

THE ENVIRONMENTAL MANAGEMENT OF FABRICATION BY WELDING

ABSTRACT

This paper was prepared taking as a reference the European Welding Federation (EWF) documents dealing with the environmental management system (EMS) for welded product manufacturers. It proposes an interpretative approach of the most important and specific clauses of ISO 14001 relating to welding and allied activities. Only the effects of welding on the environment outside the manufacturing plant are covered. The responsibilities of the Environmental Management System and the tasks of the Environmental Welding Coordinator (EWC) are defined, and the syllabus of the corresponding training course is given. The Environmental Analysis (EA) process is clearly illustrated by a flow chart and examples covering the main welding processes. A non-exhaustive list of environmental aspects and impacts of the fabrication of welded products is included, as well as an identification form of the environmental impacts. An exhaustive checklist dealing with both general subjects from ISO 14001 and specific items directly related to welding fabrication is given.

IIW-Thesaurus keywords: *Environment; Welding; Standards; Regulations; ISO; CEN; Personnel; Education.*

FOREWORD

This paper was prepared taking as a reference the documents of the European Welding Federation (EWF) dealing with the environmental management system for welded product Manufacturers.

1 INTRODUCTION

The international standards, dealing with environmental management activity, aim at providing companies with correct references for the application of an effective system helping them to get to their targets in the specific field. In this framework ISO 14001 (Environmental management system – Specification with guidance for use) has been prepared.

This standard adopts the general principles of the ISO 9000 series, with which it can share an integrated management system, and applies to companies willing to:

- implement, maintain and improve an environmental management system;
- demonstrate the fitness of their environmental policy to other private or public parties;
- seek certification of their environmental management system by a third party accredited organisation.

Companies going to implement an environmental management system according to ISO 14001 must first clarify their position with regard to their surrounding environment by performing an Environmental Analysis (EA). This analysis constitutes the basis of the organisation's

environmental policy, through which they identify those environmental aspects* of their activity that bring on or can bring on critical or dangerous situations. The EA process flow chart is shown in Appendix 1.

As a general rule, this EA is performed taking into account at least the following main factors:

- emission in air;
- releases to water;
- waste management;
- contamination of land;
- use of raw materials and natural resources;
- other local environmental and community issues.

The following step required by the standard is to define the significance of any impact**, associated with environmental aspects. For each impact it is necessary at least to identify the relevant nature and entity as well as the risk of pollution connected to it.

The enforcement of this process leads to the issue of an Environmental Analysis Report (EAR) where the actual situation is compared with:

- legislative and regulatory requirements;
- advanced practice already applied in the Company;
- effectiveness of the resources possibly already devoted to environmental aspects.

The final results of this analytical process enables a Company to design, when applicable, an Environmental Management Programme (EMP), showing the technical actions aimed at improving its relationship with the environment and, therefore, to review its environmental policy and the connected tasks, if any.

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* Element of an organisation's activities, products or services that can interact with the environment.

** Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

2 ENVIRONMENTAL MANAGEMENT SYSTEM IN WELDING FABRICATION

2.1 General

Fabrication by welding is a complex process that cannot be limited to the welding phase alone. Other activities are normally performed, before and after welding, which can give rise to impacts on the surrounding environment. From this point of view, fabrication by welding can be regarded as made of the following main phases:

- material management and preparation;
- welding;
- tests in workshop and laboratory;
- final treatments.

The same previously mentioned analytical principles, applied to fabrication by welding, lead to singling out the environmental aspects, together with their relevant associated impacts, throughout the production process.

This paragraph describes how a Manufacturer of welded products, making reference to EN/ISO 14001, can implement an Environmental Management System (EMS) covering welding and allied activities.

Only the effect that welding and allied activities can have on the environment outside the manufacturing plant is taken into consideration. Health, safety or environmental issues inside the plant are not covered.

Of course, EMSs should be applied by Manufacturers whose welding and allied activities are already properly controlled from the point of view of quality. One way of doing that is by complying with EN 729/ISO 3834, but other process management systems can be implemented, provided the technical conditions applied are appropriate.

Some activities required by the EMS described in ISO 14001 are similar to those required by EN 729/ISO 3834 (e.g. management of the calibration/validation of monitoring equipment, management of nonconformity, corrective and preventive actions, etc.). Moreover some of the clauses of ISO 14001 are self-explanatory and easy to apply to welding and allied activities, and therefore no further explanation is needed.

Therefore this document proposes only an interpretative approach of the most important and specific clauses of ISO 14001 as they relate to welding and allied activities.

2.2 The Environmental Management System (EMS) responsibilities

In order to keep the organisation under control, ISO 14001 requires the Manufacturer to appoint a person as “a specific management representative” who reports directly to the Top Management. In welded fabrication this person could be the Welding Coordinator according to EN 719 /ISO14731, skilled and qualified through suitable training courses in the EMS.

Of course, it is also possible to appoint another person within the organisation provided he/she can demonstrate

appropriate knowledge and competence, and provided he/she has access to expertise from the welding coordination person(s) in the manufacturing organisation.

The person appointed to be responsible to the Top Management for the EMS is referred to hereafter as the Environmental Welding Coordinator (EWC). The syllabus of a recommended training course for the EWC is given in Appendix 2.

Any other persons within the organisation who have responsibilities relating to the EMS shall report to the EWC. Each of them shall take care of the implementation of that part of the environmental system entrusted to him.

For all welding fabrication related activities the EWC is at least responsible for:

- supporting the Top Management in defining the environmental policy;
- documenting and disseminating this environmental policy inside the organisation;
- supporting the Top Management in defining the environmental structure;
- defining aspects, impacts and related legal prescriptions;
- defining environmental objectives and targets;
- supporting the Manufacturer in issuing the environmental plans;
- alerting, educating and training personnel in charge of environmental responsibilities relevant to environmental problems;
- evaluating the importance of the internal and external environmental signals;
- coordinating the environmental emergencies;
- dealing with the environmental non-conformities;
- providing environmental audits to ensure the correct implementation of the EMS;
- ensuring that the **EMS** is regularly reviewed, with the aim of achieving a continuous improvement.

2.3 Environmental Analysis (EA)

The main scope of the EA is to establish if the aspects connected with the activities of the above-mentioned fabrication phases exceed the prescribed limits, resulting in negative impacts on the surrounding areas.

An example of this analysis, dealing with welding fabrication is shown in Appendix 3. The exercise contains a fairly complete qualitative information on the fabrication processes involved, while leaving to the Manufacturer the responsibility of quantifying the aspects, so that the possible negativeness of the related environmental impacts can be determined.

Appendix 4, which is directly connected with Appendix 3, gives more detailed qualitative information for the different welding processes, connecting each welding process with the materials used. This Appendix shows inside of each connection (represented by a coloured box), all aspects of each process. The colour represents the potential impact level (decreasing from red to green) that can be expected from the aspects shown. The connection between impact level and corresponding action

is represented in detail in the lower part of Appendix 4. Aspects whose levels are outside the Manufacturer's or the law's requirements are recorded and evaluated for correction.

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

This decision may change and improve the welding environmental policy of the Manufacturer by adopting further objectives and targets for specific pollution removal.

Appendix 5 shows an example of the form, which could be used for recording the history of the analysis for each aspect, including the proposed corrective action. This form is generally associated with the Environmental Analysis Report (EAR), which is issued at the end of the analysis and at any process change to define any potential pollution. In welding and related activities any completed form, proposal or planning needs to be approved by the EWC.

Changes of the system (e.g. change of processes, procedures, key personnel, etc.) shall lead to the various subjects being rearranged accordingly.

2.4 Audits

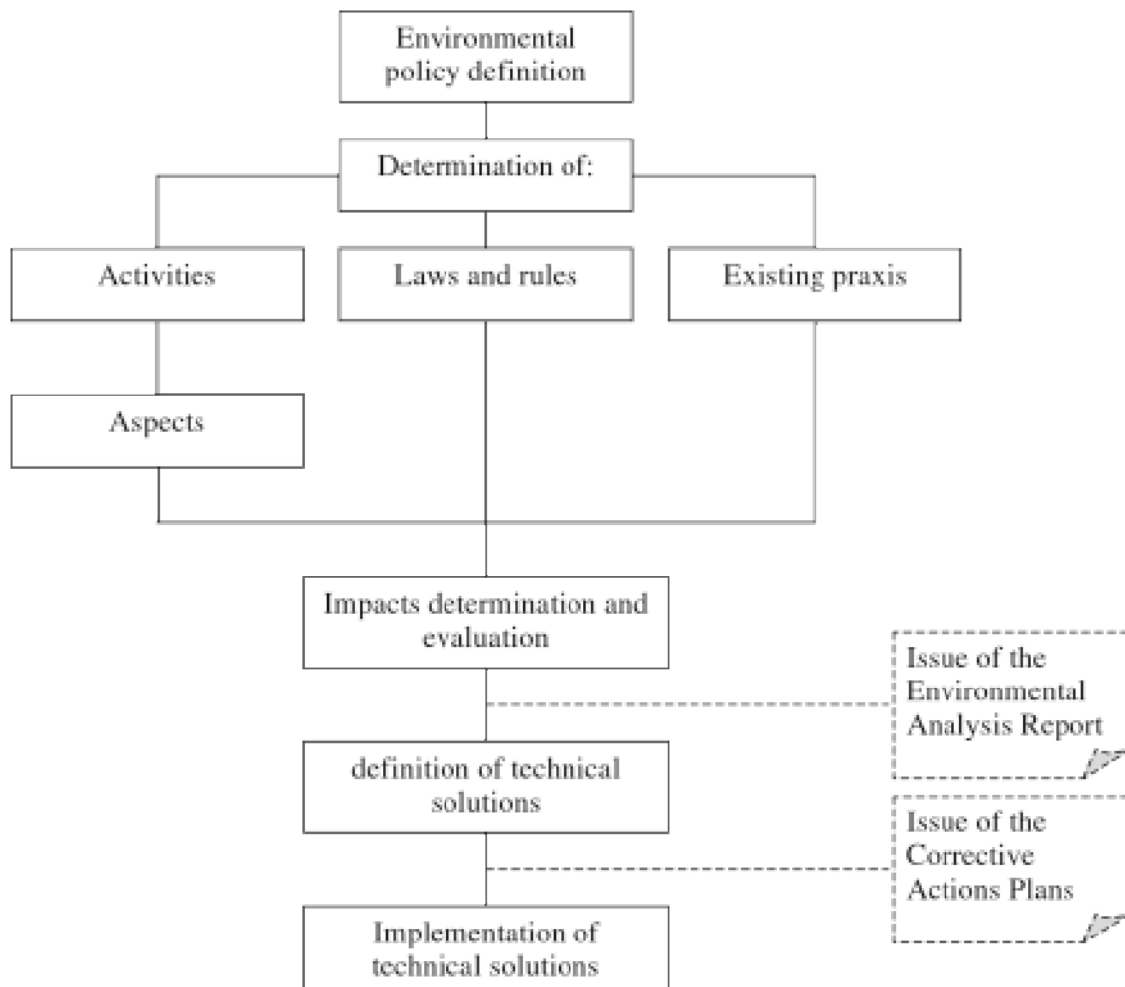
Audits of the implemented EMS are to be under the responsibility of the EWC and arranged so as to cover all areas to which the EMS is applied. Appendix 6 reports on an exhaustive checklist dealing with both general subjects from ISO 14001 and specific items directly related to welding fabrication.

3 CONCLUSION

The correct running of an EMS depends largely on the attention paid by all personnel to the aspects of their activity that can have significant impacts on the surrounding environment. This is the reason why standard ISO 14001 requires that all personnel be informed on the matter concerning the environmental management, in the frame of their activity, and that this acquired competence be updated every time any modification occurs. The personnel's competence has to include the specific knowledge of the particular fabrication process applied, which is the only one allowing the actual technical understanding in the evaluation of the:

- completeness of the environmental analysis;
- fitness of the applied environmental procedures, if any;
- fitness of the environmental programme.

Appendix 1. Environmental Analysis process flow chart.



Appendix 2. Training course for Environmental Welding Coordinators (Typical Content).

	Subject	Time
1	Introduction. – Briefing on ISO 14001; the most relevant clauses; – EN 729/ISO 3834 (or equivalent quality management systems for welding fabrication) and ISO 14001: points of contact.	4 h
2	Application of ISO 14001 in the Company. – The Manufacturer's environmental policy for welding; – The EMS as an environmental framework for Manufacturers of welded products; – Activities in the Company, with reference to welding fabrication and allied processes; – Expected improvement in the environment after implementing the EMS in a Company.	4 h
3	Environmental analysis. – Role of the environmental analysis in welding fabrication and allied processes; – Example of environmental analysis; – Actions to be applied in order to reduce environmental welding fabrication impacts; – Most important EMS procedures/instructions.	4 h
4	EMS procedures/instructions, examples. – Management of non-conformities and emergencies; – How, when and why a nonconformity may cause an emergency.	2 h
5	Personnel involved in EMS. – Role of the Welding Coordinator in the EMS; – Environmental auditing; interpretation of standards ISO 14010, ISO 14011 and ISO 14012 for surveillance of the EMS's implementation in a Company; – Importance of the personnel's education on EMS.	2 h
	TOTAL	16 h

The content of the above is the "base knowledge" for the Welding Co-ordinator to be considered qualified as an "Environmental Welding Co-ordinator".

Appendix 3. Environmental aspects and impacts of the activities relevant to fabrication of welded products (non-exhaustive list).

ACTIVITY	ASPECTS	IMPACTS
Material management and preparation		
Storage and handling of various products	Spilling of oils, laboratory reagents, diluents, scraps, etc.	⇒ Ground pollution by various organic and inorganic products
Heat treatments	Emission of combustion products	⇒ Atmospheric pollution by gas combustion products and particulate substances
	Escaping of cooling liquids	⇒ Ground pollution by liquids and particulate substances
Sand blasting	Discharging of sands	⇒ Ground pollution
	Emission of noise	⇒ Acoustic pollution
Thermal cutting	Emission of radiant energy (light, heat)	⇒ Surrounding pollution
	Production of cutting slag	⇒ Ground pollution
	Emission of fumes containing metal oxides, metallic elements and gases (NO _x , O ₃)	⇒ Atmospheric pollution by metals, vapours, gases and particulate substances
Plasma cutting	Emission of radiant energy (light, heat)	⇒ Surrounding pollution
	Emission of fumes containing metal oxides, metallic elements and gases (NO _x , O ₃)	⇒ Atmospheric pollution by metals, vapours, gases and particulate substances
Underwater cutting	Emission of radiant energy (light, heat)	⇒ Surrounding pollution
	Escape of cutting liquids	⇒ Ground pollution
Edge preparation	Spilling of cooling water and machining oils	⇒ Ground pollution by oils
	Production of exhausted oils and metallic residual products (shavings, chips, scrap, etc.)	⇒ Ground pollution by oil and metals
Forming/pressing	Emission of noise	⇒ Acoustic pollution

ACTIVITY	ASPECTS	IMPACTS
Joining processes		
WELDING PROCESSES		
Welding (see Appendix 3 for a detailed analysis)	Emission of radiant energy (light, heat) Production of slag and residues of welding materials Emission of fumes containing metal oxides, metallic elements and gasses (NO _x , O ₃)	⇒ Surrounding pollution ⇒ Ground pollution by metals and their compounds ⇒ Atmospheric pollution by metals, vapours, gases and particulate substances
OTHER JOINING PROCESSES		
Soldering	Emission of : – Hydrogen bromide – Lead oxide – Hydrogen chloride – Formaldehyde – Hydrazine – Inorganic tin compounds – Organic tin compounds – Cleaning liquids	⇒ Atmospheric pollution by metals, vapours, gases and particulate substances ⇒ Ground pollution
Brazing	Emission of : – Boron oxide – Boron trifluoride – Cadmium oxide – Fluorides – Copper oxide – Phosphorous pentoxide – Silver oxide – Zinc oxide	⇒ Atmospheric pollution by metals, vapours, gases and particulate substances
Flame spraying	Emission of metallic oxides, based on the composition of the powder used Emission of NO _x	⇒ Atmospheric pollution by metals, vapours, gases and particulate substances
Arc Spraying	Emission of metallic oxides, based on the composition of the powder used	⇒ Atmospheric pollution by metals, vapours, gases and particulate substances
Plasma spraying Plasma spraying of chromium – nickel powders	Emission of metallic oxides, based on the composition of the powder used As above, plus emission of : – Nickel oxide – Ozone	⇒ Atmospheric pollution by metals, vapours, gases and particulate substances
Testing		
Chemical and physical tests	Emission of gases and vapours Production of analysis residues	⇒ Atmospheric pollution ⇒ Ground pollution
Radiographic tests	Emission of radiant energy Production of film processing, fixing and washing liquids	⇒ Release of x an γ radiation ⇒ Ground pollution by liquids containing acids, salts, etc.
Magnetic tests	Production of liquids and powders	⇒ Ground pollution by organic liquids and metallic particulate substances
Penetrant tests	Escape of liquids and particulate substances	⇒ Ground pollution by organic and non organic liquids and particulate substances (pigments, etc.)
Hydraulic tests	Escape of liquids	⇒ Ground pollution with oils, oxides, etc.
Final treatments		
Pickling	Emission of acid and basic liquids and vapours	⇒ Ground and air pollution
Heat treatments by oxyfuel processes	Emission of combustion products (gases, fumes, powders) Escape of cooling fluids	⇒ Atmospheric pollution by gas combustion products and particulate substances ⇒ Ground pollution by oils and particulate substances
Machining	Spilling of cooling water and machining oils Emission of noise Production of exhausted oils and metallic residual products (shavings, chips, scrap, etc.)	⇒ Ground pollution by oils ⇒ Acoustic pollution ⇒ Ground pollution by oils and metals
Painting	Escape of solvents with or without pigments	⇒ Ground and air pollution

Possible other impacts, when significant, could be taken into consideration (i.e.: reduction of electric energy sources, pollution caused by accidents, fires, failures of containers, etc.

Appendix 4. Example of environmental analysis in welding processes.

	MATERIAL WELDED			
	Low alloyed steel	High alloyed steel	Aluminium alloys	Nickel alloys
Arc processes				
Manual metal arc welding with Basic electrode	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), F, NOx, Co, – Radiant energy – Slags and residues of welding materials 	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, CO, Cr (VI), Ni – Radiant energy – Slags and residues of welding materials 	N/A	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, CO, Ni – Radiant energy – Slags and residues of welding materials
Manual metal arc welding with electrodes other than basic	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, Co, – Radiant energy – Slags and residues of welding materials 	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, CO, Cr (VI), Ni – Radiant energy – Slags and residues of welding materials 	N/A	<ul style="list-style-type: none"> – Fumes of particulate (Cr, Mn, Cu and other metal oxides), NOx, CO, Ni – Radiant energy – Slags and residues of welding materials
Flux cored arc welding, self shielded arc welding	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, Co, – Radiant energy – Slags and residues of welding materials 	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, CO, Cr (VI), Ni – Radiant energy – Slags and residues of welding materials 	N/A	<ul style="list-style-type: none"> – Fumes of particulate (Cr, Mn, Cu and other metal oxides), NOx, CO, Ni – Radiant energy – Slags and residues of welding materials
MIG/MAG	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, Co. – Radiant energy – CO2 (MAG) 	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, CO, Cr (VI), Ni – CO2 (MAG) – Radiant energy 	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, CO – CO2 (MAG) – Radiant energy 	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx, CO, Ni – CO2 (MAG) – Radiant energy
TIG	<ul style="list-style-type: none"> – ThO₂ (when using thoriated tungsten electrodes) – Radiant energy 	<ul style="list-style-type: none"> Cr (VI), Ni oxides – ThO₂ (when using thoriated tungsten electrodes) – Radiant energy 	<ul style="list-style-type: none"> – Radiant energy 	<ul style="list-style-type: none"> – Ni oxides – Radiant energy
Submerged arc welding	<ul style="list-style-type: none"> – Radiant energy – Residues of welding materials 	<ul style="list-style-type: none"> – Radiant energy – Residues of welding materials 	N/A	<ul style="list-style-type: none"> – Radiant energy – Residues of welding materials
Other welding proc.				
Plasma welding	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), Co, – Radiant energy 	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), Co, Cr (VI), Ni oxides – Radiant energy 	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), Co – Radiant energy 	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), Co, Ni oxides – Radiant energy
Oxyfuel welding	<ul style="list-style-type: none"> – Fumes of particulates (Cr, Mn, Cu and other metal oxides), NOx 	N/A	N/A	N/A
Resistance welding	<ul style="list-style-type: none"> – Organic substances (When oiled or greased sheets are welded) – CO 	<ul style="list-style-type: none"> – Organic substances (When oiled or greased sheets are welded) – CO 	<ul style="list-style-type: none"> – Organic substances (When oiled or greased sheets are welded) – CO 	<ul style="list-style-type: none"> – Organic substances (When oiled or greased sheets are welded) – CO
Impact	Involved Action			
HIGH IMPACT	Environmental Detailed Analysis + Corrective Actions + Surveillance			
MEDIUM IMPACT	Environmental Detailed Analysis + Surveillance			
MEDIUM / LOW IMPACT	Surveillance (+Environmental Detailed Analysis when welding with thoriated electrodes)			
LOW IMPACT	Surveillance			

WELDING PROCESS

Appendix 5. Identification Form of the Environmental Impacts.

ORGANISATION LOGO	IDENTIFICATION FORM OF THE ENVIRONMENTAL IMPACTS	Form n. Rev..... Date.....
ENVIRONMENTAL ASPECT CONSIDERED		
Type Location Responsibility Existing procedure	Description of emission. Source and destination place of emission. Other information. Area in which the environmental aspect is present. Identification of responsible section of the activity producing the aspect Description of the procedures normally used for conducting and maintaining that part of the plant in which the aspect is present.	
ASSOCIATED ENVIRONMENTAL IMPACTS		
Quality and quantity of the impact Relevant risks Regulations Permits Impact control Remarks/information	Characteristic of the emissions; reference to the toxicological forms; etc. Description of the risks connected with the generated pollution. Insert reference to existing laws and rules Insert reference to authorisations and permits released by local, regional or national authorities Existing practice to limit, annul or avoid the impact, control the emissions, respond to emergency situations, etc.(reference to the documented procedures) Description of the internal or external communication	
IMPACT EVALUATION RESULTS		
In this section the environmental impact is evaluated as “significant” or “not significant” considering one or more of the following evaluation criteria: <ul style="list-style-type: none"> – Evaluation of the impact itself (e.g. extent, severity and persistence of impact, chance of occurrence, foreseen length of life, location, possible source, etc.); – Evaluation of the risks; – Evaluation of regulations and authorisations; – Evaluation of present practice used to control that impact; – Evaluation of remarks, claims, information received by the interested parties; – Evaluation of information from the product/services suppliers; – Evaluation of measurements, analyses, data obtained from direct inspection. 		
EXPECTED IMPROVEMENTS		
In this section the expected improvements are described as follows: <ol style="list-style-type: none"> 1. Limitation of impact; 2. Limitation of risks; 3. More education and training; 4. Improvement of efficiency of present practices; 5. Improvement of informative channels; 6. Other (to be specified) 		

Appendix 6. Check List for Assessment.

The Environmental Management of Fabrication by Welding Check List for the Assessment						
N	Reference item	QUESTIONS	ANSWERS			Reference documents and annotations
			YES	NO	N.A.	
Fundamental Requirements						
1a	IIW	Does the Manufacturer implement EN 729 / ISO 3834 or an equivalent process management system for welding fabrication?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1b		Are materials and processes employed correctly identified?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Manufacturer's Environmental Policy for Welding Fabrication						
2	ISO 14001 4.2	Does a written document exist describing the Environmental Policy for welding fabrication declared by the Manufacturer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3	ISO 14001 A2	Is the Manufacturer's Environmental Policy for welding fabrication consistent with the activities performed and to the relevant impacts?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	ISO 14001 4.2	Does the Environmental Policy for welding fabrication include the prevention of pollution and continuous improvement?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	ISO 14001 4.2	Does the policy take account of the environmental laws, rules and regulations applicable to the Manufacturer's activities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6	ISO 14001 4.2	Is the Environmental Policy for welding fabrication documented, activated, delivered and understood by all those involved, inside and outside the Manufacturing Organization?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7	ISO 14001 A2	Is the Environmental Policy reviewed in the light of the continuously evolving welding fabrication technologies?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Environmental Aspects</i>						
8	ISO 14001 4.3.1	Has the Manufacturer a documented procedure to evaluate the Environmental impacts of welding fabrication (Welding Fabrication Environmental Analysis)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9	ISO 14001 A.3.1	Is the Welding Fabrication Environmental Analysis based on – emissions to atmosphere? – liquid waste? – solid waste? – resource depletion (electric energy, water, etc.)?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
10	ISO 14001 4.3.1	Does the documentation prescribe a new analysis any time process changes occur?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11	ISO 14001 4.3.1	Is the Environmental Policy reviewed on the basis of results of each further Welding Fabrication Environmental Analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Legal and other requirements</i>						
12	ISO 14001 4.3.2	Has the Manufacturer a system to define and update any legal and technical prescription (laws, regulations, rules, standards and codes, etc., if any) relevant to impacts due to welding fabrication?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13	ISO 14001 4.3.2	Does the system inform the involved personnel about requirements and relevant updates?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14	ISO 14001 4.3.2	Does the Manufacturer request necessary permissions, licences and authorisations to operate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Welding Environmental Objectives and Targets</i>						
15	ISO 14001 4.3.3	Are Environmental objectives and targets defined for all personnel involved in welding fabrication (designers, welders and NDT operators, etc.)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Welding Fabrication Environmental Management Plan</i>						
16	ISO 14001 4.3.4	Has the Manufacturer established a plan to reach environmental targets in welding fabrication?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17	ISO 14001 4.3.4	Does the plan indicate the responsibilities in reaching environmental targets?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

N	Reference item	QUESTIONS	ANSWERS			Reference documents and annotations
			YES	NO	N.A.	
18	ISO 14001 4.4.1	Is the plan reviewed and updated whenever a new welding fabrication process is introduced?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Manufacturer Organisation and Responsibilities</i>						
19	ISO 14001 4.4.1	Are responsibilities, roles and authorities of personnel involved in welding fabrication correctly defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20	ISO 14001 4.4.1	To manage the EMS for welding fabrication, does the Manufacturer have sufficient 1. human resources? 2. physical resources (sites, equipment, etc.)? 3. specific competencies? 4. proper technologies? 5. economic funds?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
21	IIW	Does the Manufacturer identify the Environmental Welding Coordinator (EWC) and can the person demonstrate competence to fulfil his/her responsibilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
22	ISO 14001 A4.1	Are the EMS trends considered by the Environmental Welding Coordinator during reviews in order to obtain improvement?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
23	ISO 14001 4.4.1	Is all the personnel involved in welding fabrication informed about the application and operation of the EMS?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
24	IIW	Is the EMS correctly integrated with the EN 729 / ISO 3834 or other equivalent welding fabrication management system(s)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Training, Awareness and Competence</i>						
25	ISO 14001 4.4.2	Are areas identified where training on environment and welding fabrication is needed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
26	ISO 14001 4.4.2	Has the Environmental Welding Coordinator planned and implemented a training program for all personnel involved in welding fabrication?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
27	IIW	Has the Environmental Welding Coordinator attended any course on Environmental management of welding fabrication?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
28	IIW	Does the training program include references to any regulations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Communication</i>						
29	ISO 14001 4.4.3	Does the Manufacturer communicate (i.e. to public authorities) its application of the EMS for welding fabrication?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>EMS Document Control</i>						
30	ISO 14001 4.4.5	Does the Manufacturer describe the fundamental EMS related elements on paper or computerised documents?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
31	ISO 14001 4.4.5	Does the Manufacturer issue procedures approved by the Environmental Welding Coordinator in order to have a correct environmental impact related document control?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
32	ISO 14001 4.4.5	Are the updated EMS documents available where needed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
33	ISO 14001 4.4.5	Are obsolete documents withdrawn from emission or use points?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Operational Control</i>						
34	ISO 14001 4.4.6	Are all operations and activities defined as a result of the Environmental Welding Fabrication Analysis properly planned and applied in order to reduce negative environmental impacts (if any)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
35	ISO 14001 4.4.5	Are operating criteria for the control of such impacts defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
36	ISO 14001 A3.1	Does the Environmental Welding Fabrication Analysis consider the possibility to intervene on suppliers of products to prevent any negative impacts?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

N	Reference item	QUESTIONS	ANSWERS			Reference documents and annotations
			YES	NO	N.A.	
<i>Emergency Preparedness and Response</i>						
37	ISO 14001 4.4.7	Does the Manufacturer establish and maintain procedures to identify and manage potential welding fabrication accidents in order to prevent and mitigate any environmental related impact?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
38	ISO 14001 4.4.7	Are such procedures reviewed by the Environmental Welding Coordinator also on the basis of emergencies/accidents that have occurred, if any?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
39	ISO 14001 4.4.7	Does the Manufacturer periodically test the issued emergency procedures, where practicable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Checking and Corrective Actions						
<i>Monitoring and Measurement</i>						
40	ISO 14001 4.5.1	Does the Manufacturer implement documented procedures for monitoring and measuring the key characteristics of welding fabrication, which can have a significant impact on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
41	ISO 14001 4.5.1	Is the monitoring equipment properly validated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
42	ISO 14001 4.5.1	Is there a procedure for periodically evaluating compliance with relevant environmental legislation and regulations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Non-conformances and Preventive and Corrective Actions</i>						
43	ISO 14001 4.5.2	Does the Environmental Welding Coordinator manage non-conformances and preventive and corrective actions?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
44	ISO 14001 4.4.6	Are there documented procedures for such management?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Records</i>						
45	ISO 14001 4.4.6	Does the Manufacturer implement documented procedures for the identification, maintenance and disposal of welding fabrication environmental records?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
46	ISO 14001 4.4.6	Are such documents correctly managed with reference to: – Identification? – Legibility? – Traceability? – Storing?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
<i>EMS Audit</i>						
47	ISO 14001 4.4.6	Has the Manufacturer procedures to periodically perform EMS audits?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
48	ISO 14001 4.4.6	Are the personnel performing audits familiar with welding fabrication and knowledgeable in the relevant environmental aspects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Management review						
49	ISO 14001 A6	Does the Management perform a periodic EMS review in order to obtain continuous improvement, adequacy and efficiency?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	