

# **O1 – Harmonised Curriculum for HSE implementation in Joining**



## CONTENTS

	1.	FOREWORD	3
	2.	DESK RESEARCH ON NQF/EQF and ECVET	5
2.1.	Desk	research guideline	5
2.2.	Com	parative desk research on the methodology for the shift into learning outcomes	9
2.3.	Com	mon understanding on ECVET points assignment	16
	3.	NEEDS ANALYSIS	17
3.1	Desk l	Research results	17
3.2. –	Needs	s Analysis' Report	18
	4.	HSE JOINING COMPETENCE MATRIX	35
	6.	CONCLUSION	47
	7.	APPENDIXES	48



#### 1. FOREWORD

HSE-Joining: Health, Safety and Environment training curriculum development for joining technologies, is an ERASMUS+ project that started in December 2016 and will finish in November 2018. The project is being conducted by a consortium of six partners from four European countries, all partners with technical expertise to achieve the project objectives and a wide experience of participation and management of national and/or European projects:

PARTNER COUNTRY ORGANISATION					
D1	BE	VCL	Vervolmakingscentrum voor lassers		
D2	BE	EWF	European Federation for Welding, Joining and Cutting AISBL		
D3	PT	ISQ	Instituto de Soldadura e Qualidade		
D4	IT	IIS	Istituto Italiano della Saldatura Ente Morale		
D5	RO	ISIM	Institutul National de Cercetare Dezvoltare in Sudura si Incercari de Materiale Timisoara		
D6	РТ	ISQe	ISQ e-learning, SA		

Nowadays, employers must provide information, instruction, training and supervision in the field of health and safety for their workers having these responsibilities is mandatory. To obtain the expected results (less accidents, less occupational diseases, clean and safety workplaces, friendly environment) the technical personnel that leads the health, safety and environmental management system in the company must have an updated knowledge and the necessary expertise to fulfil their tasks.

The overall aim of the HSE Joining project is to create a training curriculum for Environmental and Health and Safety management in manufacturing companies, taking into account the hazards of the workplace for staff (fume, radiation, noise, vibration), factors with potential high risk on the health and safety of welders and also the significant impact on the environment.

This first step of the O1 development is structured in the following steps:



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1. A comparative analysis between partners' National Qualification Frameworks (NQF) and the European Qualification Framework (EQF), on a desk research basis, in order to set the framework for the Health, Safety and Environment Curriculum for joining technologies. This research stage will urge them to find out about the current state of the art of NQF implementation, correspondence between NQF and EQF levels and the allocation of ECVET points in their national system.

2. Needs analysis based on the survey distributed to joining and manufacturing companies across Europe.

3. Competence Matrix consolidating the information and results systematised in the previous steps.



#### 2. DESK RESEARCH ON NQF/EQF and ECVET

### 2.1. Desk research guideline

As previous mentioned, the first stage of this Intellectual Output was to perform a comparative study on the EQF and NQFs of each partner country part of the HSE Joining consortium, which can be checked in the next section 2.2 – Comparative desk research on the methodology for the shift into learning outcomes. This study was based on the following bibliographic sources retrieved from Cedefop - the European centre for the development of vocational education:

#### National qualifications framework developments in Europe

The report provides an overview of European national qualifications frameworks (NQFs) and their qualifications, celebrating Cedefop's long-term work in the field and showing that the Centre can make a difference to European vocational education and training and, more importantly, to European citizens.

The work on transparency of qualifications starting in the 1990s, within the forum on transparency, directly led to the initial outline of the European qualifications framework (EQF) in 2003-04, a work which became a catalyst for NQF developments during the past decade.

#### Analysis and overview of NQF level descriptors in European countries

Most of the 36 countries involved in implementing the European qualifications framework (EQF) have defined, and largely adopted, level descriptors of learning outcomes, i.e. what an individual possessing a qualification at a particular level is expected to know and be able to do.

The report shows that while the EQF has influenced national level descriptors, countries have also adjusted the learning outcomes approach to their own needs and priorities: these descriptors have mostly been the fruit of extensive discussions between government, social partners, and education and training providers.

#### The shift to learning outcomes

This study served as a basis for later developments in the Learning Outcomes approach throughout Europe.



## **ECVET in Europe Monitoring report 2015**

Cedefop has been conducting monitoring of ECVET implementation since 2010; this report covers developments from mid-2013 till 2015. It is based on national responses provided by the ECVET users' group from 28 EU Member States and four EFTA countries. The report examines whether existing credit systems provide conditions for individuals to have their learning accumulated or transferred towards a qualification. It examines key aspects: whether qualifications are based on learning outcomes and organised in units; whether individual units are assessed and validated for further transfer and accumulation; whether units are assigned credit points; and whether VET providers use memoranda of understanding and learning agreements to understand better the learning outcomes they provide. The report also focuses on the ways ECVET is promoted among stakeholders and beneficiaries and on examples of support materials that can be useful to ECVET promoters throughout Europe.

**Qualifications frameworks: expanding influence, persisting obstacles** 

The European Qualifications Framework was also taken as reference, which is presented below, in the table 1.

Levels of				
Qualificati	Knowledge	Skills	Competencies	
on				
	General basic	General basic skills for	Work/study under direct	
Level 1	knowledge	accomplish a simple task	supervision in a structured	
			context	
	Basic factual	Basic cognitive and practical	Work/study under direct	
	knowledge in a	skills needed for the	supervision with some	
	working/study area	application of the adequate	autonomy	
Loval 2		information to the		
Level 2		accomplishment of tasks and		
		current problem solving		
		through simple rules and		
		instruments		
Loval 2	knowledge of facts,	Range of cognitive and	Taking responsibility for	
Level 5	principles, processes	practical skills necessary for	executing tasks in a	

## The 8 EQF Levels:



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Levels of				
Qualificati	Knowledge	Skills	Competencies	
on				
	and general concepts in a study/work area	the task accomplishment and problem solving through selection and application of instruments, materials and basic information	study/work area. Adapt the behavior to circumstances in order to solve problems	
Level 4	Factual and theoretical knowledge in broad contexts within a field of study/work	Range of cognitive and practical skills necessary for the conceiving for specific problem solving in a study/work area	Manage own work within the guidelines established in the context of study/work, usually predictable but liable to change. Supervise the routine work of third parts and taking responsibilities in terms of evaluation and activity improvements in study/work contexts	
Level 5	Comprehensive, expertise, factual and theoretical knowledge in a study/work area and awareness of the knowledge limits	Large range of cognitive and practical skills for conceiving creative solutions for abstract problems	Manage and supervise in study/work contexts subject to unpredictable changes. Revise and develop the thirds development	
Level 6	Deep knowledges for a specific study/work area which demands an critical comprehension of theories and principles	Advanced skills which show mastery and innovation for complex and unpredictable problem solving in a study/work specialized area	Managementcomplextechnicalorprofessionalactivitiesorprofessionalactivitiesorprojects, takingtheresponsibilityfordecisionmakinginunpredictablestudy/workcontexts.Takingresponsibilitiesinmanagementforindividual,professionalandcollectivedevelopment	





Levels of				
Qualificati	Knowledge	Skills	Competencies	
on				
	Highly specialized	Specialized skills for problem	Manage and transform	
	knowledge, some of	solving in terms of	study/work complex and	
	them are in the	investigation and innovation,	unpredictable contexts which	
	forefront of some	to develop new knowledges	demand new strategies.	
Level 7	study/work	and procedures in order to	Taking responsibilities in	
	knowledge, that	integrate them in different	order to contribute to new	
	underpin the capacity	areas	knowledges and professional	
	for original thinking		practices and/or review the	
			strategic team performances	
	Cutting-edge	The most advanced and	Demonstrate a considerable	
	knowledge's at the	specialize techniques,	level of authority,	
	forefront in a	including synthesis and	innovation, autonomy,	
	study/work area and	evaluation skills, necessary to	scientific and professional	
	in the interconnection	solve critical problems in the	integrity and assume a	
Level 8	of areas	investigation and innovation	sustained commitment	
		areas, for the enlargement and	regarding the development of	
		redefinition of the existing	new ideas or processes in the	
		professional practices	forefront of study/work	
			contexts, including the	
			investigation field	

Table 1 - European Qualifications Framework (EQF) descriptors

As for the principles for ECVET attribution of points/credits, it is important to notice that:

- ECVET allocates points to qualifications and not to education and training programmes.
- ECVET points/credits allocation is based on using a convention according to which 60 points/credits are allocated to the learning outcomes expected to be achieved in a year of formal full-time learning.



# **2.2.** Comparative desk research on the methodology for the shift into learning outcomes

#### Common understanding on the definition of knowledge, skills and competences:

Each country has its own understanding of knowledge, skills and competences, therefore, the definition of the learning outcomes for HSE Joining curriculum was developed having as reference two approaches:

i) the EQF descriptors, according to the European Council Recommendation from 2017 (latest revision);

ii) the sectorial approach of the European Federation for Welding, Joining and Cutting (EWF) which is a common approach that embraces national specificities, as well<sup>1</sup>.

Below is illustrated the stages until reaching the final framework for the HSE Joining curriculum, meaning that the Table 2 – EQF descriptors (European Commission, 2017)presents the EQF descriptors, according to the latest revision (2017), being one of the "new" descriptors autonomy and responsibility. Having an overview on the NQFs of the consortium, the table 3 presents the descriptors for Belgium (French community), the table 4 for Belgium (German-speaking community), the table 5 presents the descriptors for Portugal and, at last, table 6 for Italy and the table 7 for Romania.

## **EQF Descriptors**

Knowledge	Skills	Responsibility and autonomy	
In the context of EQF, knowledge is described as theoretical and/or factual.	In the context of EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments).	In the context of the EQF responsibility and autonomy is described as the ability of the learner to apply knowledge and skills autonomously and with responsibility	

Table 2 – EQF descriptors (European Commission, 2017)

<sup>&</sup>lt;sup>1</sup> Analysis and overview of NQF level descriptors in European countries, CEDEFOP, 2013 ISBN 978-92-896-1361-3



#### **NQF** Descriptors

#### Belgium

#### Main NQF level descriptor elements in Belgium (French Community)



#### Table 3 - NQF descriptors in Belgium (French Community)

Main categories of level descriptors of the qualifications framework of the German-speaking Community of Belgium

Action competence (Handlungskompetenz)				
Subject/occupation-o (Fachliche F	oriented competence Kompetenz)	Personal co (Personale )	ompetence Kompetenz)	
Knowledge	Skills	Social competence	Autonomy	
Sources Minister of the Common exception Community of Delaismen 2010 (in Common)				

Source: Ministry of the German-speaking Community of Belgium, 2013 [in German].

Table 4 - NQF descriptors in Belgium (German-speaking community)

#### Portugal

#### Three main NQF level descriptor elements in Portugal

Level descriptor elements					
Knowledge Skills Attitudes					
<ul> <li>Facts, principles, theories and practices</li> </ul>	<ul> <li>Cognitive skills (logical, intuitive and creative thinking)</li> <li>Practical skills (manual dexterity and the use of methods, materials, tools and instruments)</li> </ul>	<ul><li>Autonomy</li><li>Responsibility</li></ul>			

Table 5 - NQF descriptors in Portugal

#### Italy

#### Main NQF level descriptor elements in Italy

Level descriptor elements					
Knowledge	Responsibility and autonomy				
<ul> <li>theoretical and/or factual dimension of knowledge</li> </ul>	<ul> <li>procedural, practical, technical, professional and context-</li> </ul>	<ul> <li>responsibility</li> </ul>			
<ul> <li>extent and depth of knowledge</li> </ul>	specific skills	<ul> <li>autonomy</li> </ul>			
<ul> <li>understanding and awareness of knowledge</li> </ul>	<ul> <li>cognitive, social-interaction and activation skills</li> </ul>	<ul> <li>context</li> </ul>			

Table 6 - NQF descriptors in Italy



## Romania

#### Main NQF level descriptor elements in Romania

Level descriptor elements				
Knowledge	Responsibility and autonomy			
<ul><li>factual</li><li>theoretical</li></ul>	<ul><li> cognitive</li><li> practical</li></ul>	<ul><li>autonomy</li><li>responsibility</li></ul>		

Table 7 – NQF descriptors in Romania

The table 8, presented below (adapted from Cedefop's, 2015) is a comparison between the NQFs, the descriptors and the current status on the reference to the EQF.

Country	Scope of the	Number	Level	Stage of	NQF linked
	framework	of levels	descriptors	developm	to EQF
				ent	
Belgium (Fl)	Comprehensive NQF, including all levels and types of qualifications from formal education and training and from the professional qualifications system.	Eight	<ul> <li>knowledge/skil</li> <li>ls</li> <li>context/autono</li> <li>my</li> <li>/responsibility</li> </ul>	Operational	2011
Belgium (FR)	Designed as comprehensive framework; will include all levels and types of qualifications from formal education and training and from the professional qualifications system.	Eight proposed	<ul> <li>knowledge/skil</li> <li>ls</li> <li>context/autono</li> <li>my/responsibilit</li> <li>y</li> </ul>	Advanced developme nt stage Formal adoption pending	2013





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Belgium (DG)	Comprehensive NQF including all levels and types of qualifications from formal education and training.	Eight	<ul> <li>occupational</li> <li>competence</li> <li>(knowledge and</li> <li>skills)</li> <li>personal</li> <li>competence</li> <li>(social</li> <li>competence and</li> <li>autonomy)</li> </ul>	(Early) operational stage	-
Italy Portugal	Technical work pointing towards an NQF carried out. NQF carried out. Comprehensive NQF including all levels and types of qualifications from formal education formal education and training and form the national from the national system for recognition, validation and certification of competences.	Not yet decided Eight	EQF level descriptors used • knowledge • skills • attitude	Developme nt/design stage (Early) operational stage	2013 major national qualifications from formal education and training linked directly to EQF 2011
Romania (RO)	Comprehensive NQF including all levels and types of qualifications from formal education and training.	Eight	<ul><li> knowledge</li><li> skills</li><li> competence</li></ul>	Formally adopted	-

Table 8 - Comparison of the NQFs between countries





The information presented in the previous table (table 8) supported the design a sectorial approach to the HSE Joining curriculum, reflecting a common understanding (table 9), resulting from the desk research. In the table 9 is presented (refer to the next page) the template and methodology suggested for describing the learning outcomes of HSE curriculum, starting by the Competence Unit description (Table 9). It's also presented the descriptors and key-words used as reference for the competence matrix of the project. The final result filled with learning outcomes is detailed in section 4. HSE Joining Competence Matrix. At last, in this section is also described for ECVET the methodology used the allocation of points.



**Table 9. COMPETENCE UNIT** - The qualification is structured into Competence Units that will provide a certain level of Knowledge, Skills and Autonomy and Responsibility to perform tasks and responsibilities. The Performance Criteria describes the required steps to perform a given professional action.

COMPETENCE UNIT DESCRIPTION							
COMPETENCE UNIT	ACTION	PERFORMANCE CRITERIA	KNOWLEDGE	SKILLS	AUTONOMY AND RESPONSIBILITY	EQF LEVEL	WORKLOAD (Hours)
			Key-words: Highly specialised and forefront knowledge including original thinking, research and critical assessment.	Key-words: Highly specialised problem- solving skills including critical and original evaluation. + in complex and unpredictable conditions.	Key-words: Manage and transform + in a highly complex context + Act as the full responsible person for the definition and revision.	7	Contact hours + Self-study + assessment
Name of the Competence Unit	Professional tasks to be accomplished in the workplace.	Steps to be taken to master a professional action and that are linked to each Competence Unit.	<b>Key-words:</b> Advanced knowledge and critical understanding.	Key-words: Advanced problem-solving skills including critical evaluation. + in complex and unpredictable conditions.	Key-words: Manage + in a highly complex context + Act autonomously as the responsible person for the decision making and the definition.	6	Contact hours + Self-study + assessment
			Key-words: Specialised, factual and theoretical knowledge.	Key-words: Specialised range of cognitive and practical skills. + in common/regular problems.	Key-words: Manage and supervise common or standard + in an unpredictable context + Take responsibility with limited autonomy for decision making in common or	5	Contact hours + Self-study + assessment



		Key-words: Fundamental factual and theoretical knowledge.	Key-words: Fundamental range of cognitive and practical skills + in basic and specific problems.	Key-words: Self-manage within the guidelines of work + in a predictable context, but subject to change + Take responsibility without autonomy for decision making in basic work and supervise basic tasks.	4	Contact hours + Self-study + assessment
EXTERNAL RESOURCES	Resources needed to implement the Competence Unit.					

Table 10 - Competence Unit descriptors



#### **2.3.** Common understanding on ECVET points assignment

The methodology adopted for the ECVET points allocation is presented below, in the Table 11 - Reasoning for the assignment of ECVET pointsAlluding to the contact hours column, the amount of contact hours represent the average length of a training course in what refers to contact hours. Stemming from that, the estimated workload is two times the contact hours presented, which would correspond to the presented values of ECVET workload, having into consideration the 120 ECVET points as a reference to typically complete a qualification. This reasoning corresponds to the workload ECVET presented in the 3<sup>rd</sup> column, rounding up the ECVET workload (e.g. 28 hours of workload = 30 hours of ECVET workload). Having as reference that typically 1 ECVET point represents 30 hours of workload, the accordingly ECVET points that were assigned.

Contact	Workload	Workload	ECVET
Hours		ECVET	Points
8	16	15	0.5
14	28	30	1
21	42	45	1.5
28	56	60	2
35	70	75	2.5
42	84	90	3
49	98	105	3.5
56	112	120	4
63	126	135	4.5

Table 11 - Reasoning for the assignment of ECVET points

The minimum and maximum values related to this system ranged from 0 (any competition/validation of competence units) to 120 credits (full competition of the qualifications).

For the final result, (competence matrix of HSE Joining), please refer to the table 13.

#### 3. NEEDS ANALYSIS

The needs analysis on health, safety and environment was done through a desk research and through a survey. The desk results identified were during the desk research are presented in this section under the topic 3.1. Desk Research and the results from the survey are presented under the topic 3.2 – Needs analysis' Report.

#### **3.1.** Desk Research results

From the desk research carried out (refer to appendix A), the different joining hazards identified were:

- 1. Fire and explosion
- 2. Burns and exposure to heat
- 3. Airborne contaminants
- 4. Electric risks
- 5. Compressed air and liquified gases
- 6. Noise and vibration
- 7. Radiation
- 8. Lead
- 9. Toxic gases

These were the starting point when building the survey.

Control measures regarding these topics were also collected which are delivered in the report.

The main Training requirements should cover the right way to perform the task, the hazards associated, how to prevent them, reporting procedures and it is also considered that training on PPE is of the outmost importance – suitable for the nature of the work and the right way to use.





### 3.2 – Needs Analysis' Report

Under the scope of the Health Safety and Environment Training for Joining project, a total of <u>152 answers</u> were collected by a survey designed to analyse the joining industry' needs and how the Vocational Education and Training providers and Universities address this topic. To check the structure and questions posed, please refer to appendix B.

The first part of the report is focused on the general characterisation of the respondents; the second one will be on the answers provided by the Vocational Education and Training (VET)/Professional schools and universities; and, at last, the third part on the answers provided by the companies.

### I. Respondents' Characterization

#### 1. Type of organisation

When the respondents were asked to identify the organisation they represent (Figure *1* - Type of organisation), the majority of the respondents to survey are representatives of companies (80%) against a minority from Vocational Education and Training providers/professional schools (11%) and universities (9%), providing the project with valuable data from both sides, which will be further analysed in sections II and III. This was totally aligned with the project objectives.







Figure 1 - Type of organisation

#### 2. Countries coverage

The data under analysis resulted from the involvement of 16 European countries, according to Figure 2 - Countries coverage, being the countries most represented Germany (76%), followed by United Kingdom (4%), Belgium (3%) and Netherlands (3%). This just highlighted the relevance of the project and the addressed topic across Europe and not just in the partner countries.



Figure 2 - Countries coverage



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## II. Training Characterization

The average of answers collected from VET providers, professional schools and universities was 10, being this the universe under analysis in this section.

### 3. Training provided on Health and Safety

When this target group was asked which topics are addressed of health and safety training they provide concerning a) "Health and Safety on hazards causes" (Figure 3 - Training on hazards causes), b) "Health and Safety on hazards risks" (Figure 4 - Training on hazards risks) and c) "Health and Safety on how to prevent hazards" (Figure 5 - Training on how to prevent hazards), in the area a) the majority answered they provide training on "fumes and gases" (56%) and "radiation" (11%). On the other hand, a fair part of the respondents (33%) stated they cover all hazards causes posed in this question ("fumes and gases", "hot material and spatter", "radiation", "electrical current", "handling of high-pressure gases cylinders", "confined spaces and noise").



Figure 3 - Training on hazards causes

Regarding the area b) "Health and Safety hazards risks" (Figure 4 - Training on hazards risks), the answers collected were quite balanced. A fair part of the respondents answered they provide training in "fumes and gases" (30%) and "radiation" (30%) and on "electrical current" (20%), while another 20% stated they cover all the topics



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Figure 4 - Training on hazards risks

Concerning the area c) "How to prevent hazards" (Figure 5 - Training on how to prevent hazards), the answers were generally split between the delivery of training on "fumes and gases" (33%), "radiation" (22%) and "hot material and spatter" (11%). Comparing to the previous questions/areas, likewise, a great part of respondents stated they cover all the topics mentioned (33%) when delivering training and the most representative topics addressed are the same.



Figure 5 - Training on how to prevent hazards



### 4. Training provided on Environment

When the respondents were asked "which topics of training are more requested regarding environmental risks" (Figure 6 - Training on environmental risks), having the possibility to choose one of the following options: "stocking and handling of various products", "heat treatments", "sand blasting", "thermal cutting", "chemical and physical tests", "fusion welding", "adhesive usage", "underwater cutting", "arc welding", "laser and electron beam welding", "magnetic tests", "radiographic test", "waste disposal" and "other" options. The respondents highlighted "arc welding" (44%), "fusion welding" (22%), "laser and electron beam welding" (22%) and "soldering" (11%) within the category "Other" as the most requested.



Figure 6 - Training on environmental risks

#### 5. Hours of training

When posed the question "how many hours has a standard HSE training?" (Figure 7 - Hours HSE training), the great majority of respondents (70%) answered they deliver less than 7 hours, against a minority (30%) which selected the option "between 7 and 21 hours" and 0% of answers on the option "more than 21 hours". This might lead to the conclusion that the training delivered is usually in the format of short training courses.







Figure 7 - Hours HSE training

Concerning the question "What is the number of HSE training hours your organisation gives in a year?" (Figure 8 – Hours on HSE per year), a huge majority of respondents answered they deliver less than 100 hours per year. The remaining 20% of answers were equally distributed among the option "Between 100 and 300 hours" (10%) and "More than 300 hours" (10%). It likely might be assumed that HSE is not a core topic/issue of these organisations' training offer.



Figure 8 - Hours on HSE per year



#### 6. Professional categories attending training offers

Making a parallelism with the professional category of the people who attend the training courses, asking the question "What is the level of the trained personnel?" (Figure 9 - Level of the trained personnel), half of the respondents (50%) selected "Operators/welders", while 30% selected "Engineers" and 20% selected the option "Other". According to answers provided, the option "Other" represents: option 1) the training delivered is targeted at all the professional categories (engineers, welders/operators, supervisors and managers); 2) is only targeted at engineers and managers.



Figure 9 - Level of the trained personnel

## 7. Strategies to keep the training updated

When the VET providers, professional schools and universities were asked how their training is kept updated with new legislation or requirements, they stated is done by: i) analysing information from Journals' newsletters and using information from the standard OSHAS 18001(certification) and ii) by further training of the trainers.



## III. Companies characterization

The average of answers collected from companies was 55, being this the universe under analysis in this section.

### 8. Activity sectors of the companies

When posed the question "What is the main/core activity of your company" (*Figure 10 - Companies' core activity*), having "Metal construction", "Automotive", Naval and/or off-shore constructions", "energy sector" and "consultancy", more than half of the respondents (56%) fit themselves in the "Other" option. The remaining respondents fit themselves in "automotive sector (16%) and in "consultancy" services (16%), "metal construction" (6%), "energy" (4%) and, at least, in the "naval and/or off-shore constructions" (2%).



Figure 10 - Companies' core activity

A thematic categorization and further meta-analysis was conducted. As a result, six major sectors emerged (



Other sectors
Metal working and machine fabrication
Horizontal sectors (e.g. Non-destructive testing, certification and, sales and
maintenance of material handling)
Aerospace
Research and Development
Chemistry
Agriculture and Construction

Table 12 - Categorisation of "Other sectors"), rooted on the answers given by the respondents. Similarly to a rating scale, the sector most alluded is highlighted in red (e.g. "metal working and machine fabrication") and the least ones in green (e.g. "Chemistry" and "Agriculture and construction").

Table 12 - Categorisation of "Other sectors"

#### 9. Personnel responsible for Health, Safety and Environment

Concerning the question "Does your organisation have personnel responsible for Health, Safety and/or Environment?" (*Figure 11 – Personnel responsible for health, safety and environment*), the great majority answered positively (91%), in opposition to 9% who answered negatively. From the universe of those who answered positively, 76% stated the company has personnel to be in charge for "Health, Safety and Environment"



issues, while 13% stated having for "Health and Safety" and only 2% assured to have personnel responsible for "Environment".



Figure 11 - Personnel responsible for health, safety and environment

#### 10. Training on Health and Safety

When the companies were asked which topics are addressed of health and safety training they provide concerning a) "Health and Safety on hazards causes" (Figure 12 - Training on hazards causes), b) "Health and Safety on hazards risks" (Figure 13 - Training on hazards risks) and c) "Health and Safety on how to prevent hazards" (Figure 14 - Training on how to prevent hazards), in the area a) the majority answered they provide training on all the options provided ("fumes and gases", "hot material and spatter", "radiation", "electrical current", "handling of high pressure gases cylinders", "confined spaces and noise)" encompassed in the category "Other" (35%). The next most selected options, exclusively, were "electrical current" (16%), followed by "handling of high-pressure gases cylinders" (13%), "fumes and gases" (11%), "radiation" (9%) and, finally, by "hot material and spatter" (7%), "noise" (6%) and "confined spaces" (4%).







Figure 12 - Training on hazards causes

Similarly to the answers given in area a), the respondents when answering whether their company delivers training in area b) "Health and Safety on hazards risks" (*Figure 13 - Training on hazards risks*), the majority (32%) stated they cover almost all topics presented. On the other hand, 15% selected exclusively the option "handling of high-pressure gases cylinders", 13% selected "electrical current", another 13% "fumes and gases". A smaller rate of respondents answered they provide training exclusively in "hot material and spatter" (9%), in "radiation" (7%), "noise" (7%) and "confined spaces" (4%).



Figure 13 - Training on hazards risks



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Regarding area c) "How to prevent hazards" (Figure 14 - Training on how to prevent hazards, Figure 5 - Training on how to prevent hazards), aligned with the answers given in the previous questions, the majority of the respondents (32%) answered they deliver training in almost all the topics mentioned in figure 14. The remaining answers were quite balanced, distributed between the delivery of training on "handling of high-pressure gases cylinders" (15%), "fumes and gases" (14%), "radiation" (14%) and "electrical current" (12%). At least, the topics less delivered are how to prevent hazards on "hot material and spatter" (8%) and "noise" (6%). Apparently, none company delivers training on how to prevent hazards in "confined spaces" (0%).



Figure 14 - Training on how to prevent hazards

#### 11. Training on Environment

When posed the question "what kind of environment training does your organisation usually requires?" (*Figure 15 - Training required on environment*), despite the majority has chosen the option "Other" (29%), this category embraces different opinions. A fair part of the respondents under the option "Other" considered environment is not required and/or applicable in their company. Another part, deemed important to have training in more than one topic beyond the ones mentioned, such as: "automation tooling", "site works" and in most of the ones mentioned.

Having this in mind, the training the companies usually require the most are on "stocking and handling of various products" (21%) and on "arc welding" (17%). A less



representative part of companies selected some topics they require, such as: "adhesive usage" (8%), "heat treatments" (4%), "chemical and physical tests" (4%), "fusion welding" (4%), "laser and electron beam welding" (4%), "waste disposal" (4%), "magnetic tests" (2%) and "radiographic test" (2%).



Figure 15 - Training required on environment

#### 12. Critical areas to have HSE training

To the question "In which areas do you find critical to have HSE training?" (*Figure 16 - Critical areas to have HSE training*), having the possibility to choose more than one option, the respondents highlighted (marked in red) "illness caused by welding fumes and gases" (25%) and "manual handling" (25%). The other areas they stressed as the most critical to have training (marked in orange) were "arc welding" (23%) and, in the same level of relevance, "welding fume facts" (21%), "welding fumes – reducing the risk" (21%), "fire and explosion" (21%), "laser and electron beam welding" (21%) and "hot material and spatter" (21%). The remaining areas (marked in yellow), such as "noise and

vibration" (19%), "welding fumes – use of extraction and protective equipment" (17%) and "electrical hazards" (15%) were deemed less relevant and the other options marked in blue, not relevant when compared to the other rates.



Figure 16 - Critical areas to have HSE training

#### 13. Training shortages

When the companies were asked in which areas they find there's a bigger lack of training complying with their needs (Figure 17 - Areas lacking training), giving the possibility to select more than one option, the areas highlighted were quite balanced among themselves. On top (marked in orange), was stressed the lack of training on "noise and vibration" (23%), proceeded by the lack of training on "welding fumes – use of extraction and protective equipment" (21%), "welding fume facts" (19%), "illness caused by welding fumes and gases" (16%), "laser and electron beam welding" (16%).



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Making a parallelism with the previous question, it seems that one of the areas highlighted by the companies as critical (*Figure 16 - Critical areas to have HSE training*) is "laser and electron beam welding" and there is lack of training in that topic. The same logic is applied to "illness caused by welding fumes and gases", "welding fume facts" and "noise and vibration".



#### 14. Hours of training

When the companies were asked how many hours of HSE training do they provide per year (*Figure 18 – Hours on HSE per year*), the trend was slightly different to the one fed by the VET providers/professional schools and universities (Figure 7 - Hours HSE training). More than half of the companies (51%) answered they provide "less than 100 hours" per year. On the contrary, when compared with the answers given by the VET providers, a fair part of the companies (33%) answered they provide "more than 300





hours of hours" per year. At last, 16% answered they provide "between 100 and 300 hours" of training.

#### 15. Reasons for the training provision

Regarding the question to figure out what are the reasons for the companies to request training (*Figure 19 - Reasons for requesting HSE training*), a fair portion of respondents (38%) pointed out because it's "mandatory by law", while another part (22%) answered because it's needed to "raise awareness". The remaining respondents equally divided themselves between the option, because is needed to "update the personnel" (20%) and "Other" (20%). The answers incorporated in "Other" option cover all the possibilities mentioned and new reasons, as for instance: "it's part of company's policy" and "it's necessary for a high-quality performance and profitability".



Figure 19 - Reasons for requesting HSE training



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#### 16. Professional categories in need of training

To close the survey, the last question presented to the companies was "which level of personnel has the biggest need of training?" (Figure 20 - Professional categories with highest need of training). More than half of the respondents (55%) considered that the professional category which is needing training the most are the "welders/operators". According to remaining respondents (44%), those are the "engineers" (12%), the "supervisors" (12%) and, finally, the "managers" (8%). 12% of respondents deemed that all the professionals need it. Overall, this trend matches, the answers provided by VET providers/professional schools and universities (Figure 9 - Level of the trained personnel) had highlighted the welders/operators and engineers as core target groups of their training offers.



Figure 20 - Professional categories with highest need of training



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#### 4. HSE JOINING COMPETENCE MATRIX

The competence matrix summarises the intended learning outcomes that the trainee is expected to master throughout the training period. Nevertheless, after completed the desk research and needs analysis, it was considered by the consortium that the Qualification level description/professional profile wasn't applicable to this curriculum, since the market wasn't requiring a qualification, but the need for raising the awareness of current employees on the exposure to hazards in joining. Thus, was devised a Competence Unit devoted Health, Safety and Environment that allows the trainee to implement measures to promote health, safety and environmental good conditions in the workplace, related to joining technologies.

Stemming from the needs analysis the following topics were deemed very relevant to be covered in the course:

- 1. Fumes
- 2. Electricity
- 3. Electromagnetic fields
- 4. Cutting risks
- 5. Hot material and spatter
- 6. Arc radiation
- 7. Noise
- 8. Vibration
- 9. Handling of gas cylinders
- 10. Confined spaces
- 11. Ergonomics
- 12. Pickling of stainless steel
- 13. Waste disposal
- 14. Storing materials
- 15. Brazing and soldering

In the same line, the main objectives of the training course are to equip the trainee with the necessary skills to:

- 1. Recognise risks:
- 1.1 Health (personal risks)



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- 1.2 Safety (workplace risks)
- 1.3 Environment (when applicable)
- 2. Organising a safe workplace:

2.1 Start to work for the welder (individual)

- 2.2 Safe work for the group (including signs)
- 2.2 Supervisor checking his workshop
- 2.2 Checking the workplace
- 3. Proper use and maintenance of equipment:
  - 3.1 Individual Equipment
  - 3.2 Workshop Installations
  - 3.3 Personal Protective Equipment
- 4. European, National Regulations and Recommendations:
  - 4.1 European Recommendations
  - 4.2 European and national regulations



		HSE Joining Comepetence	e Matrix			
		EQF Level:	3	EQF Level:		4
Entry requirements:		European Welder (EW)		European Welding	Practitioner (EWP)	
		Total number of Contact Hours	8	Total number o	of Contact Hours	1
		Workload	16	Wor	kload	2
		ECVET Points	0.5	ECVE	Г Points	1
		LEARNING OUTCOM	ES			
	]	By the end of this training, he/she wi	ill be able	e to		
ACTIONS/ ACHIEVEMENTS	PERFORMANCE CRITERIA	KNOWLEDGE		SKILLS	AUTONOMY A RESPONSIBILI	ND TY
		0. Introduction				
		Health, Safety and Environment definitions.	Distingu definition	ish the concepts and ns of health, Safety		
		Risks and hazards definition.	and Env and haza	rronment and risks		
	1. Recognising the	1. Fumes				
	health and safety risks	Elements and factors influencing	Identify	the main hazardous		
	in joining activities.	hazardous substances generation in	substances in fumes generated by welding		Self-manage, within	n
	2. Organising a safe	fumes.			guidelines of work ex	pos
To implement	workplace for the		processe	5.	to risks by weldin	ig
measures to	welder, workers and	Types of health and risks and effects			related manufa	ctu
promote health,	visitors.	on workers when exposed to fumes.	List the	main element and	processes in the wor	kpl
safety and	3. Making proper use	Types of fime extraction equipment	factors	influencing the	in a predictable conte	ext,
environmental good	and maintenance of	in a welding workshop and its	generatio	on of fumes in	subject to change.	
workplace	individual and	maintenance	welding.			
related to joining	installation equipment	mantenanee.	Decemi		Take responsibility,	for
technologies	in the workplace.	Personal Protective Equipment.	health of	foots associated with	prevention of risk	S
teennologies	4. Making proper use		the ac	ute and chronic	hazards in welding	g
	and maintenance of the	Types of respiratory protective	exposure	to fumes	related manufa	ctu
	personal protective	equipment.	exposure	to fumes.	processes in the work	kpl
	equipment.		Identify	the different types of	without autonomy	7
	5. Preventing a		equipme	nt to extract fumes	decision-making.	
	ioining activities in the		and its	applications in the		
	environment		workplac	ce.		
	6 Checking the					
	compliance with		Recognis	se, select and use		
	international and		effective	ly respiratory		
	national standards and		protectiv	e equipment against		
	regulations		fumes ha	zards.		
			1			



Recognise the importance of
performing regular checks to
the individual fumes
extraction equipment and
personal protective
equipment.

		HSE Joining Comepetence	e Matrix			
		EQF Level:	3	EQF Level:		4
Entry requirements	:	European Welder (EW)		European Welding	Practitioner (EWP)	
		Total number of Contact Hours	8	Total number of	f Contact Hours	1
		Workload	16	Worl	kload	2
		ECVET Points	0.5	ECVEI	Points	
		LEARNING OUTCOM	ES			<u> </u>
	· ·	By the end of this training, he/she w	ill be able	e to		ND
ACTIONS/ CHIEVEMENTS	PERFORMANCE CRITERIA	KNOWLEDGE		SKILLS	RESPONSIBILI	TY
		<ul> <li>2. Electricity</li> <li>Concept of electricity.</li> <li>Electrical risks and hazards at the workplace.</li> <li>Effects of electricity on the human body.</li> <li>Measures for organising the workplace safe from electrical hazards;</li> <li>Electrical hazards and electrical warning signs;</li> <li>Maintenance of electrical equipment and components safety.</li> <li>Personal Protective Equipment.</li> <li><b>3. Electromagnetic Fields</b></li> <li>Electromagnetic fields concept.</li> </ul>	hazardou in the wo Recognis electricit body. Apply pr the work risks asso Recognis hazards warning Recogni performi the in extraction personal equipmen Recognis Protectiv protect hazards.	se the effects of y on the human reventive measures at place to minimise the ociated to electricity. se the electrical and electrical signs. se the importance of ng regular checks to ndividual fumes' n equipment and protective nt. se and use Personal re Equipment to against electrical	Idem	



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	EMF emitting sources involved in	List biophysical effects
	welding processes and related	arising from EMF exposure.
	manufacturing processes.	Associate a welding position
	Frequencies of radiation and effects	with workers' level of
	of EMFs on the human body.	exposure to EMFs.
	Risks and effects of workers'	Recognise the signs of EMFs
	exposure to EMFs;	hazards in the workplace.
	Measures for organising an EMFs	Identify EMFs emitting
	safe workplace;	sources in welding and
	Signs of EMFs hazards in the	related manufacturing
	workplace;	processes at the workplace.
	Devices used for checking EMFs at	Apply the necessary measures
	the workplace;	to reduce the exposure to
	Personal Protective Equipment.	electromagnetic fields.

# HSE Joining Comepetence Matrix

	EQF Level:	3	EQF Level:	4	
Entry requirements:	European Welder (EW)		European Welding Practitioner (EWP)		
	Total number of Contact Hours	8	Total number of Contact Hours	12	
	Workload	16	Workload	24	
	ECVET Points	0.5	ECVET Points	1	

## **LEARNING OUTCOMES**

# By the end of this training, he/she will be able to ...

ACTIONS/ ACHIEVEMENTS	PERFORMANCE CRITERIA	KNOWLEDGE	SKILLS	AUTONOMY AND RESPONSIBILITY
		<ul> <li>4. Cutting</li> <li>Cut definition and types of wounds.</li> <li>Causes and consequences of cuts associated to metal handling and grinding.</li> <li>Measures for organising a workplace free from cutting risks.</li> <li>Proper metal handling and maintenance of equipment and components.</li> <li>Classification and levels of performance of the gloves.</li> <li>Personal Protective Equipment.</li> </ul>	Identify cutting risks methods to avoid accidents. Recognise and use the appropriate PPE regarding preventions against cutting. Recognise and maintain safe grinding equipment. Use of grinding equipment safely. Recognise and use Personal Protective Equipment to protect against cutting hazards. Recognise the classification of safety gloves according to EN 388:2016 and EN 12477.	Idem





1		
	5. Hot Material and Spatter	
	Spatter and sparks definition.	Recognise hazardous
	Emitters of spatter and sparks.	situations and risks, at the
	Flammability of materials involved	workplace, arising from hot
	in welding processes.	material and spatter.
	Risks associated to hot material and	Recognise colour change of
	spatter.	materials due to heating.
	Signs of hot material, risk of	Recognise the signs of hot
	explosion and recommendation to wear heat protection	material, risk of explosion
		and recommendation to wear
	Measures to assure a workplace free from burns and fire.	heat protection.
		Apply preventive measures in
	Maintenance of welding equipment	the workplace to safeguard it
	and the workplace (degradation of	from fire and explosion.
	the welding equipment and	Recognise and use PPE to
	augmented risk in the workplace and	protect against hot material
	its maintenance.	and spatters.
	Personal Protective Equipment.	

# HSE Joining Comepetence Matrix

Entry requirements:		EQF Level:	3	EQF Level:		4
		European Welder (EW)		European Welding Practitioner (EWP)		
		Total number of Contact Hours	8	Total number o	f Contact Hours	12
		Workload	16	Wor	kload	24
		ECVET Points	0.5	ECVE	Г Points	1
	LEARNING OUTCOMES					
ACTIONS/		By the end of this training, he/she w	ill be able	e to	AUTONOMY A	ND
ACHIEVEMENTS	CRITERIA	KNOWLEDGE		SKILLS	RESPONSIBILI	TY
		5. Arc Welding Radiaton	Identify	radiation emitter		
			sources i	n arc welding.		
		Radiation types produced by the electrical arc.	Recognis	se the risks and on the human body		
		Risks and effects for the eyes and	associate	d to arc welding	ng	
		skin when exposed to infrared and ultraviolet radiation.	radiation			
			Apply p	preventive measures		
		Radiation warning signs.	regarding	g personal and	Idem	
		Measures to mitigate the arc	collective	e equipment at the		
		radiation risks when organising the workplace.	workplac	e to minimise the		
			risks associated to arc or welding radiation.			
		Personal Protective Equipment for arc radiation.				
			Recognis	se and use the		
			Personal	Protective		



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# HSE Joining Comepetence Matrix

		EQF Level:	3	EQF Level:		4
Entry requirements	:	European Welder (EW)		European Welding Practitioner (EWP)		
		Total number of Contact Hours	8	Total number o	of Contact Hours	12
		Workload	16	Wor	kload	24
		ECVET Points	0.5	ECVET Points		1
	LEARNING OUTCOMES					
	]	By the end of this training, he/she w	ill be able	to	AUTONOMY A	ND
ACTIONS/ ACHIEVEMENTS	PERFORMANCE CRITERIA	KNOWLEDGE		SKILLS	RESPONSIBILI	TY
		7. Vibration				
		Concept of vibration	Identify	the main welding		
		Risks associated to the exposure to	related	process generating		
		vibration involved in welding	vibration.			
		processes and related manufacturing	Recognis	se the risks and		
		processes.	vibration	exposure.	Idem	
		body	Define	the adequate		
		Vibration warning signs.	conditior workplac	ns in the at the et o minimise risks.		
		Safety measures to be applied when exposed to vibration.	Recognis	se the need to regular checks to the		



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41

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		Maintenance of equipment and its	equipme	nt and personal		
		components.	protectiv	e equipment;		
		Personal Protective Equipment	Recognis	se, select and use		
			effective	ly protective		
			equipme	nt against vibration		
			hazards.	C		
		8. Handling of gas cylinders				
			Explain	fully the risks		
			associate	ed to storage		
			distributi	on and handling of		
		Types of gases used in welding and	gases	ion and nanoning of		
		their main properties	Detail	the correct		
		Gas cylinders specifications	interpret	ation of Health and		
		including their relation between	Safety	regulations with		
		gases and the cylinders colour	respect to	handling		
		Ricks accorded to incorrect	Recomi	se the rick associated		
		handling (transportation stars of 1	to	vlinder handling		
		nanunng (nansportation, storage and	oporation	ymuer nandning		
		Dersonal Drotective Equipment	Follow	io.		
		r ersonar r rotective Equipment	1 OHOW	sale working		
			procedur	es to ensure that each		
			type of n	and ing risk factors.		
				ne facilities against		
			the	requirements for		
			nanding	and storing of gas		
			Decomi	a coloct and use		
			offootivo	ly protoctive		
			effectively protective			
			cylinders hazards			
			e y milaene			
		HSE Joining Comepetence	e Matrix			
			Γ			
		EQF Level:	3	EQF Level:		4
Entry requirements	s:	European Welder (EW)		European Welding	Practitioner (EWP)	
		Total number of Contact Hours	8	Total number o	of Contact Hours	12
		Workload	16	Wor	kload	24
		ECVET Points	0.5	ECVE	Г Points	1
		LEARNING OUTCOM	ES			L
	]	By the end of this training, he/she wi	ill be able	e to		
ACTIONS/ ACHIEVEMENTS	PERFORMANCE CRITERIA	KNOWLEDGE		SKILLS	AUTONOMY A RESPONSIBILI	ND TY
		9. Confined spaces				
		Concept of confined space.			Idem	
		Risks associated to confined spaces.	Recognis	se a confined space.		



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# HSE Joining Comepetence Matrix

	EQF Level:	3	EQF Level:	4		
Entry requirements:	European Welder (EW)		European Welding Practitioner (EWP)			
	Total number of Contact Hours	8	<b>Total number of Contact Hours</b>			
				12		
	Workload	16	Workload	24		
	ECVET Points	0.5	ECVET Points	1		
LEARNING OUTCOMES						

ACTIONS/ ACHIEVEMENTS	PERFORMANCE CRITERIA	KNOWLEDGE	SKILLS	AUTONOMY AND RESPONSIBILITY
		11. Pickling of stainless steel	Recognise the risks regarding	
		Chemical cleaning methods for	health and environment	
		stainless steel.	associated with the different	
		Symbols associated to pickling of	pickling methods.	Idem
		stainless steel.	Identify the different safety	
			symbols on the packages and	



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Risks associated to different	recipients of the pickling
pickling methods.	agents.
Appropriate conditions to perform	Identify preventive actions to
the pickling of stainless steel (e.g.	safeguard the soil and water.
location, ventilation, waste water	Apply the storage rules for
treatment, storage of chemicals).	pickling agents and diluents.
Correct procedures to perform the	Understand the safety and
cleaning of the chemicals from the	risks warnings (S and R) on
stainless steel.	chemicals.
Applicability of the Personal	Recognise, select and use
Protective Equipment according to	effectively protective
the type of chemical used.	equipment in pickling of
	stainless steel.
12. Waste disposal	Recognise the environmental
	risks associated to waste
Concepts of waste, waste	disposal.
management and waste disposal	Identify the main
methods.	environment dimensions (air,
Benefits of managing waste	soil, water) in which the
disposal.	company process can
Waste generated in a welding shop.	interfere, including before,
Risks associated to different types of	during and after the welding
waste.	processes.
Personal Protective Equipment to	Recognise the benefits of
handle waste.	waste disposal management.
	Follow the procedures
	established by the company
	associated to waste disposal.
	Prepare waste disposal
	procedures, in cooperation
	with the welding coordinator,
	to make sure all the
	environmental requirements
	are met.
	1

# HSE Joining Comepetence Matrix

EQF Level: Entry requirements: European Welder (E		EQF Level:	3	EQF Level:		4
		European Welder (EW)		European Welding	Practitioner (EWP)	
		Total number of Contact Hours	Iours         8         Total number of Contact Hours		f Contact Hours	12
		Workload	16	5 Workload		24
		ECVET Points	0.5	ECVET Points		1
	LEARNING OUTCOMES					
	By the end of this training, he/she will be able to					
	ACTIONS/ PERFORMANCE ACHIEVEMENTS CRITERIA	KNOWLEDGE		SKILLS AUTONOMY A RESPONSIBILI		ND TY





	13. Storing materials		
	Importance of storing materials	Outline the characteristics of	
	properly.	materials (solids, liquids,	
	Health and safety principles to	gases) subject to specific	
	prevent risks from storing material.	storage conditions.	
	Requirements associated to different	Read storage conditions	
	types of material storage, including	specifications.	
	compressed gas cylinders.	Organise storage conditions	
	Risks associated to different	and associated procedures in	
	materials storage.	the workplace.	
	Warning signs	Identify the potential hazards	
	Personal Protective Fouinment	associated to materials	
	r ensonai r roteen ve Equipmenta	storage	
		Follow methods of safe	
		working practices	
		Recognise select and use	
		effectively protective	
		equipment in materials	11
		storage	Iaem
	14 Brazing and soldering	storage.	
	14. Drazing and soldering	Define the brazing and	
		soldering processes	
	Concepts of brazing and soldering	Catagoriza the fluxes linked	
	Pisks associated to brazing and	to the brazing process	
	soldering	Decomise the risks	
	Droventive measures used in hereine	associated to brazing and	
	and soldering	soldering activities	
	Waste disposal related to brazing	Apply preventive measures	
	and soldering	used in brozing and soldoring	
	Iller dling and storege of huszing and	Managa westa dianagal	
	soldering roleted meterials	related to buoging of 1	
	Applicability of the Descent	soldering	
	Applicability of the Personal Protoctive Equipment constitute to	Bosognico colort cul	
	the use of hearing and and and and	recognise, select and use	
	the use of orazing and soldering.	enectively protective	
		equipment used in brazing	
		and soldering.	

# HSE Joining Comepetence Matrix

	EQF Level:	3	EQF Level:	4		
	Entry requirements:	irements: European Welder (EW)		European Welding Practitioner (EWP)		
		Total number of Contact Hours	8	Total number of Contact Hours	12	
		Workload	16	Workload	24	





		ECVET Points	0.5	ECVET Points		1
		LEARNING OUTCOM	ES			
	I	By the end of this training, he/she wi	ill be able	e to		
ACTIONS/ ACHIEVEMENTS	PERFORMANCE CRITERIA	KNOWLEDGE		SKILLS	RESPONSIBILI	ND TY
		European, National Standards and regulations and Recommendations applicable*.	Identify standards regarding fumes, electrom cutting, spatter, a vibration cylinders ergonom stainless storage and solde	and apply relevant s and regulations g health and safety on electricity, agnetic fields, hot material and arc radiation, noise, , handling of gas s, confined spaces, ics, pickling of steel, waste disposal, of material, brazing ering hazards *.	Idem	
EXTERNAL RESOURCES	<ul><li>PowerPoint pres</li><li>Handbook</li><li>Serious Game</li></ul>	sentations	1			

\*European, National Standards and regulations and Recommendations is covered in each topic is applicable only for welding coordinators (e.g. EWP).

Table 13 - HSE Joining Learning Outcomes matrix



#### 6. CONCLUSION

The content of this intellectual output is comprehensive and comprises several interlocking stages mentioned throughout the document: desk research on the National Qualifications Framework (NQF), needs/market analysis and curriculum development based in learning outcomes and competence units (competence matrix).

The first two phases outlined allowed to come up with a common methodological approach for the curriculum aligned with the European tools (EQF and ECVET) and tailored to meet the needs of the companies in terms in several aspects, as listed: goals and topics to be covered, background of the professionals demanding training, availability of the professionals to attend the training (length of the course) and expected learning outcomes.

## 7. APPENDIXES

# **Appendix** A

**Five case studies:** 



VINCI Construction is the leading French group and a major global player in the construction industry, with 700 consolidated companies and 67,000 employees in 100 countries. It operates in eight areas: buildings, functional structures, transport infrastructure, hydraulic infrastructure, renewable and nuclear energy, environment, oil and gas, mining.

It has a QSE (Quality, Safety and Environment) responsible who provides the relevant information and news concerning the standards and environmental legislations to the site managers.

The site manager organizes meeting to pass on that info to the employees.

No specific safety training.

This is included in the specific training courses as in VINCI case that uses Arc welding gas cutting is in the welding coordinator.



Since 1975, BA Systemes designs, integrates and maintains intralogistics systems with AGVs (Automated Guided Vehicle). With 40 years of experience in mobile robotics, their automated handling and storage solutions offer efficiency and performance to the logistics processes of warehouses and production plants.

The company has a Health and Safety Workplace Committee, constituted by elected personnel and a management representative - no specific HSE or QSE responsible.

The committee receives information about the environment standards, requirements and related instructions from the UIMM - l'Union des industries at métiers de la metallurgie.

In 2016, the hours of training provided were 5472 to 142 employees.

No specific HSE training.

In BA Systemes case, HSE issues are addressed in other specific training courses like "electric authorization", "welding course" and "fire extinguisher manipulation course".

BA Systemes is aiming to get ISO 14001 certification and because for that they must have an HSE responsible, they now find that the staff in charge of the plant, planning and production need a higher level of training.





STAR is a French, sheet metalwork company. The company does not have a QSE responsible.

Each year 150 hours of training are provided for 10 employees.

HSE training is given in Worker safety training and ARI training. The ARI training consists in mastering the use of an Insulating Respiratory Device (French: Appareil Respiratoire Isolant). STAR finds that company lacks training in Electromagnetic fields and new legislation and that workers need a higher level of training.



INSA Rennes is an engineering school and a training and research center.

It was created in 1966, and each year it welcomes around 1,800 students. Moreover, there are six research labs.

INSA Rennes has several persons in charge of the HSE, teachers and also a safety engineer. Learning about HSE is mandatory for all students from the beginning, in fact there is a compulsory risk unit.

The school emphasizes on the individual and collective protection, electric risks and fumes suction.

In the first year, there are six hours of training per student and in the third year there are 24 hours of training.

The training level is the same for all students since they will all have an engineer degree.



Every year over 15,000 customers in more than 60 countries benefit from the expertise of TWI, the world's largest training organization in non-destructive testing, welding, welding inspection and various other disciplines.

HSE training is covered by many others specific training courses, like:

- BGAS-CSWIP (British Gas Approved Scheme) Pipeline Welding Inspector
- EWF diplomas
- IEMA Approved Associate Certificate in Environmental Management, aimed at environmental practitioners
- IOSH (Institution of Occupational Safety and Health) Managing Safely, aimed at supervisors, managers and team leaders
- NEBOSH (The National Examination Board in Occupational Safety and Health)
- International Diploma in Occupational Health and Safety, aimed at practitioner
- International Certificate in Construction Health and Safety aimed at Supervisors and managers





International General Diploma in Occupational Health and Safety, aimed at Managers, supervisors, worker representatives.



## **Appendix B**

"HSE Joining – Health, Safety and Environmental Training Curriculum for Joining Technologies." is a European project which aims to develop a Harmonised curriculum for training in joining, tackling the hazards of the workplace in terms of the environment and personnel safety, specifically related to welding (for example: fume, radiation, noise, vibration). These hazards are considered as potential high risk on the health and safety of welders, as well as having an impact on the environment. The idea is to prepare a curriculum, completely adjusted to the market (employment) needs and requirements, allowing a perfect match between the market demand, the job seek and the VET offer.

In this sense, and in order to identify the most relevant issues you face, and need to address your everyday work, we would very much appreciate your collaboration in answering the questions that best apply to your organisation.

- \* 1. Please indentify the type of organisation you represent?
  - Vocational Educational Training Provider/Professional School
  - O University
- Company
- \* 2. Select a country

VET Provider / Professional school / University

#### 3. What kind of Health and Safety training do you provide?

- 3A. HS Hazards causes
- Fumes and gases
- Hot Material and Spatter
- Radiation
- Electrical Current
- Handling of high pressure gases cylinders
- O Confined spaces
- O Noise
- Other (please specify)

3B. HS - Hazards risks

- Fumes and gases
- Hot Material and Spatter
- Radiation
- Electrical Current
- Handling of high pressure gases cylinders
- Confined spaces
- Noise
- Other (please specify)



3C.	HS - How to prevent hazards
0	Fumes and Gases
0	Hot Material and Spatter
0	Radiation
0	Electrical Current
0	Handling of high pressure gases cylinders
0	Confined spaces
0	Noise
0	Other (please specify)
4. F	Regarding environmental risks the training which is the most requested, is?
0	Stocking and handling of various products
0	Heat treatments
Ο	Sand blasting
0	Thermal cutting
0	Chemical and physical tests
0	Fusion welding
0	adhesive usage
0	Underwater cutting
0	Arc welding
0	Laser and Electron beam welding
0	Magnetic tests
0	Radiographic test
0	Wase disposal
0	Other (please specify)





5.	How	many	hours	has a	a standaro	I HSE	training'	?
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0	Less than 7 hours
0	Between 7 - 21 hours
0	More than 21 hours
6. V	Vhat is the number of HSE training hours your organisation gives in a year?
0	Less than 100 hours
0	Between 100 and 300 hours
0	More than 300 hours
7. V	Vhat is the level of the trained personnel? (you can choose more than one option)
0	Engineers
0	Welders / Operators
0	Supervisors
0	Managers
0	Other (please specify)

8. How do you ensure that the training your organisation provides is kept updated with new legislation/requirements?

Thank you for your cooperation.





#### Company

- 3. What is the main/core activity of your company?
- Metal construction
- Automotive
- Naval and/or off-shore constructions
- Consultancy company
- Energy Sector
- Other (please specify)

4. Does your organisation have personnel resposible for Health Safety and/or Environment?

- Yes, for Health, Safety and Environment
- Yes, but just for Health and Safety
- Yes, but just for Environment
- No

#### 5. What kind of Health and Safety training do you provide?

#### 5A. HS - Hazards causes

- Fumes and gases
- Hot Material and Spatter
- Radiation
- Electrical Current
- Handling of high pressure gases cylinders
- Confined spaces
- ) Noise
- Other (please specify)





#### 5B. HS - Hazards risks

- Fumes and gases
- Hot Material and Spatter
- Radiation
- Electrical Current
- Handling of high pressure gases cylinders
- Confined spaces
- Noise
- Other (please specify)

#### 5C. HS - How to prevent hazards

- Fumes and Gases
- Hot Material and Spatter
- Radiation
- Electrical Current
- Handling of high pressure gases cylinders
- Confined spaces
- Noise
- Other (please specify)





#### 6. What kind of Environment training does your organisation usually requires?

- Stocking and handling of various products
- Heat treatments
- Sand blasting
- Thermal cutting
- Chemical and physical tests
- Fusion welding
- Adhesive usage
- Underwater cutting
- Arc welding
- Laser and Electron beam welding
- Magnetic tests
- Radiographic test
- Waste disposal
- Other (please specify)





7. li	n which areas, do you find most critical to have HSE training?
	Illness caused by welding fumes and gases
	Welding fume facts
	Welding fumes - Reducing the risk
	Welding fumes - Use of extraction and protective equipments
	Noise and Vibration
	Manual handling
	Fire and explosion
	Lack of oxygen in confined spaces
	Electrical hazards
	Slips and trips
	Radiation
	Legislation
	Stocking and handling of various products
	Heat treatments
	Sand blasting
	Thermal cutting
	Chemical and physical tests
	Fusion welding
	Adhesive usage
	Underwater cutting
	Arc welding
	Laser and Electron beam welding
	Magnetic tests
	Radiographic test
	Waste disposal
	Hot material and spatter
	Other (please specify)





0	In which areas	de	you find there's a	blager	look of	technica	eemphile quith	Coher Poodo2
о.	in which areas,	do	you find there's a	bigger	lack of	training	complying with	your needs?

Illness caused by welding fumes and gases
Welding fume facts
Welding fumes - Reducing the risk
Welding fumes - Use of extraction and protective equipments
Noise and Vibration
Manual handling
Fire and explosion
Lack of oxygen in confined spaces
Electrical hazards
Slips and trips
Radiation
Legislation
Stocking and handling of various products
Heat treatments
Sand blasting
Thermal cutting
Chemical and physical tests
Fusion welding
Adhesive usage
Underwater cutting
Arc welding
Laser and Electron beam welding
Magnetic tests
Radiographic test
Waste disposal
Electromagnetic Fields
Hot material and spatter
Other (please specify)





9. How many hours of HSE training do you provide in your company per year?

Less than 100 hours

- Between 100 and 300 hours
- More than 300 hours

10. What are the reasons why you request the HSE training?

- Is mandatory by law
- Update the personnel
- Raise awareness
- Other (please specify)
- 11. Which level of personnel has the biggest need of training?
- Engineers
- Welders / Operators
- Supervisors
- Managers
- Other (please specify)

Thank you for your cooperation.

