evaluated in a simplified way (according to the UE suggested approach see Doc.5196/94/PA – Official Journal European Communities – 05/07/94):
  - ✓ the minimum probability of occurrence of hazardous events obviously corresponding to a situation coherent with the progress of the technical safety standards; a simplified and effective approach to the evaluation of P can be based on the use of the *expected frequency of occurrence level*, written as:

$$PR = \frac{\text{expected frequency of occurrence of the event (present situation)}}{\text{minimum expected frequency of occurrence in compliance to up to date safety standards}}$$

≤ 1 correct situation;
≥ 1 unacceptable situation

  - ✓ the approach provides an adequate evaluation of the possible severity of event's consequences, since in a situation accomplishing to the regulatory requirements there won't be any worsening in consequences due to other flaws (for example in terms of communication, organization of first aid, etc..).

C - to identify the Hazard factors (potentially involving a OH&S Hazard) the following approach is recommended:

⇒ *preliminary general risk analysis and control of site characteristics in terms of intended use, fittings, general support service (fire and accident management, emergency organization, …), e.g. by means of a Preliminary Hazard Analysis;*

⇒ *identification and management of interferences (e.g. PERT & Functional Volumes Analysis);*

⇒ *safety analysis and control of every working activity (for example through the use of a Job Safety Analysis);*

⇒ *failure analysis and control by means of Hazard Evaluation Techniques (e.g. HazOp, FMEA for one failure or FTA, ETA for multiple failures (Guidelines for hazard evaluation procedures, Center for Chemical Process Safety, American Inst. of Chem. Eng., 2008)*

Figure 1: Guidelines for Risk Analysis and Management approved by SCHMOEI EC Commission.

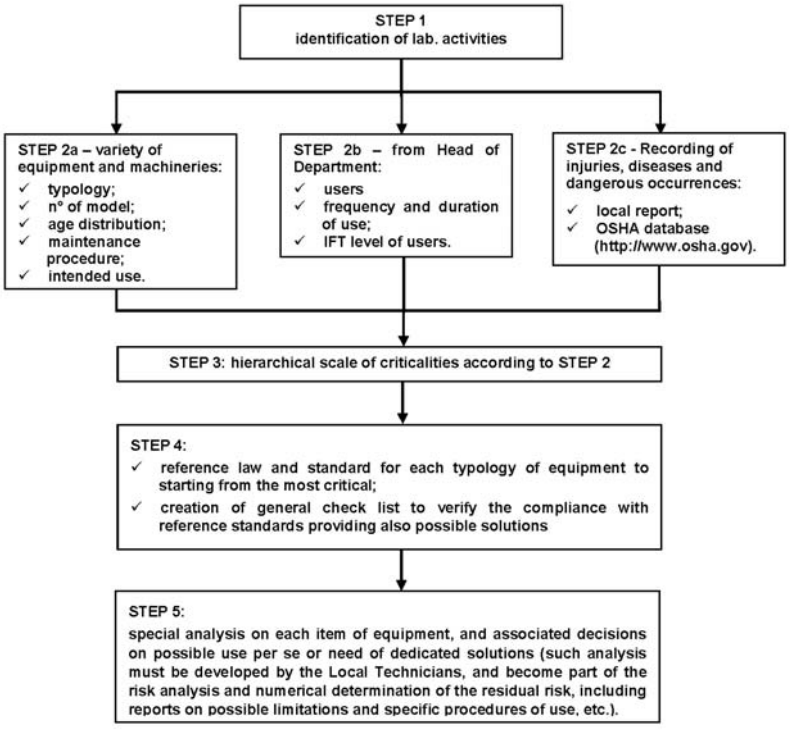

Figure 2: Flow of the information transfer and equipments/machineries analysis approach.

- **step three:** after careful evaluation and repeated practical tests, the approach for the Risk Assessment and Management in the Universities summarized in Figure 3 was considered feasible and appropriate to copy with the Law requirements.

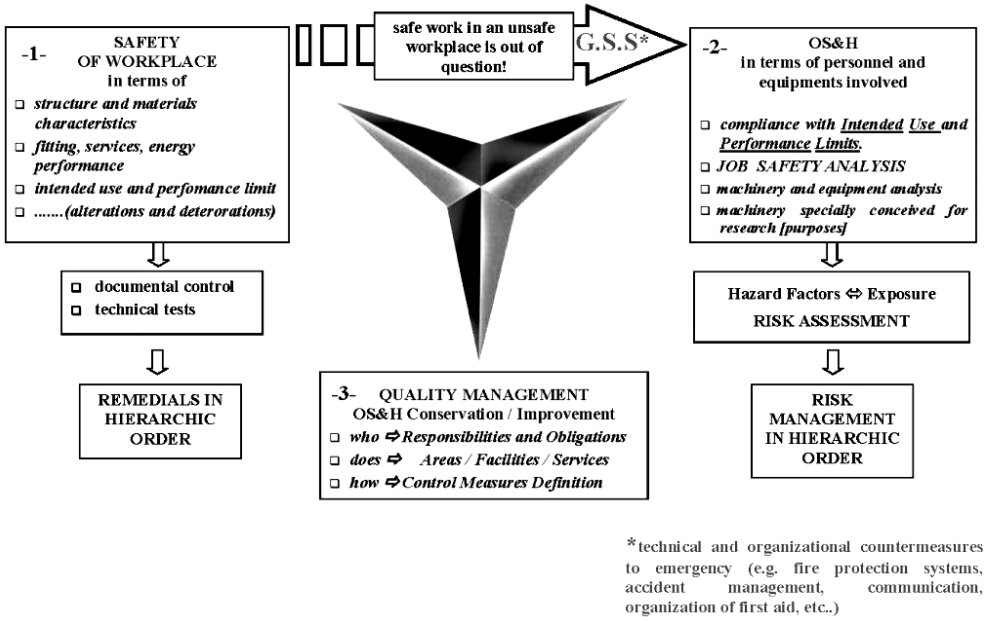

Figure 3 The approach of the Guideline specially developed for Universities

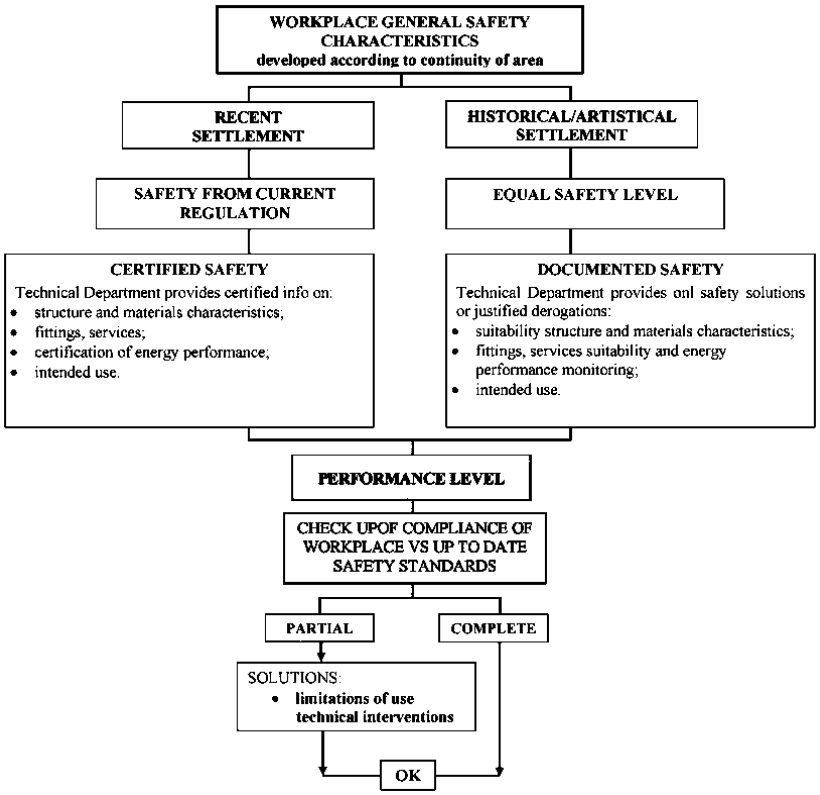

Figure 4: Dedicated approaches for settlements of different characteristics

The 3 boxes of Figure 3 can be made explicit as follows:

Workplace general safety characteristics: evaluation of workplace conditions in terms of structure, materials, plants, energy qualification, performance limits, necessary to verify the actual consistency with

the intended use. This should be associated with the General Support Services –GSS- representing the technical and organizational answer to criticalities according to general and specific regulations.
The variety of historical and artistic settlements imposes a special way of thinking of safety in applying the up to date safety standards. Taken for granted the careful collection of the mandatory/available documentation, records on additions/modifications and important maintenance following unexpected problems, the Guideline includes two different approaches (see Figure 4):

- direct up to date regulation enforcement: for recent or under construction buildings and plants;
- equal safety level: in the case of historical and artistic settlements a Safety Review can bring into evidence the presence of alterations, deteriorations, splitting of structure and plants.

In both cases, the result is a check list specific for each workplace, of great help for conservation/improvement of the routine control of the original safety level: even if this cannot be considered an exhaustive approach, it is a good and simple start point to define the intended use of each area or introduce limitations of use.
OS&H: every activity in terms of workers and equipments involved is considered, starting from the compliance with conditions defined in the previous step. The target is the evaluation, for each worker, of his exposure to the total Hazard Factors systematically identified by a Job Safety Analysis, used as reference technique and based on:

- detailed analysis of the operations performed by each worker, and logical breaking up of every complex operation in basic ones and the associated average duration of each basic operation;
- equipments are analyzed as autonomous Hazard Factors, with systematic reference to up to date regulations and standards for the definition of suitable control measures.
  Important byproducts of the JSA are the motivation of workers towards safe behaviors and the availability of documentation for an effective IFT. Moreover, since the use of original and modified machineries, and of machinery specially designed and constructed for research purposes for temporary use, excluded from the scope of Directive 2006/42/EC (The European Parliament and of the Council, 2006), is a common practice particularly in laboratory research activities, a special attention is here devoted to the involved aspects of OS&H (Figure 5).

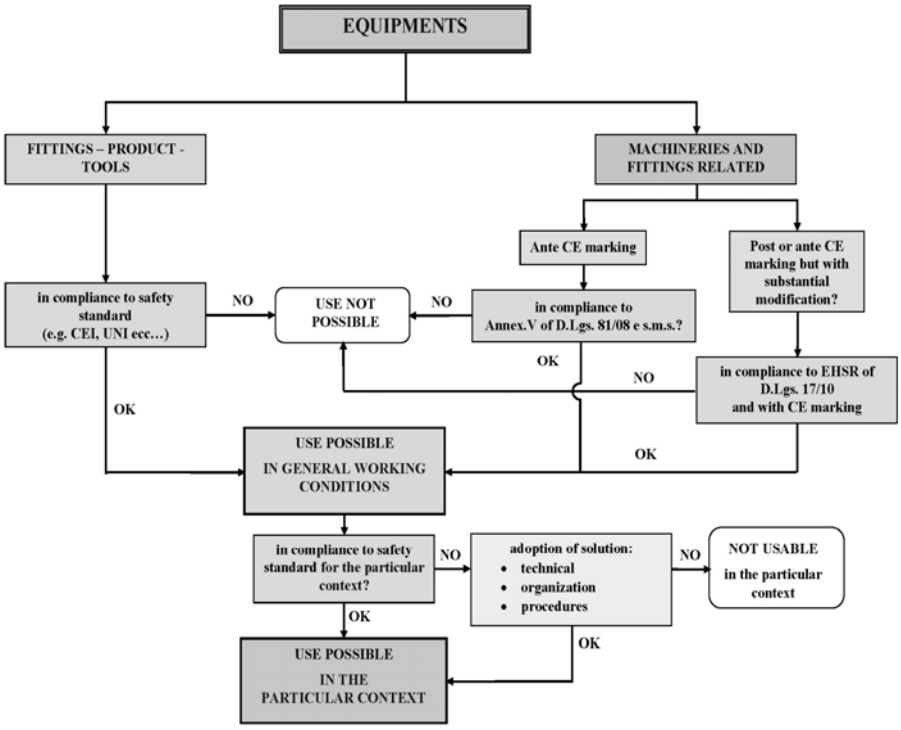

Figure 5: Equipment analysis adopted approach

Quality Management: the last step towards the adoption of a OS&H Management Systems based on the well - know Deming cycle. The intent is to establish, document, implement, and continually improve the OS&H policy, in compliance with Law and Best Techniques requirements, according to art. 30 of D.Lgs 81/08 and BS OHSAS 18001:2007.

Some results on the main sub phases applications of the Guideline are summarized in Figure 6:

Figure 6: Some examples on real cases applications

3. Conclusion

The task of Occupational Risk Assessment and Management appears to be particularly complex in the case of the Universities, due to a number of typical problems requiring special attention.
As discussed, a special approach made possible the issuing of a Guideline for the Occupational Risk Assessment and Management of employees and students, which, thanks to the good results achieved in a series of tests both on the general approach and on the Guideline Sub-phases for special problems, can be considered effective, appreciably rigorous and useful also for IFT and the Quality Management of the OS&H.

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