Course Programme 2015

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Content

Abbreviations

AT	aluminothermic
FCAW	Flux cored arc welding
SAW	Submerged arc welding
SMAW	Stick metal arc welding

1 Foreword

Course participants, who are welders by profession, are accustomed to the 'free life' of the construction site. For this reason, many of these experience difficulties in finding themselves back in the classroom.

With this in mind, *Cerncic* has spent many years developing a variety of applied teaching methods, which have been continually improved over the years in collaboration with experienced pedagogues to meet the needs of the profession and to optimize the courses offered.

All training courses are designed to achieve a profound growth of knowledge with maximum skills development in the minimum of time.

A typical day of training consists of one half each of theory and practical training. All fundamental knowledge is imparted to the participants comprehensibly in accordance with their level of knowledge. Complexities are elucidated by means of simple examples (see for example www.cerncic.at → VideoClips → "The Cooling Down of Rail Steel when Welding. What Are the Benefits of Preheating?").

The courses always commence with a Preliminary Test and conclude with a Final Test (or where appropriate, an Examination). This kind of monitoring notes the progress achieved by the participant during the training course.

The training program consists of long-standing, proven courses; however, courses may be combined, with or without a particular focus, to suit individual customer requirements. It makes sense to include special topics that can be chosen by the customer.

In the training courses emphasis is placed on understanding the subject matter. Consequently, it is not necessary to spend hours memorizing regulations.

Key Topics

Some training courses include so-called key topics: these are the result of quality assurance observations during the previous season, customer complaints, damage and special customer demands etc.

Language

The training courses may be held in German, English or Spanish. Participants must be sufficiently proficient in the relevant language. A knowledge of the theoretical basics is indispensable for working to high-quality standards. Therefore, it is essential to have a sound understanding of the explanations during training.

Examinations

Participants of beginners' courses are informed at the close of their training whether they have reached a sufficient level to pass an examination. Separate days are reserved for these (not a day of training).

Prices and terms

All prices are net prices per participant and are stated in euros. Travel expenses will be charged depending on the venue and duration of the training course. All tools and consumables are to be provided by the customer (please refer to 'Checklists for Training Courses' – download area of homepage www.cerncic.at)

Equipment

Participants are required to use their own equipment. The condition of the equipment is always discussed or examined during the course of an examination.

Competence

Cerncic has been an officially approved training and examining facility for the Austrian Federal Railways ÖBB since 2008. Extensive knowledge of damage inspections together with research work has enriched the training course content. Certification as a court-sworn independent expert for rail welding, continuously welded track and rails, and turnout and crossing materials was obtained in 2011.

References

Bahnbau Wels, Florianer Bahn Service, Graz Köflach Bahn, Goldschmidt Thermit, Linz Linien, LogServ, Österreichische Bundesbahnen, Porr Eisenbahnbau, Railtech Plötz, Raaberbahn, Salzburger Lokalbahn, Stern & Hafferl, Strabag Eisenbahnbau, Swietelsky Eisenbahnbau, Voest Alpine Instandhaltung, Voest Alpine Schiene, Weichenwerke Wörth, Wiener Linien, WIFI u.a.

Please do not hesitate to contact me if you have any further questions or enquiries.

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Wishing beautiful weldings!
Thomas Cerncic

2 Everything to do with welding …

Torch Cutting

Grinding

Supervision
Acceptance

Continously
Welded Track

Assessing
Turnout Frogs

2.1 Torch Cutting of Rails – Beginners

Duration:
2 days

Number of participants:
min. 4, max. 8

Price (€, net)
455,–
185,– examination

Course Description in Brief:

- Participants acquire a sound basic knowledge of rail materials and the associated risks when handling or cutting these
- At the end of the training course, each participant is expected to be able to make a usable torch cut of a rail
- Cutting is taught without any supports (freehand), thereby enabling the participants to utilize the flexibility of this torch cutting system in difficult positions

Participant Requirements:

- A basic knowledge of rail systems is desirable

Course Contents:

- General principles of torch cutting
- Metallurgical principles of rail materials
- Identification of individual rail grades and proper handling of the materials when torch cutting
- Practical exercises: Torch cutting
- Discussion of typical torch-cutting defects
- Essential safety-related requirements
- Optional: Qualifying examination (theoretical and practical) as a certified torch cutter (in accordance with valid regulations)

2.2 Grinding of Rail Joints – Beginners and Advanced

Duration:
1 day / 2 days

Number of participants:
min. 4, max. 8

Price (€, net)
245,– (1 day)
230,– (per additional day)

Course Description in Brief:

- Participants acquire a sound basic knowledge of the relationship between surface geometry and the dynamic wheel
- Grinding is trained preferably on GEISMAR MP12 but also on ROBEL 13.44
- Grinding is taught on the basis of a stage model covering the complex motion produced by the oscillating grinding machine, changing the angle of inclination and the vertical feed motion of the grindstone at the beginning and end of the area to be ground, separated into various partial movements. These steps are trained until the participant can perform each movement confidently and accurately. Finally, each single movement is combined to form a complex whole. Using this training system, an individual with average talents is able to produce high-quality grinding work within one day

Participant Requirements:

- A basic knowledge of rail systems is desirable

Course Contents:

- Basic principles of surface geometry and track guidance
- Discussion of grinding errors
- Practical exercises: Grinding
- Essential safety-related requirements
- Please note: The examination is usually performed in combination with a Welder Examination but may be undertaken separately if desired

2.3 Supervision and Acceptance of Rail Welding Work – Beginners and Advanced

Duration:
2 days

Number of participants:
min. 4, max. 10

Price (€, net)
455,–

Course Description in Brief:
Upon completion, the course participants should:

- have sufficient fundamental know-how and be able to apply it
- be able to detect factors influencing quality during welding and to be able to calculate any risks and initiate measures where appropriate
- be able to conduct a qualified acceptance upon completion of welding work

Participant Requirements:

- Supervisors of railways, welding companies and railway construction companies
- Government officials for infrastructure who wish to acquire a better understanding of welding work on rail systems

Course Contents:

- Basic principles of welding
- Metallurgical principles of rail materials (explained in an easily comprehensible way!)
- Knowledge and identification of individual rail grades and proper handling when welding the material
- Discussion of typical cutting, welding and grinding errors
- Practical exercises: Inspection and acceptance of welding work
- Optional: Qualifying examination

2.4 The Production of a Continously Welded Track – Beginners and Advanced

Duration:
2 days

Number of participants:
min. 4, max. 8

Price (€, net)
455,–

Course Description in Brief:
Upon completion, the course participants should:

- have a basic understanding of how a continuously welded track functions
- know what is required to produce one
- be able to calculate the necessary elongations for a specific temperature
- be able to identify any risks
- be able to neutralize a track
- be familiar with statutory regulations

Participant Requirements:

- Foremen and polishers – rail track
- Head of welding squads
- Rail track commissioners

Course Contents:

- Basic principles of continuously welded track
- Activity arising from temperature changes in the track and the resultant effects
- Methods to obtain a neutral temperature
- Technical prerequisites applying to the track
- Practical exercises: Simple calculations, installing a rail stressor and / or applying rail heaters
- Optional: Examination

2.5 Assessing Turnout Frogs – Beginners and Advanced

Duration:
2 days

Number of participants:
min. 4, max. 8

Price (€, net)
455,–

Course Description in Brief:

- An essential aspect of resurface welding on turnout parts is assessing which method to apply depending on local needs (industrial railway vs. high speed track) and whether it would be more appropriate to grind or to repair weld
- Participants acquire a sound basic knowledge of the relationship between surface geometry and the behaviour of the dynamic, passing wheel, track guidance, and an understanding of the processes involved when the wheel passes over the frog
- Discussion of the peculiarities and behaviour of special materials in the assessment (e.g. manganese steel if required by the customer)
-

Participant Requirements:

- Build-up Welder – both beginners and advanced
- Infrastructure commissioners, who want to improve their skills in evaluating their turnouts and frogs and in estimating the labour required

Course Contents:

- General principles of the surface geometry of turnouts, track guidance and the wheel transition area
- Basic principles of metallurgy (carbon steels and special steels if applicable such as nickel martensite and manganese steel)
- An understanding of the dynamic actions occurring during the transition of the wheel in the area of the frog tip
- Discussion of typical welding and grinding defects
- Practical exercises: Assessment of frogs
- Optional: Examination

3 Rail Joint Welding

Stick Electrodes (SMAW)
Innershield (FCAW)
Welding

Aluminothermic
Welding

Flash-Butt
Welding

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3.1 Rail Joint Welding (SMAW, FCAW) – Beginners

Duration:

3 days
additional days are optional

Number of participants:

min. 4, max. 8

Price (€, net)

695,– (3 days)
230,– (per additional day)
275,– examination

Course Description in Brief:

- Rail joint welding (principally Vignoles rails).
  with stick electrodes or self-shielded wire (Innershield)
- The course aims to provide participants with the skills necessary to produce an accurately welded rail joint. The training course places emphasis on producing a high-quality weld of the rail base; rail bases are welded until the participant is able to weld without any defects. (Welded samples are broken and the broken area discussed with the welder to enable him to improve his skills.)
- In addition, training is provided in torch cutting and grinding of the welded joint, depending on the time available and customer requirements

Participant Requirements:

- Fundamental knowledge of the skills required for track and track maintenance
- Good skills in electrode welding are essential

Course Contents:

- General principles of welding
- Fundamentals of the metallurgy of rail materials, made easily comprehensible
- Identification and detection of individual rail grades and proper handling (welding) of the material
- Practical exercises: Welding and aligning of railends
- Additional, depending on the time available:
  Discussion of typical rail welding defects and their causes,
  Grinding and torch cutting exercises
- Essential safety regulations
- Optional: Examination (theoretical and practical) culminating in a Test Certificate when successful

3.2 Rail Joint Welding (SMAW, FCAW) – Advanced

Duration:
2 days

Number of participants:
min. 4, max. 8

Price (€, net)
455,– (2 days)
275,– examination

Course Description in Brief:

- Improvement of skills in welding rail joints (Vignoles, grooved or crane rails) with stick electrodes or self-shielded wire, as well as grinding and torch cutting
- In addition, the ability to identify potential risks when welding, torch cutting and grinding is improved
- Possible focus on additional aspects such as the surface geometry of the welded joint, welding defects and special rail grades, depending on customer requirements

Participant Requirements:

- All participants must offer proof of having successfully completed the Welder's Qualifying Examination

Course Contents:

- General principles of welding
- Metallurgical principles of rail materials
- Knowledge and identification of individual rail grades and proper handling of the material (welding and torch cutting)
- Practical exercises: Welding, grinding and torch cutting
- Discussion of typical rail welding, grinding and torch cutting defects
- Essential safety regulations
- Optional: Examination (theoretical and practical) culminating in a Test Certificate when successful

3.3 Aluminothermic Rail Joint Welding – Beginners

Duration:

3 days
additional days are optional

Number of participants:

min. 4, max. 6

Price (€, net)

695,– (3 days)
230,– (per additional day)
275,– examination

Course Description in Brief:

- The procedures of cutting the gap, aligning, positioning the mould, preheating, welding, shearing and rough grinding are discussed and trained in detail
- Torch cutting and superfinishing are trained likewise in detail (see also Courses 'Grinding of Rail Joints' and 'Torch Cutting of Rails').

Participant Requirements:

- A basic knowledge of the skills relating to track and track maintenance are required
- The participant must have been a member of an aluminothermic welding squad for at least one season

Course Contents:

- General principles of welding
- Metallurgical principles of rail materials
- Knowledge and identification of rail grades and proper handling of the material (welding and torch cutting
- Practical exercises: Welding, grinding and torch cutting
- Discussion of rail welding, grinding and torch cutting defects
- Optional: Qualifying examination (theoretical and practical) culminating in a Welder's Certificate

3.4 Aluminothermic Rail Welding – Advanced

Duration:
2 days

Number of participants:
min. 4, max. 8

Price (€, net)
455,–
275,– examination

Course Description in Brief:

- Improvement of skills in welding rail joints (Vignoles, grooved or crane rails) with stick electrodes or self-shielded wire, as well as grinding and torch cutting
- The ability to identify potential risks in welding, torch cutting and grinding is improved .
- Possible focus on additional aspects such as the surface geometry of the welded joint, welding defects, compiling work reports and tool maintenance, depending on customer requirements

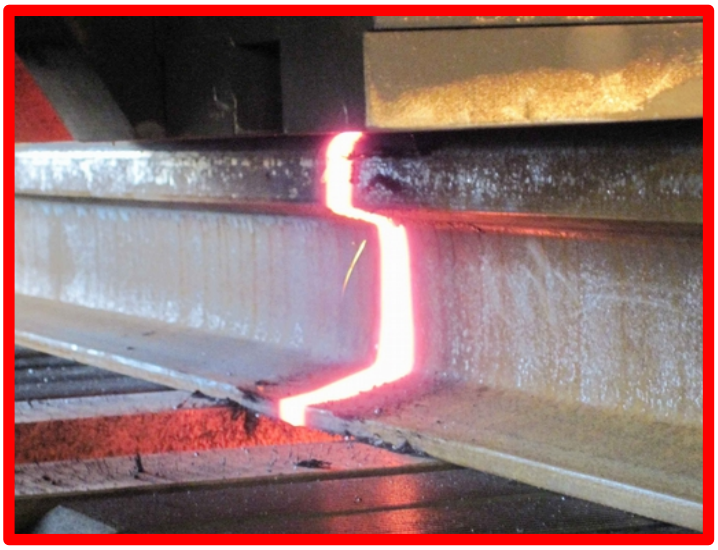
Participant Requirements:

- All participants must offer proof of having successfully completed the Welder's Qualifying Examination

Course Contents:

- General principles of welding
- Metallurgical principles of rail materials
- Knowledge and identification of rail grades and proper handling of the material (welding and torch cutting
- Practical exercises: Welding, grinding and torch cutting
- Discussion of rail welding, grinding and torch cutting defects
- Points of interest mutually agreed upon with the customer
- Essential safety regulations
- Optional: Qualifying examination (theoretical and practical) culminating in a Welder's Certificate

3.5 **Flash Butt Welding** – Beginners and Advanced



Duration:
2 days

Number of participants:
min. 4, max. 6

Price (€, net)
455,–
price for examination
on demand

Course Description in Brief:

- Improved understanding of the procedure involved in producing flash-butt welds on rail tracks
- In addition, the ability to identify potential risks when welding is improved
- Possible focus on additional aspects such as the alignment of rails, surface geometry and welding defects etc., depending on customer requirements

Participant Requirements:

- All participants are required to have spent a few months working with a flash-butt welding machine, or must be a qualified welding operator approved to DIN EN 1418 standards

Course Contents:

- General principles of welding
- Metallurgical principles of rail materials
- Knowledge and identification of rail grades and proper handling of the material
- Practical exercises: Welding, and grinding if applicable
- Points of interest mutually agreed with the customer
- Discussion of typical rail weld defects
- Essential safety regulations
- Optional: Qualifying examination culminating in a Welding Operator's Certificate

3.6 Rail Joint Welding – High Strength Grooved Rail (AT, SMAW, FCAW) – Advanced

Duration:
1 day

Number of participants:
min. 4, max. 8

Price (€, net)
245,–
275,– examination

Course Description in Brief:

- The workshop aims to extend the welder's know-how to meet the challenging needs of a 340GHT grooved rail
- Implementation of this specific knowledge in a skilled weld

Participant Requirements:

- Aluminothermic, Innershield and Stick Welders with at least 2 years' experience
- Must be in possession of a valid Welding Test Certificate for rails

Course Contents:

- General principles of welding
- Metallurgical principles of rail materials
- Knowledge and identification of rail grades and proper handling of the material
- Practical exercises: Welding
- Discussion of typical rail welding defects
- Optional: Qualifying examination (theoretical and practical) culminating in a Welder's Certificate

4 Build-up Welding

Build-up Welding
Turnout Components

Build-up Welding
Grooved Rails (SAW)

4.1 Build-up Welding Turnout Frogs – Beginners

Duration:
5 days

Number of participants:
min. 4, max. 6

Price (€, net)
1150,–

Course Description in Brief:

- Identification of materials in the turnout frog
- Understanding of the processes that take place during the transition of the wheel at the frog tip
- Assessment of turnout frogs
- Regeneration by grinding and/or welding
- Raising an awareness of possible errors when grinding and welding

Participant Requirements:

- Build-up welders, who are beginners, must have been part of a welding squad for at least a season
- Basic skills in stick and Innershield welding are required, together with adequate skills in using the arc

Course Contents:

- Basic principles of build-up welding, surface and frog geometry, track guidance and the wheel transition area
- Metallurgical principles and identification of carbon steels or special steels, if applicable, such as nickel martensite and manganese steel
- Discussion of typical errors when measuring, welding and grinding
- Practical exercises: Assessing, welding and grinding frogs
- Optional: Examination

4.2 Built-up Welding of Turnout Frogs – Advanced

Duration:
3 days

Number of participants:
min. 4, max. 6

Price (€, net)
695,–

Course Description in Brief:
Consolidated and improved understanding of

- turnout materials
- the processes occurring during the transition of the wheel
- the assessment of turnouts
- regeneration through welding and grinding
- possible defects when build-up welding and grinding

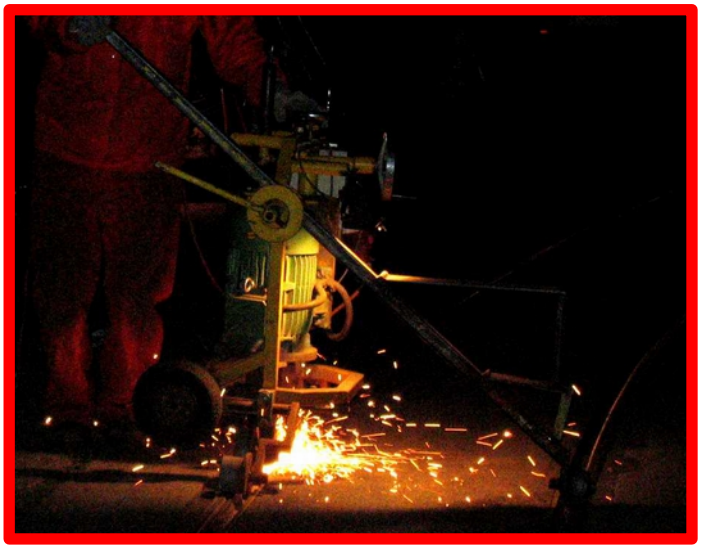
Participant Requirements:

- Only build-up welders with several years' experience

Course Contents:

- Basic principles of build-up welding, and surface and frog geometry of turnouts as well as track guidance and the wheel transition area
- Consolidation of metallurgical principles with particular emphasis on carbon and special steels (nickel martensite and austenitic manganese steel)
- Discussion of typical errors when measuring, welding and grinding as well as those occurring in auxiliary work
- Practical exercises: Assessing, measuring, welding and grinding frogs
- Optional: Examination

4.3 Build-up Welding of Grooved Rails (SAW) – Beginners and Advanced



Duration:
3 days

Number of participants:
min. 2, max. 4

Price (€, net)
695,–

Course Description in Brief:

- Participants acquire a sound basic knowledge of rail material, welding and grinding
- Improving the ability to identify and handle riscs of environmental influences (temperature, weather)
- Improving skills on welding and grinding machine

Participant Requirements:

- welders with basic knowledge of SAW welding and grooved rail superstructure

Course Contents:

- General principles of welding
- Metallurgical principles of rail materials
- Knowledge and identification of individual rail grades and proper handling of the material
- Practical exercises: Welding, grinding
- Discussion of typical rail welding, grinding and defects
- Essential safety regulations
- Optional: Examination (theoretical and practical) culminating in a Test Certificate when successful

5 Impressions

Mobile Rail Breaking Device

A view into the weld is mostly a good motivation for further improvements ...

Kinder Uni 2011- TU WIEN

Kids give a clear feedback if explanations are easy to understand, interesting and so on. The best check possible for the quality of a training!

Collection of broken Rails and Welds

This collection is a result of decades. It contains the nearly all common failures of rail and weld fractures and damages. Samples are used to enrich the training: Theoretical knowledge is applied when assessing one of those pieces …

The photograph shows an extract of the collection …

Trainings

Some impressions …

Aluminothermic Welding
Florianer Bahn Service / Austria

Aluminothermic Welding
Federal Railways ÖBB / Austria

Torch Cutting
Swietelsky / Austria

Stick Electrode Welding
Stern&Hafferl / Austria

Build-up Welding
Federal Railways OBB / Austria

Supervision & Acceptance
Wiener Linien / Austria

Build-up Welding
Federal Railways OBB / Austria

Build-up Welding
PORR / Austria

Geometry of Welded Joint
Kiefer / Germany

Stick Electrode Welding
L.Weiss / Estonia

… and many others!

Contact me!

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