

# LEONARDO DA VINCI

## Lifelong Learning Programme – Transfer of Innovation

### Second Phase: 2007 – 2013

Agreement Number: UK/08/LLP-LoV/TOI/163-142

Title: Development of a Harmonised System for Education, Qualification and Certification of Rail Track Welders – Phase 2

**Acronym: RAILS SAFE 2**

### Interim Assessment Evaluation

Conducted and reported by: Dr David Shackleton

Date: 26 September 2009

#### **1. INTRODUCTION**

Following submission of a proposal in March 2008 to the Leonardo da Vinci Programme by TWI Ltd, acting as the lead organisation, a contract was awarded in October 2008 for a new project to develop a harmonised system for education, qualification and certification of a European arc welder for railway tracks. This is known as Phase 2 of the Leonardo da Vinci RAILS SAFE project.

An integral part of the project is that the quality and impact of the output of the project is independently evaluated by a person involved neither as a partner in the project nor with the project management. The full evaluation is to be completed at the end of the project in September 2010. An interim evaluation is included at the halfway stage to provide evidence that the project is progressing satisfactorily and to indicate any improvements that might be made or whether any reasons exist that would indicate that the project goals might not be achieved.

Dr Shackleton was contracted to conduct this interim evaluation and this report summarises the conclusions reached relating to the quality and potential impact of the output of the project in relation to the objectives set.

#### **2. RAILS SAFE PHASE 2 PROJECT OBJECTIVES AND DELIVERABLES**

The stated objectives of the RAILS SAFE project are to:

- transfer the innovative features of the first RAILS SAFE project, particularly the European harmonisation aspects, to the current project,

- have trained and certified railway track arc welders available for railway companies to assure the quality and reliability of the railway tracks whilst ensuring healthy and safe working conditions, thus reducing accidents and downtime caused by welding problems,
- harmonise education, qualification and certification to make exchange of welders for national railway authorities and companies in the European Union possible,
- ensure that the qualification system is aligned with existing official national VET systems in Europe,
- provide a system that underpins the emerging European standard, EN 15594, dealing with the restoration of rails by electric arc welding,
- assure the quality of and access to continuing vocational education and certification for life-long competences and better employability of railway welders across national borders,
- facilitate the achievement of harmonised implementation of the developed system throughout the whole of Europe through the European Welding Federation, and,
- facilitate free movement of labour within the rail sector in Europe and provide a mechanism for skilled welders in other sectors to transfer into the rail sector thereby taking advantage of new job opportunities.

The intended deliverables (outputs) detailed in the project proposal are the following:

- a) A set of industry requirements on performance objectives for the education of railway track arc welders for joining and restoration of rails,
- b) Report on national Vocational Education and Training (VET) schemes
- c) Guideline for the Education, Training, Examination, Qualification and Certification of European Arc Welders for Railway Tracks.
- d) Development of examination, qualification and certification procedures for railway track arc welders.
- e) Rules for implementation of a scheme for the education, training, qualification and certification procedures for railway track arc welders. .
- f) Pilot courses with qualification and certification (including development and translation of education and training material into national languages for the sole use of the partners where the pilot courses will be held and the preparation of examination questions and practical tests for assessment).
- g) An organisation for operating and maintaining the harmonised system

### **3. PROJECT STRUCTURE**

The project involves 6 partners, one of whom (TWI Ltd) also provides the project management which involves the planning and control of contracting and financial aspects. One of the other partners (RI) acts as project coordinator dealing with the preparation, guidance, progress and quality control of all activities.

Overall, 5 countries are represented in the project. The partners involved provide a combination of experience and expertise that embraces on an industrial scale commercial interests involved in the welding of rail. Each partner, therefore, has a specific role within the project that reflects their involvement and experience as outlined in the following table.

<b>Project Partner</b>	<b>Industrial Activity</b>	<b>Project Role/Activity</b>
TWI Ltd	Research and technology institute. Training and certification of personnel.	<ul style="list-style-type: none"> <li>- Develop draft performance objectives for arc welding of rail.</li> <li>- Host and organisation workshop on industry performance requirements (track arc welder's education and training).</li> <li>- Prepare guideline on the training and certification of arc welders of rail.</li> <li>- Prepare educational material for training of arc welders of rail. .</li> <li>- Conduct and evaluate a pilot training course.</li> </ul>
Ir J B van den Brug Raadgevend Ingenieur (RI)	Engineering consultancy centred on knowledge transfer in welding	<ul style="list-style-type: none"> <li>- Conduct workshops to establish industry requirements on performance objectives for the education and training of railway track arc welders</li> <li>- Conduct European workshop to determine welder training curriculum guidelines.</li> <li>- Prepare plan for an organisation to operate the system.</li> </ul>
Instituto de Soldadura e Qualidade (ISQ)	Research and technology institute. Training and certification of personnel.	<ul style="list-style-type: none"> <li>- Review the draft and final performance objectives.</li> <li>- Review the draft and final curriculum guideline.</li> <li>- Assist in developing education and training material.</li> <li>- Conduct and evaluate a pilot training course</li> </ul>
European Federation for Welding, Joining and Cutting (EWF)	European forum for national welding organisations. Formalises education requirements for welding personnel and provides a European wide structure for the certification of welding personnel.	<ul style="list-style-type: none"> <li>Review the final performance objectives.</li> <li>- Develop examination, qualification and certification procedures.</li> <li>- Prepare rules for implementing the training, qualification and certification system.</li> <li>- Assist in the development of a plan for an organisation to operate the system.</li> </ul>
Svetskommissionen (Swedish Welding Commission) (SWC)	Promotes the development of welding and allied processes to its members.	<ul style="list-style-type: none"> <li>- Review draft performance objectives.</li> <li>- Organise workshop to seek industry requirements on performance objectives for the education and training of railway track arc welders.</li> <li>- Review draft and final guideline.</li> <li>- Assist in developing education and training material.</li> </ul> <p>Development of examination questions</p>
National de Cercetare – Dezvoltare in Sudura si Incercari de Materiale (National R&D Institute for Welding and Material Testing) (ISIM)	Represents the Romanian industry in the education, qualification and certification of welding personnel.	<ul style="list-style-type: none"> <li>- Review draft performance objectives.</li> <li>- Review the draft and final guidelines.</li> <li>- Organise workshop to seek industry requirements on performance objectives for the education and training of railway track arc welders.</li> <li>- Conduct and evaluate a pilot training course.</li> </ul>

#### 4. PROJECT WORK-PACKAGES

The project consists of the following work-packages.

- i) Industry requirements on performance objectives for the education of arc welders for joining and restoration of rails.
- ii) Guideline for education, qualification and certification of arc welders for joining and restoration of rails.
- iii) Rules for implementation.
- iv) Pilot courses with qualification and certification.
- v) Dissemination of the system in Europe; Dissemination plan.
- vi) Quality management including an evaluation of the quality of the output of the project; quality management plan.

#### 5. PROJECT SCHEDULE

The project is scheduled to be carried out over a period of 2 calendar years (24 months). The initial project schedule was amended at the first partner meeting in October 2008. The revised schedule is shown in the table below. Final reports are issued two months after the end of the project.

WP	Description	Time Schedule							
		1st Year				2nd Year			
		Q1.1	Q1.2	Q1.3	Q1.4	Q2.1	Q2.2	Q2.3	Q2.4
1	Industry requirements	■	■	■					
2	Guideline		■	■	■	■	■		
3	Rules			■	■	■	■		
4	Pilot courses				■	■	■	■	■
5	Dissemination	■	■	■	■	■	■	■	■
6	Quality management	■	■	■	■	■	■	■	■

More detailed breakdowns of the schedules for each of the work-packages were prepared which identified when individual parts of each work-package would be completed.

At the time this interim report was prepared (beginning of September, 2009), the following parts of the project were scheduled to have been completed.

Project Task Number	Project Tasks Scheduled to be Complete or Well Advanced by end August 2009
1.1	Preparation of draft (arc welder) performance objectives for education and training
1.2	Execution of 3 Workshops to obtain input and consensus from potential industrial users on the performance objectives for arc welders of rail
1.2	Conduct a survey of national VET systems
1.3	Finalisation of (arc welder) performance objectives for education and training of arc welders of rail
2.1	Preparation of draft Guideline for a harmonised system for education, qualification and certification of arc welders for rail welding
3.1	Preparation of draft rules for the implementation of a harmonised system for education, qualification and certification of arc welders for rail welding

## **6. EVALUATION**

Whilst an assessment to determine whether the project objectives have been met must wait until the project is complete, it is possible at this stage to assess whether the original proposal was realistic and if its schedule is being achieved. Moreover, the results so far obtained can be examined to determine whether the project is progressing in a satisfactory manner and whether it is likely to be completed on schedule and achieve its objectives.

The evaluation is carried out under a series of headings. This commences with an analysis of the proposal to determine whether it was realistic and then follows through a series of headings to evaluate the work completed and the extent to which the partners participated and concludes with an assessment of the potential outcome of the project.

### **6.1 Project Proposal**

The intent of the project, as described in the proposal, was to establish systems in Europe to ensure that arc welders for rail were properly trained and qualified. The proposal recognised that no approved European Guideline existed for the training, qualification and certification of arc welders for rail and the programme incorporates measures to develop an industry wide consensus on what this Guideline should be. Based on this Guideline, work would be conducted to convert the consensus into a practical scheme for the provision of training, qualification and certification of arc welders for the joining and restoration of rail at the European level.

The training of arc welders for rail is an expensive operation. Investment in rail infrastructure is not the same throughout Europe and, whilst there is always a minimum level of activity in every country, the level can vary. Thus, one country's requirements may exceed its existing resource whilst other countries have excess capacity in approved arc welders. However, transferring welders from one country to another can be a problem because of the different ways arc welders are trained and qualified throughout Europe.

The project sets out to overcome this problem and the way the work programme is constructed offers a realistic way whereby this goal can be achieved. The initial work-packages are designed to obtain the industry's views, through consultation and workshops in various European countries, on arc welder performance objectives as well as training and qualification. These views would then be taken into account in work-packages to develop the initial draft Guideline covering how arc welders for rail are to be trained, qualified and certified. Once the Guideline has been prepared, work-packages are included to develop training material and to run pilot courses in order that the material can be evaluated.

The railway industry is a major economic force in Europe and the project team is small in relation to the overall size of this sector. Moreover, vested national interests can have a pronounced influence on the way new technology is adopted and this applies as strongly to matters concerning the welding of rail as to the construction and operation of railway vehicles. The creation of an advisory group and the inclusion, therefore, of a work-

package that is specifically aimed at disseminating the outputs of the project is seen as recognition that effort will be needed to convince organisations outside the project partnership of the value of the work and to encourage them to adopt the project outputs.

Overall, the proposal provides a suitable technical base on which the project can be carried out and in my opinion offers a satisfactory approach to developing a common system for the training, qualification and certification of arc welders for the joining and restoration of rails throughout Europe.

## **6.2 Suitability of Objectives**

The stated objectives for the project, listed in section 2, reflect a particular need in Europe and are considered suitable. The deliverables from the project are achievable and will provide a basis on which the objectives may be accomplished.

## **6.3 Achievement of Objectives**

Whilst at this stage, it is not possible to assess whether the objectives have been achieved as such an assessment will not be possible until after the project has been completed, it is possible to review the progress on the work-packages and assess whether the deliverables in preparation are being developed in a satisfactory manner.

This commences with a brief appraisal of the project administration and the extent to which the partners have participated and carried out the tasks allocated in the project programme. It is then followed by a review of the individual work-packages that have generated results and an evaluation as to whether they have been conducted in accordance with the programme and the extent to which the results contribute to achieving the project objectives.

### **6.3.1 Project Administration**

The administration of the project is split between TWI and RI. TWI provides the management, including financial and contractual matters and arranging partner meetings, whereas RI coordinates and controls the work-packages. To date, there have been 3 partner meetings, 16-17 October 2008, 10 February, 2009 and 5 August 2009 which have been in accordance with the project schedule. Partner attendance has been good.

A Project Guide has been prepared by TWI. This document details:

- Description of organisational structure
- Partner responsibilities
- Partner meetings
- Reporting
- List of deliverables
- Methods of communication
- Financial data recording
- Partner contact details

This, together with the project proposal provides a satisfactory basis for the administration of the project.

### **6.3.2 Partner Participation**

The participation of the partners in attendance at meetings and performing their allocated tasks is an essential requirement for the project to be completed successfully.

Attendance at the three partner meetings has been good with only a small level of non-attendance. Reports in the minutes of partner meetings show that work-packages have been actioned in accordance with the schedule and indicate that the partners have undertaken their tasks in accordance with the project programme. Evaluation of the various documents provides no evidence that this observation is incorrect.

It is concluded, therefore, that in the absence of any reports or observations to the contrary, the partners have been involved in the project as originally intended and that they have completed those tasks allocated that were required to be completed before the end of August, 2009.

### **6.3.3 Work-package 1: Industry Requirements on Performance Objectives for the Education of Arc Welders for Joining, Repairing and Refurbishing Rails**

The purpose of this work-package is to establish industry requirements for the training of arc welders for rail taking account of national vocational education and training systems and the introduction of the European standard on the arc welding of rail, EN 15594.

#### **6.3.3.1 Performance Objectives for Railway Track Personnel**

The principle behind performance objectives is that the objectives identify the specific knowledge and skills a person should gain and demonstrate as a result of the education and training they have received. The performance objectives are defined for the purpose of RAILS SAFE 2 as the expected results of welders completing the training course and achieving qualification.

The key elements of this Work-Package are to conduct workshops with the industry to establish their views on what the performance objectives should be. At the same time, a survey was initiated to determine what national vocational education and training systems existed in Europe or were being developed. Finally, to analyse the collated data and provide a base for the development of Guidelines for the education, qualification and certification of arc welders for rail applications and to present the results at a European seminar for the industry's review and comment.

Work commenced on identifying the arc welder performance objectives for presentation to industry members attending the three workshops. Subsequent to the start of the project, it was decided to incorporate these draft performance objectives into the draft Guideline and to present this for discussion as the three workshops would provide an opportunity to obtain industry feedback on not only the performance objectives but also on the initial Guideline proposals for the training and education of arc welders for rail applications.

The 3 industry workshops were held on 2 April 2009 (Bucharest), 29 April, 2009 (Cambridge) and 19 May 2009 (Malmo). Overall, the workshops attracted 29 participants

representing railway authorities, government departments, rail operators, rail construction companies, rail training schools, rail welding equipment suppliers and research institutes involved in rail R&D and/or vocational personnel certification.

The participants showed a positive attitude to the RAILS SAFE 2 performance objectives. However, in regard to access conditions for a candidate to commence the training course, there was a strong view for previous welding competence although it was suggested that a candidate need have no previous welding experience. In addition, there were a number of proposals dealing with the aspects to be included in the expected competencies of candidates after achieving certification. In two of the workshops, participants were in favour of having two, one for joining of rail and the other for restoration.

The comments raised at the workshops concerning performance objectives have been taken into account in revising the Guideline for arc welding but there are aspects that still require to be resolved and these will be raised at the European seminar which will be held on 11 November 2009.

#### **6.3.3.2 Identification of Relevant European VET Schemes for Rail and Applicable Arc Welder Training and Qualification Documents**

Separate to the development of performance objectives, a survey was initiated to obtain details of national vocational, education and training (VET) schemes for rail arc welding in Europe. Whilst the structure for a European wide system for vocational training is being developed, it is not specific to the rail industry and has yet to be finalised and implemented. Separate to this, the survey has only identified the UK as having an existing VET system for rail arc welder training and qualification. A more satisfactory outcome has resulted, however, from the enquiry into national documentation with input from Slovakia, Croatia, Italy, Czech Republic, Germany and Austria and an inventory of relevant national documents is being compiled. This will be completed when approaches to other countries had been made.

#### **6.3.3.3 Achievement of Work-Package 1 Objectives**

Whilst those aspects of this work-package concerning VET systems and relevant national documentation have not developed as positively or as quickly as was hoped, it is recognised that some information has been received and more may become available. For this reason, these areas will remain open until later in the schedule.

It is noted that the workshops have generated a positive response to the programme and the performance objectives which has generated support for the project. In addition, the workshops have proved valuable in providing a forum to discuss the performance objectives detailed in the Guidelines.

It is noted, however, that in document “Attachment No 1 to RAILS SAFE 2 Workshop Agenda (RAILSAFE2/PRES/RE/RI/JB/090113/3)” there is the statement that “The RAILS SAFE 2 system will be designed to provide valuable underpinning material for EN 15594 (Railway applications – Track – Restoration of rails by electric arc welding). The performance objectives in the Guideline (RAILSAFE2/GUIDE/RE/TWITJ/081201/4) do

not make adequate reference to EN 15594 and how the performance objectives meet the requirements for welder training and qualification. In view of this, it is recommended that compliance with EN 15594 should be more clearly identified as a performance objective so that the RAILS SAFE 2 approach can be seen as complying with the European standard for training and qualification of rail arc welders.

#### **6.3.4 Work-package 2: Guideline for Education, Qualification and Certification of Arc Welders for Joining and Restoration of Rails**

Work-package 2 commenced in November 2008 and a draft Guideline (document RAILS SAFE2/GUIDE/RE/TWITJ/081201/4) was completed in February 2009 for presentation and discussion at the Workshops commencing in April 2009. A summary of the current draft (dated 17 August 2009) is given in the following section.

##### **6.3.4.1 Minimum Requirements for the Education, Training, Examination, Qualification and Certification of a European Arc Welder for Railway Tracks (EAWRJ/EAWRR)**

This draft, as indicated above, incorporates the education and training curriculum and the examination procedure. The draft guideline provides a sound base for the education, training, examination, qualification and certification of arc welders for rail applications. The document is to be finalized for the seminar which will take place on 11 November 2009.

The elements covered by the Guideline are as follows:

- Overall structure
- Access to the course
- Instruction programme
- Arc welder instructors (Railway track)
- Examinations and tests
- Entry to welder database

It also includes examples of a welding procedure specification and practical assessment forms as well as projected qualification and certification forms.

Training, qualification and certification follow three routes; the first for joining only; the second for restoration only; and the third for a combination of the two. The overall training and examination hours are 101 hours for joining only, 103 hours for restoration only and 174 hours for joining and restoration. There are seven individual skill modules and the training and examination hours above include the practical hours for one skill module for joining (43 hours), one skill module for restoration (59 hours) and two skill modules for joining and restoration (102 hours).

The skill modules are as follows:

1. Joining rails by MMA welding
2. MMA restoration of plain rail, all rail grade groups

3. MMA restoration of crossings, all rail grade groups
4. MMA restoration of switchblades, all permissible rail grade groups
5. FCAW restoration of plain rail and crossings, all rail grade groups
6. FCAW restoration of switchblades, normal rail grade groups
7. FCAW restoration of plain rail and switch and crossing components using fully automatic equipment

The theoretical part of the training requirements addresses all the elements detailed in section 6.1 of EN 15594. However, it is suggested that the particular defects detailed in Section 7 of EN 15594 be included in the list of defects in Expected Result 1 of Section 1.4.5 in the Guideline.

Both the Guideline and EN 15594 call up EN 287-1 stating this should be used as much as is reasonably practical. However, EN 287-1 is primarily concerned with butt welds and fillet welds for qualification in plate and pipe. This might be adapted for butt welding of rail but is very different to the restoration of rail. It is suggested that some default criteria, maybe in the form of WPS, are prepared to cover typical restoration situations. It is widely recognized that some of the arc welding rectification of rail components is extremely difficult and incorporating some WPS to reflect these various situations would seem to be desirable.

EN 287-1 also defines the testing to be carried out on a welder's test piece. These tests include RT, bend tests and fracture testing and are applied in accordance with the notes. These tests are not addressed either in EN 15594 or the Guidelines and it is recommended that some consideration should be given to these.

#### **6.3.4.2 Achievement of Work-Package 2 Objectives**

The main purpose of Work-Package 2 is to develop the Guideline based on the performance objectives established in Work-Package 1 to a stage where it can be presented to a wider group from the rail industry at the European Seminar on 11 November 2009. An earlier version of the Guideline that will be presented to this Seminar has already been presented to small groups of organisations in the rail industry and modified to take account of the input received. It is this amended version that will be presented at the November 11 Seminar.

As a result of the progress that has been achieved, it is considered that the objectives applicable to this stage of the project and that the draft Guideline is in a satisfactory state for presentation at the forthcoming European Seminar.

#### **6.3.5 Work-Package 3: Rules for Implementation**

Work on this package commenced in June 2009. A draft set of Rules for the implementation of a harmonized system for education, qualification and certification of arc welders for joining and restoration of rail has been prepared based on the harmonized system developed in the RAILS SAFE 1 project for aluminothermic welders in order that they can be integrated with the established system.

This draft is under review by the partners and, when completed and any necessary revisions made, will be incorporated into the presentations at the 11 November 2009 European Seminar.

#### **6.3.5.1 Achievement of Work Package 3 Objectives**

Whilst this Work-Package is only half way through its scheduled timescale, a draft set of Rules has been prepared and these are now being reviewed by the partners in order that they can be presented at the European Seminar. The current level of progress is in accordance with the work schedule and achievement of the Work-Package objectives at this stage can be considered as being progressively met.

#### **6.3.6 Other Work-Packages**

The only other Work-Package of significance that is relevant at this time is number 5 dealing with the dissemination of the system in Europe. A number of actions have already been initiated in addition to the workshops already carried out or planned.

From an early stage, a website was established for RAILSsafe 2 and this gives details about the programme and makes available the documents used for the workshops in Work-Package 1. Separate to this an Advisory Group of key personnel from the rail industry has been created and a member of this Group will make one of the presentations at the European Seminar in November. The documents used for the workshops in Work-Package 1 have been issued to this Group and a meeting is arranged for the Group on 10 November 2009 in London.

In view of these current activities, it is considered that the project team has made a sound start to the dissemination of information about RAILSsafe 2 at this stage of the project.

### **6.4 Progress**

As has already been indicated, an evaluation as to whether the objectives have been met must wait until the end of the project. However, at this interim stage, it is possible to assess the level of progress of the project in relation to the original programme and to assess whether this progress is consistent with the original intent of the project.

Overall, it is evident that progress is in line with the modified project schedule and there is no evidence to suggest that the work programme will not be completed by the scheduled end date (30 September 2010). The documentation developed to date is of a good standard and there is every reason to believe that the work-packages will be completed satisfactorily and the planned objectives achieved.

## **7. OVERALL ASSESSMENT**

The purpose of this report was to give an interim assessment of the RAILSsafe project. The approach to do this has involved an assessment of the project itself, an examination of the organisation and the involvement of its partners, a review of project results and an appraisal as to how likely the project objectives will be achieved.

Whilst the project goal may be seen as a means of triggering a European structure that adopts and implements on a European scale a harmonised system for the training, qualification and certification of arc welders for joining and refurbishment of rails, the objectives are more realistic. These centre on developing a harmonised system of training and qualification that becomes operational and forms the basis for the growth of a European system. In this sense, the project is moving towards these objectives and there is nothing to suggest that it will not be successful by the time the project comes to a close.

What is probably the biggest difficulty for the project is to develop systems for training and certification of rail welders that will achieve widespread support from the rail industry. From the beginning, the project has set out to involve the rail industry in its programme and there has been useful feedback and a recognition in some quarters that the work being done is useful.

In the course of this interim assessment, a number of recommendations have been made that bear on the outputs of the project which in turn could have a major bearing on the eventual acceptability of the systems that are developed. It is to be hoped that these recommendations will be considered by the project partners.

In conclusion, therefore, the quality of the work has been found to be of a consistently high level and progress has been found to be in accordance with the amended project schedule. As a result, there is every expectation that the project will conclude successfully and that the objectives set will be achieved.

Report prepared by Eur Ing Dr David Shackleton  
26 September 2009