GREEN WELD

WP3 – Development and Adaption of Welders Training Program and Materials

Integrating the set of green skills into VET curricula

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1. Background

Incorporating Green Skills-set into Vocational Education and Training (VET) Trans-national Curricula is a crucial aspect of GREENWELD work package 3. One of its objectives is to synthesize the insights derived from the Needs Analysis Report together with the recommendations identified through the Desk Research and the Roundtable event. Table 1 summarises the findings from the needs analysis report and desk research and roundtable event.

Needs Analysis Report	Desk Research and Roundtable event
- To develop a comprehensive glossary encompassing relevant sustainability and welding training concepts. - To develop additional Competence Unit (CU) for the different levels of the profile, with different levels of depth of knowledge and skills. - Consider ESCO's collection of green skills and knowledge to select skills that are transversal or cross-sectoral in welding. - Use of innovative training methodologies. - Create a comprehensive training methodology for training organizations.	- Consider a CU to raise awareness for the green transition. - Increase awareness of environmental issues and procedures within the organizations. - Topics identified as relevant: o Energy, Gas, and other consumables. o Welding techniques and equipment. o Material usage and reuse of materials.

Table 1 - Desk Research Recommendations

The European International Welder training programme reflects the knowledge and the skills needed for this occupation, in close liaison with industry requirements, current times demand an update of this curriculum, adding green skills.

This document proposes two new Competence Units (CUs) (also known as Module of training) for Environmental Awareness for a Greener Welding Education as additional CU to be available within the European International Welder Qualification(Latest version of IAB 089 (Part I and III), as a starting point, describing the expected skills and knowledge needed by Welders to fulfil the gap of Green Skills.

2. Guidelines for Starting

The European/International Welder qualification and training, IAB 089 (Part I and II), is structured in the following possible routes:

- Standard Route – for new learners
- Alternative Route – when trainees already have experience (reskilling /upskilling)

The GREENWELD Competence Units are presented as additional competence units. These CUs can be accessed by professionals already with experience in Welding or professionals who are just finishing their training in Welding. In both cases, these CUs are targeting those who need to improve their training with Green Skills in Welding.

The main topics to be included in the GREENWELD CUs are the following:

- Awareness of green topics: Reducing, Recycling, Reuse
- Waste and material reduction
- Parameters to measure the impact of welding work
- Welding Energy performance
- Welding simulation equipment and green good practices

3. GREENWELD Competence Units

This chapter is dedicated to exploring detailed information about the access conditions for individuals who intend to enrol in the GREENWELD training and attend the developed CUs. Finally, it is relevant to show that the expected learning outcomes are also identified, that describe the desirable knowledge and skills to be gained after successfully completing the CU, thus providing the roadmap for trainers and trainees to evaluate their progress and capacity for essential competencies.

3.1 Entry Requirements / Access Conditions for GREENWELD Competence Units

To access the GREENWELD CUs the conditions are:

- Hold the European International Welder Diploma *or*
- Attending training programme for European International Welder *or*
- Have a qualification according to EN ISO 9606 or EN ISO 14732 or similar

After completing successfully, the two competence units, a Green Welding Certificate will be issued.

Fig 1. Shows the scheme to access the GREENWELD competence units and, after the examination, the Green Welding Certificate.

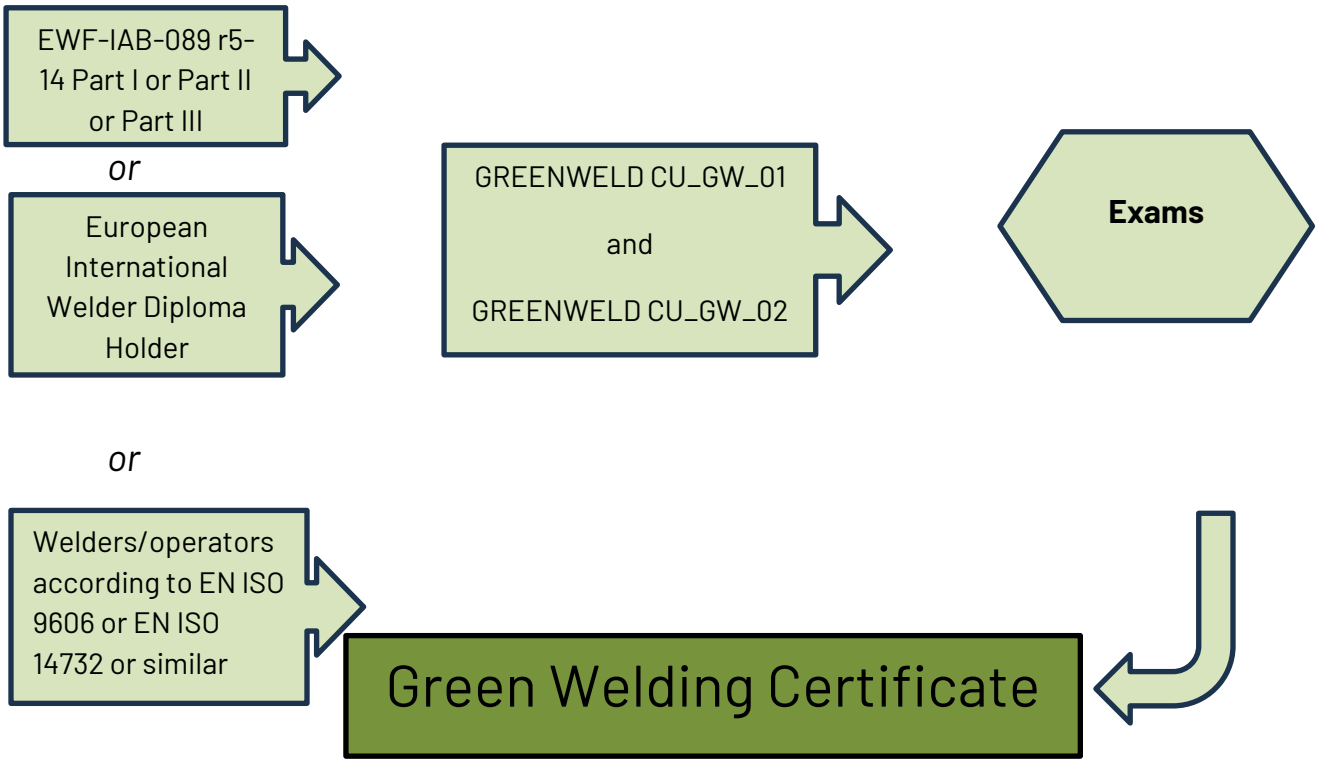

Figure 1 - GREENWELD Access Scheme

3.2 GREENWELD Competence Units Overview

The Competence units are also detailed in terms of knowledge, skills, and autonomy/responsibility, following the EQF descriptors, as summarized in Table 2.

GREENWELD Competence Units			
Proficiency Level /	Knowledge	Skills	Autonomy and Responsibility
Basic /Aligned with EQF level 3	Basic facts, principles, processes, and general concepts on green awareness and green procedures applied to welding and related technologies.	Be able to check and follow information on greener procedures. Carry our action previously defined that can reduce the impact of welding.	Work under supervision, taking personal responsibility for own actions and having self-awareness of the impact of their own actions on the environment.

Table 2 - Summary of GREENWELD CU in Proficiency level, Knowledge, Skills and Autonomy/Responsibility

Competence Unit Learning Outcomes

Competence Units (CU) /Units of Learning Outcomes (ULOs) cover the minimum requirements for education and training, in terms of Learning Outcomes (LOs) and contact (teaching) hours to be devoted to achieving them. Recommended contact hours are distributed between theoretical (A), assigned projects/exercises (B), and practical workshop training (C).

On each Competence Unit, objectives and scope are defined for a specific depth of knowledge and skills, which is described as "proficiency level", in alignment with EQF. The same Competence Unit can also be part of different Qualifications, whenever its Learning Outcomes are necessary for the qualification´s expected results.

On the following tables, the theorical and practical training are presented describing the scope and the learning outcome expected to be achieved by the candidate after successfully completing the CUs.

CU_GW_01: Environmental Awareness for a Greener Welding Subject	Recommended Contact Hours
Awareness in Green Topis: Reduce, Recycle, Reuse	2,5h
Waste and material reduction	1 h
Total Teaching Hours	**3,5h**
Workload	**7**

Table 3 - CU GW01 Environmental Awareness for a Greener Welding

Learning Outcomes – CU1_GW_01 Environmental Awareness for a Greener Welding	
Knowledge	Basic facts, principles, processes, and general concepts on: • Awareness in Green Topis: Reduce, Recycle, Reuse. • Waste reduction.
Skills	• Apply welding techniques, procedures and specifications that minimize carbon emissions. • Apply the methods for waste reduction during and after welding.

Table 4 - CUGW01 Learning Outcomes

CU_GW_02: Greenweld Impact Measurement Subject	Recommended Contact Hours
Parameters to measure the impact of welding work	1,5 h
Welding Energy performance	1,5 h
Welding simulation equipment and green good practices	0,5h
Total Teaching Hours	**3,5h**
Workload	**7**

Table 5 - CU GW02 Greenweld Impact Measurement

Learning Outcomes – CU_GW_02 Greenweld Impact measurement	
Knowledge	Basic facts, principles, processes, and general concepts on: • Parameters to measure the impact of welding work • Welding Energy performance • Welding simulators and demonstration in a greener approach
Skills	• Carry out actions to control the energy consumption during welding process. • Identify the parameters required for energy saving during welding. • Identify the advantages of using welding simulators. • Recognize the environmental benefits associated with the utilization of welding equipment and apply green welding good practices.

Table 6 - CU GW02 Learning Outcomes

4. Examination

The examination is a formal way to assess the trainees' comprehension of the knowledge and skills covered in the competence unit. This section describes the examination and validation of the Competence Unit, following the principle of harmonisation and use of common standards.

Trainees who have attended this Competence Unit training can apply for an examination, and if approved, a record of achievement will be issued for the new CU.

The successful completion of examinations may lead to a digital certification, demonstrating that the trainee has acquired the necessary knowledge and skills, with the issue of the Green Welding Certificate.

To provide a clear and fair evaluation, training centres, under the supervision of an Authorized Nominated Body, should follow specific considerations regarding the format and duration of the examination, the success rate of the examination and the actions to perform in case of failure.

On the other hand, the GREENWELD project defines recommendations for training centres to be open to reflect on the impact of their activities. The focus is on start following and implementing practices that can lead to actions that are more environmentally friendly, which can, also, lead to changes in the examination process, as listed below:

- Online registration and communication: Nowadays, technology allows to implement registration based on non-physical documents, avoiding printing and movement of people.
- Digital examinations: To guarantee the reliability of results, trainees should undertake the exams in person, however, training centres can replace the printed exam by a digital exam to be led in the examination classroom.
- Encourage the use of public transportation: Provide information and raise awareness about the impact of using public transportation and the CO2 footprint, in comparison to individual transportation.
- Leading by example: Demonstrate environmentally friendly behaviours and practices inside the training centre.

This list of environmental practices, involving the examination, is just a part in the whole training process, which means that training centres have many possibilities to start implementing minor changes that have the potential to impact the global system of training.

5. Green Training Centers

To effectively foster a new generation of environmentally aware professionals, there will be a new set of requirements that training facilities could follow to embrace this transition. Obviously, these new requirements are related to the training and the training method; however, some of them also involve the equipment and the training facilities. This chapter outlines some essential parameters that green training facilities may have in place to align with the evolving needs and stringent requirements for sustainable education and training.

What is the ideal green training centre?

When thinking about an ideal scenario for training centres, it is necessary to consider a number of choices and changes beyond the subject of training itself. Whether in the building, equipment and materials, as well as the entire value chain associated with human resources, and associated accreditation and/or certification aspects.

To go deeper on this topic, we can follow the ISO 14001 standard for certifying environmental management systems as a reference point. This standard is an essential tool for organisations that want to achieve greater trust with customers, employees, the surrounding community, and society by demonstrating a voluntary commitment to continually improving their environmental performance.

Following we have a list of possible actions that were identified in the workshop Sustainable Futures: Green and Digital Skills Transition, promoted by EWF, in November '23[1]:

[1] https://www.ewf.be/news/ewf-workshop-report.aspx

Energy Efficiency and Renewables

- The building utilizes a water-cooling system to conserve energy and reduce heat gain.
Photovoltaic panels to generate electricity to supplement the centre's power needs (or other sources of renewable energy).
– An air purifying system incorporating plants promotes indoor air quality.
– Grey and blue water systems are employed for water recirculation and reuse.

Sustainable Waste Management

-Industrial symbiosis is practiced by selling welding scraps from training to other industries.
– Composting is employed to transform food waste into nutrient-rich soil amendments.
– Bicycles and rickshaws are encouraged for transportation on-site, reducing reliance on fossil fuels.
– General waste sorting of all types of waste consumed thought out the entire training facility.

Sustainable Food Practices

– A farm-to-table approach ensures the centre source its food locally and sustainable.
– Green certificates from suppliers verify the ecofriendly practices of providers
– Aim towards a zero-food-waste policy. Training centres with a canteen can donate or sell their food leftovers to a very low price point to either students or employees.

Training Innovation

-Simulators, games, and augmented reality (AR) are utilized for engaging and effective training programs.
– Paperless communication and operations minimize the use of paper and its environmental impact.

Resource Optimization and Repurposing

– End-of-life equipment is repurposed whenever possible, extending its lifespan and reducing waste; Shopfloor rearrangements enhance energy efficiency and reduce unnecessary energy consumption.
– Smart grid systems optimize energy usage and ensure efficient demand response capability.
– An integrated resource management IoT platform collects and analyses data to further optimize resource allocation.
– Upcycle reuse, or donate used equipment furniture etc.

Consumables and Community Outreach

– Eco-friendly whiteboards, green label products, and seasonal and local supplies are prioritized for purchases.
– Packaging is minimized to reduce waste and protect the environment.
– The centre actively engages with the community by hosting events and promoting sustainable practices.
– Encourage employees and trainees to reduce carbon emissions from transportation, either by using public transportation or car sharing.

The actions identified in the workshop "Sustainable Futures: Green and Digital Skills Transition" offer a practical roadmap as a kick off for green training centers. From energy efficiency and renewable energy to sustainable waste management, innovative training practices, resource optimization, and consumables choices. Each of these aspects plays a crucial role in creating a holistic and eco-conscious learning environment.

Besides the listed actions identified in the workshop 'Sustainable Futures: Green and Digital Skills Transition,' promoted by EWF, ambitious training centers could aim for a Net-Zero policy, either for the entire center or for the GREENWELD training. One way to achieve this is by offsetting their carbon footprint, either for emissions related to GREENWELD or for the entire training center.

Improving or/and implementing some of the above measures, training centres not only contribute to a sustainable future, but they also act as an example for their trainees. Furthermore, it promotes a mindset of responsibility and awareness regarding the environmental impact of their professional practices, with the hope of raising awareness and promoting a more widespread environmental mindset throughout all aspects of their work behaviour.

To conclude, the ideal green training center extends beyond the subject of training itself, encompassing considerations in building design, equipment, materials, and the entire value chain associated with human resources. So, fostering the new generation of environmentally aware professionals requires comprehensive and strategic approaches from training facilities, not only by delivering a green curriculum, but also, by becoming themselves a greener training center.