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Guideline for health and safety management in welding fabrication activities (based on EWF health and safety management system)

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This guideline describes a management system to be voluntarily introduced by welded products manufacturers in order to protect the health and to assure safety conditions for all the personnel involved in welding fabrication activities. In addition, a comprehensive implementation of this system should give a continuous reduction of the residual health and safety risks.

This system applies to all the welding fabrication activities; therefore all the activities performed before, during and after welding (but related to welding) should be considered as these can give rise to risks of accidents.

Keywords:
Health, safety, health safety management system, welding, fabrication

Submitted by Luca Costa (Italy) at the request of the Commission

INTERNATIONAL INSTITUTE OF WELDING
Italian Delegation

GUIDELINE FOR HEALTH AND SAFETY MANAGEMENT IN WELDING FABRICATION ACTIVITIES

Based on EWF SMS (EWF health and safety management system)

Presented by Luca Costa[1]

1 Scope and field of application

This guideline describes a management system to be voluntarily introduced by welded products Manufacturers, in order to protect the health and to assure safety conditions for all the personnel involved in welding fabrication activities[2]. In addition, a comprehensive implementation of this system should give a continuous reduction of the residual health and safety risks.

This system applies to all the welding fabrication activities; therefore all the activities performed before, during and after welding (but related to welding) should be considered, as can give rise to risks of accidents.

2 Definitions and Acronyms

For the scope of this guideline, the following definitions apply:

Accident: Undesired event giving rise to death, ill health, damage or other loss.

Hazard: Source or situation with a potential arm in terms of human injury or ill health, damage to property, damage to workplace environment, or combination of these.

Health and safety: Conditions and factors that affect the well-being of employees and any other person (contractors personnel, visitors, etc.) In the workplace.

Incident: Event that gives rise to an accident or has the potential to lead to an accident.

Risk: Combination of the likelihood and consequence(s) of a specified hazardous event.

Working areas: The areas where working activities, equipment or devices may cause accidents.

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[1] Dr. Ing. Luca Costa, IWE, Italian Institute of Welding – EWF Working Group "Quality, Environment Health and Safety" secretariat.

[2] This guideline has been prepared taking into consideration the activities ongoing in the "European Federation for Welding Joining and Cutting". This document in particular has been prepared on the basis of the study document "EWF safety management scheme (EWF-SMS) Guideline for manufacturers of welded products", produced by the working group "Quality, Environment Health and Safety".

For the scope of this guideline, the following acronyms are used:

EWF: European federation for welding, joining and cutting.
SWC: Health and safety welding coordinator.
SMS: Health and safety management system.
WSAR: Welding health and safety analysis report.
DAR: Documented audit report.

3 Health, safety and quality management

This guideline may only be applied to Manufacturers who can demonstrate that their welding and allied activities are already appropriately controlled from the operational point of view, as the correct management of welding procedures, processes, techniques and consumables give assurance that the risks are reduced at the origin by avoidance of useless operations and that the technical conditions implemented are correct.

As a consequence, the following should be considered as basic requirements for the appropriate management of welding fabrication and therefore required for the health and safety management too.

Requirement	Application
Requirements and technical review	The Manufacturer shall review the contractual and any other requirements together with any technical data relevant to the welding fabrication activities, in order to verify that the work content is within its capability to perform, that sufficient resources are available and that documentation is clear and unambiguous
Welders and welding operators	Welders and welding operators shall be qualified by an appropriate test
Welding co-ordination personnel	At lest one welding coordinator, with appropriate technical knowledge in welding and in the specific production processes, is required
Equipment maintenance	Necessary as applicable to provide, maintain and achieve product conformity, records are recommended
Production and testing equipment	Suitable and available as required for preparation, process execution, testing, transport, lifting in combination with safety equipment and protective clothes
Production planning	Required documented plans records are recommended
Qualification of welding procedures	Required; WPS or work instruction shall be available to the welders / welding operators
Post-weld heat treatment	Procedure is required
Non-conformance and corrective actions	Measures of control are implemented procedures for repair and/or rectification are required

Table 1 – Quality management requirements to be applied for the Health and Safety management.

It should be noted that the proposed requirements are considered as basic in quality management of welding fabrication activities. Most of those are already reported in ISO 3834 – 3 “Quality requirements for fusion welding of metallic materials - Standard quality requirements”. As a consequence, compliance with ISO 3834 is one way to demonstrate appropriate quality management in welding, even if many other process management systems are acceptable, providing that the technical conditions implemented are equivalent to those proposed in table 1[3].

The proposed management scheme for Health and Safety has been designed for application in conjunction with ISO 3834, and the requirement reported hereinafter can be considered and managed as integration of such a standard.

[3] EWF proposes a technical interpretation of ISO 3834 (also referred as EN 729), and applies a certification system, namely EWF EN 729 Scheme. Compliance with this scheme is considered by the EWF the best way to correctly manage the welding fabrication activities from a quality point of view.

4 Key elements of the health and safety management system

The part of the SMS described in the following paragraphs is only related to welding fabrication activities; it should be adjusted and graduated according to the nature and dimension of welding health and safety risks which may cause accidents inside of the working areas.

The key elements to realise an adequate and acceptable SMS are the following, at least:

- to define and implement a correct occupational health and safety policy;
- to appoint an occupational health and safety expert person, responsible to establish and maintain the SMS in the welding fabrication process;
- to perform a risk evaluation analysis at the beginning of the SMS implementation and after any welding process significant change;
- to define a health and safety operating plan;
- to assure a continuous improvement of the implemented SMS.

The SMS includes different steps, starting from the safety policy definition up to the improvement of the stated and implemented safety scheme; these steps are reported in the flow diagram of Fig. 1; higher detail is given in the following paragraphs.

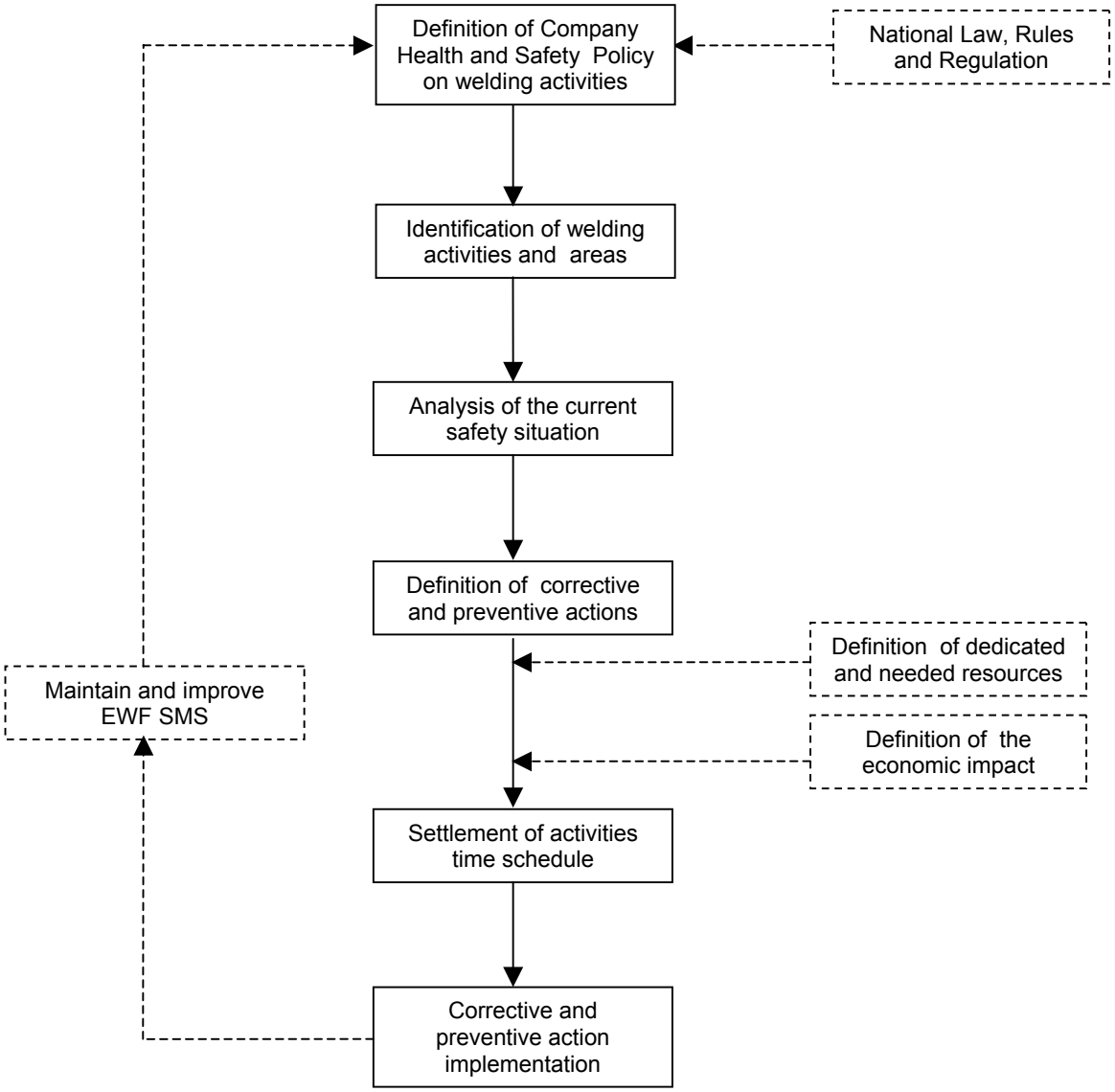

Fig. 1 – Health and Safety Management system flow chart.

5 Health and safety welding coordinator

In order to have the SMS properly defined, implemented and under control, the welded product Manufacturer shall appoint a person, who is the representative of the top management for the welding health and safety matter.

This person could be the welding coordinator, skilled and qualified through suitable training courses in the health and safety matter and on this management system. However, it is also possible to appoint another person within the organisation, providing he/she can demonstrate appropriate knowledge and competence, and providing he/she has access to expertise from the welding co-ordination person(s) in the company.

The person appointed to be responsible to the top management for the SMS is referred to hereafter as the health and safety welding coordinator (SWC)[4].

Any other persons within the organisation having tasks or responsibilities relevant to this SMS shall report to the SWC. Each will take care of the implementation of the part of the health and safety scheme allocated to him/her.

For all welding fabrication related activities the SWC is at least responsible for:
- supporting the top management to define the health and safety policy;
- supporting the top management to define the health and safety organisation structure within the company;
- documenting and disseminating the health and safety policy inside the organisation;
- defining the health and safety legal prescriptions;
- defining the health and safety hazards and connected risks;
- alerting, educating and training all personnel on the health and safety risks;
- dealing with the health and safety non-conformities and defining the related corrective actions, if any;
- co-ordinating the health and safety emergencies;
- providing safety audit to assure the correct implementation of SMS;
- regularly reviewing the complete SMS with the aim of improving the current revision following any experience carried out.

6 Health and safety management of welding processes and allied activities

The SMS requires the definition of the overall current health and safety risks with the purpose to prevent any future potential accident during the welding activities. To get this target the manufacturer implement a series of health and safety investigations, starting from the preliminary analysis which is the basis of the organisation strategy on health and safety.

6.1 Preliminary welding health and safety analysis

At first, before having any safety system running, it is necessary for the manufacturer to establish if there are any risks, connected with the welding fabrication phases, which may provoke events giving rise to accidents on the working areas.

The following fabrication phases shall be included in the preliminary welding health and safety analysis, at least:
- materials management;
- materials preparation;
- welding activities;
- final treatments;
- tests in workshop and laboratory.

The types of hazardous events shall be identified taking into consideration law, requirements and technical documents having the company policy on health and safety as a reference.

In particular, it is the responsibility of the SWC to define:

[4] Attachment 1 gives the syllabus of a recommended training course for the SWC

a) the activities which in his/her judgement can provoke hazardous events;
b) the type of the hazardous event and the potential injury it may provoke to a person;
c) the likelihood of hazardous event and the magnitude of harm.

The risk levels can be evaluated according to table 2, taking into consideration the likelihood of the hazardous event and the relevant magnitude of potential harm.

		Likelihood of hazardous event		
		low	**medium**	**high**
Magnitude of Harm	**Very low**	Trivial risk	Tolerable risk	Moderate risk
	Low	Tolerable risk	Moderate risk	Elevated risk
	Medium	Moderate risk	Elevated risk	Intolerable risk
	Very high	Elevated risk	Intolerable risk	Intolerable risk

Table 2 – Definition of the risk level.

This welding Health and Safety preliminary analysis shall be documented and included in the welding health and safety analysis report (WSAR).

The form reported in attachment 2 can be used as reference to perform the preliminary health and safety analysis and to document the performed activities. The same form can be used for the maintenance of the system, whenever required.

6.2 Preventing and corrective actions management

Corrections must be adopted when it is recognised that the safety system is failing or can potentially fail in respect to the health and safety welding policy or to law requirements. Table 3 reports a guidance for the definition of corrective actions to be implemented, in order to reduce the risk level up to tolerable.

The corrective actions to adopt in the process are to be defined in details (e.g. specifying materials, equipment, personnel, timing, cost estimates, etc.), planned and reviewed for the ultimate implementation decision.

Risk level	**Action**
Trivial	No actions required
Tolerable	Frequently verify the maintenance of the current status.
Moderate	Monitor the risk reduction for a limited period of time. Tolerable risk level shall be reached, at least.
Elevated	Take actions to achieve a substantial risk reduction; allocate more resources in case is needed. Tolerable risk level shall be reached, at least.
Intolerable	Stop production in the working area and take actions to achieve a prompt and substantial risk reduction; allocate more resources in case is needed. Tolerable risk level shall be reached, at least.

Table 3 – Actions to undertake depending on the risk level.

Attachment 3 shows an example of a planning table to be used to record the corrective actions and the relevant details, i.e. the budget, the priority, the implementation time period, etc. This table is generally associated with the WSAR.

6.3 Maintenance of the implemented system

The application of the system shall be maintained, and periodically reviewed:
- every time a significant change in the welding fabrication activity occurs (new processes, material or techniques that can affect the health and safety conditions);
- every time a significant change in the reference documents occurs (law, rules and/or technical documents).

6.4 Audits

Audits to the health and safety management system shall be run under the responsibility of the SWC and the audit planning shall be arranged to cover all the areas in which the SMS is applied. The audits shall be conducted to avoid and to prevent any potential risk of accidents due to inattention of personnel or inadequate safety conditions in the working areas.

A documented audit report (DAR) shall be issued.

7 Management of non-conformities

The Manufacturer shall have a documented procedure describing how the non-conformities are managed; sources of non-conformities and related proposed resolutions shall be included in this procedure.

In the case of other management systems implemented (e.g. ISO 3834) the same non-conformity management procedures can be applied.

The formal approval of the SWC is needed before the enforcement of the proposed resolutions.

8 Personnel training

All personnel involved in welding fabrication activities need to be alerted to the welding health and safety management system established to avoid potential accident. For this purpose a specific training program shall be defined and applied by the SWC.

Changes in the welding fabrication process (e.g. change of processes, procedures, key personnel, etc.) shall promote a rearrangement of the training program.

9 Health and safety operating plan

The SWC shall issue the Health and Safety Operating Plan collecting the following documents, at least :

a) the company policy for the welding related activities;
b) reference to the national laws and rules which the company shall meet;
c) the implemented welding processes specifying the type, the base materials, the equipment, etc.;
d) the principal actions taken to remove or, at least, to minimise the causes of risks of accident during the welding process activities;
e) the adopted dispositions to maintain and to improve the SMS;
f) the health and safety objectives and the indicators chosen to meet the previous point “e”.

10 Emergency management plan

With reference to the risk levels defined by the safety analysis, the SWC shall define the possible emergency conditions in which the operators may occur and specify how to face up them. The SWC is responsible to manage and organise the safety measures and to diffuse them (with specific courses, if necessary) to the welding related personnel.

It is his/her responsibility to issue the emergency management plan, which shall contain the following, at least:

a) the type of the emergency situations which may occur;
b) the procedures (including also the first aid) to be implemented at the occurrence of any of those emergency situations;
c) The maps of the working areas and the related escape-ways to follow in case of accident.

11 Health and safety documentation control

Sufficient documentation shall be available to enable the SMS to be fully implemented and proportional to its need. It is important for the documentation to be kept to the minimum required for effectiveness and efficiency.

The type of the documents are generally the following:

a) the technical specifications and drawings, describing products, materials, etc. and their characteristics;
b) the records issued to demonstrate a result of any kind of control or verification (e.g. certificate of a test, non conformity report, audit report, etc.);
c) the safety management documents (e.g. plans, manuals, procedures, instructions, etc.);
d) laws and rules in the health and safety matter.

A documented procedure shall be issued for the SMS document control, defining the responsibility for the issuance, verification, approval, distribution and filing.

Any document issued or used for safety reason in welding areas must be approved by the SWC.

12 Communications

Arrangements shall be established and maintained for:

- effective and open communication on the SMS;
- employee involvement and consultation for safety purpose on risks of accident, etc.

13 Management Review

The top management shall define the frequency of the management review. The review shall consider, at least:

- the overall performance of the SMS;
- the performance of the most important elements of the SMS;
- the findings of audits;
- the internal and external factors, such as changes in the welding organisation structure, legislation pending, introduction of new welding technologies, etc.

ATTACHMENT 1: TRAINING COURSE FOR HEALTH AND SAFETY WELDING COORDINATORS (TYPICAL CONTENT)[5]

	SUBJECT	Time
1	**Introduction** - Description of the course - A briefing on management systems; the most relevant items - National and international working groups dealing with health and safety	1h
2	**The Management Systems for welding fabrication activities: application of ISO 3834 and health and safety management scheme in a company: points of contact** - Applicable schemes for Manufacturers of welded products - The manufacturer's policies (quality, health and safety) for welding - The welded product manufacturer's activities, with reference to welding fabrication and allied processes - Expected improvement in quality, health and safety after the schemes implementation in a company	3h
3	**Survey on health and safety in welding fabrication** - Risks for health and safety in welding activities - Risks for health and safety in allied activities - Applicable measures to reduce the risks - Applicable documents, law, rules	8h
4	**The welding health and safety analysis** - Role of the health and safety analysis in welding fabrication and allied processes - Example of the welding health and safety analysis - Actions to be applied in order to reduce the risks - The most important EWF SMS procedures/instructions	4h
5	**SMS principal documents: examples** - The safety operating plan - The emergency management plan - How, when and why a non-conformity may cause an emergency	2
6	**Personnel involved in SMS.** - Role of the welding coordinator in the SMS - Safety auditing, interpretation of EN ISO 19011 standard for surveillance - The importance of the personnel education on SMS	2h
	TOTAL	20h

[5] The content of the above is the "basic knowledge" for the Welding Co-ordinator (qualified according to ISO 14731 / EN 719) to be qualified as a "Health and Safety Welding Co-ordinator"

ATTACHMENT 2: FORM TO BE USED FOR THE HEALTH AND SAFETY ANALYSIS

ACTIVITY	HAZARDOUS EVENT				RISK LEVEL	ACTION
	Type	Potential Arm	Likelihood	Magnitude of Harm		

ATTACHMENT 3: FORM TO BE USED FOR CORRECTIVE ACTIONS PLAN

Corrective Action	**Budget**	**Priority**	**Time period requested (estimate)**		**Verified for conformity**	**SWC Signature and possible notes**
(Number)	(Currency)	(1÷10)	(initial date)	(final date)	OK if meets req. NO if doesn't	
TOTAL BUDGET						
SWC Signature						**Date**