Education and Culture

Leonardo da Vinci

Course: 141 - TIG WELDING OF STAINLESS STEEL

Module-1

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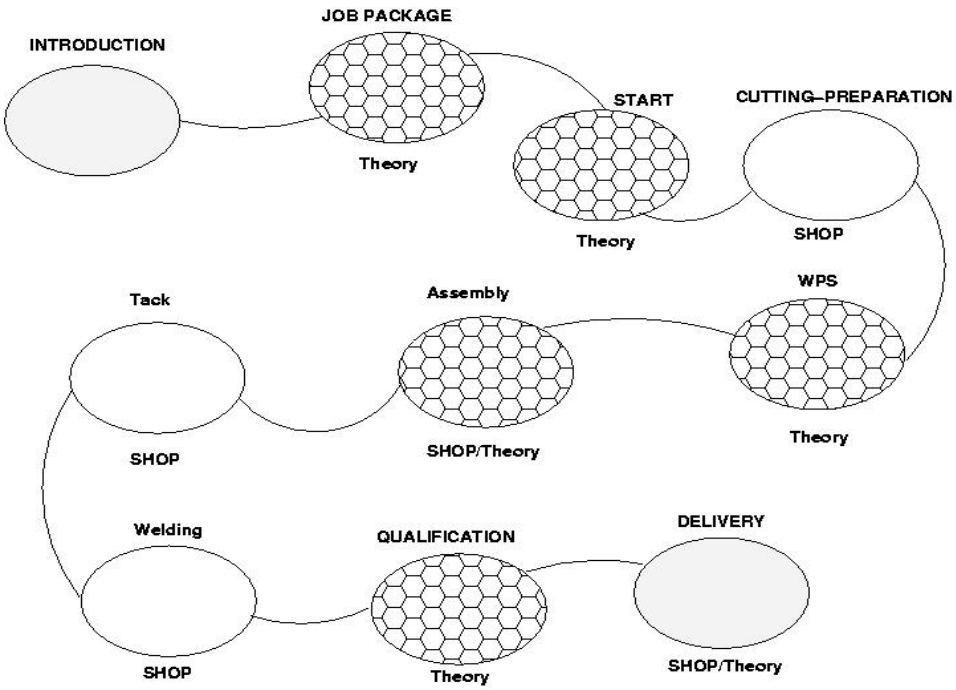
MODULE 1

Activity Based Training

Instead of utilizing the traditional methodology whereby the student moves through a traditional education with theoretical content from A to Z, followed by hands on training, this course will use an Activity Based Training (ATB). With ATB it is understood that the training follow the production activities according the production path of a predefined structure or product. The course will also exploit a blended approach whereby different delivery technologies for the content itself will be used.

The course has been divided into 9 different modules and three of these are modules where the major part of the hours will be utilized for practical work. This means that the students have to participate together in a workshop or laboratory.
This is an important aspect of the methology itself. When working in an industrial environment the student has to work together with other personnel in order to meet the requirements in quality, time schedules and so forth. The team building effort, its importance for the final product and its importance for the total quality of the production environment must be stressed during the educational process.
In a welding environment today the students will work together with other persons from different cultures, with different educational backgrounds and with different practical experience, which will require a profound focus on flexibility and open minded attitude towards other people. Few if any other educational routes will demand such flexibility to the student itself and to the students behaviour on a short and long term basis.



The course will consist of several job-elements. The figure shows how one job-package is built up of different elements, some are pure theory elements and other is a mixture of theory and hands-on training. The training will be carried out in the workshop, shop, or in a laboratory. Video streaming and/or videoconferencing will be used in Shop/Theory packages.

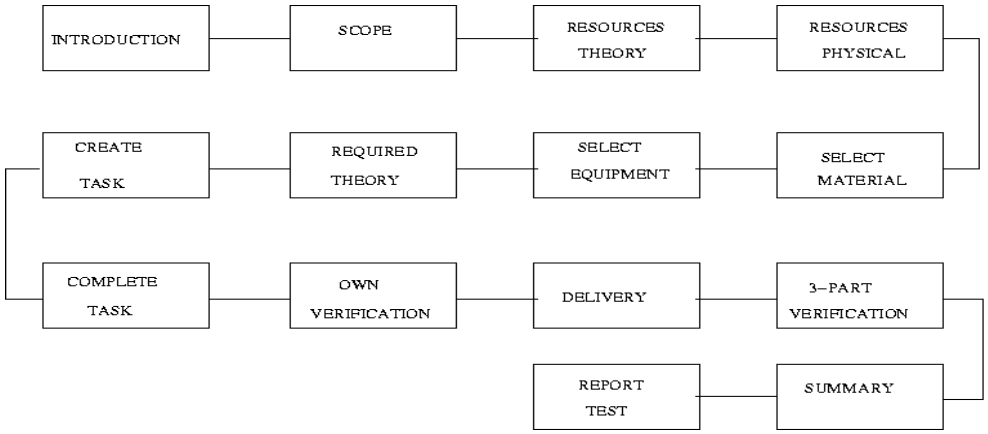
Job Package.

A job package might contain several job elements. A job package is a complete documentation package of specific activities that must be mastered in the welding industry in order to handle the whole production process. It contains at least the following information:

i. Drawing of the structure to be fabricated
ii. Work description with which methods shall be used in the production
iii. Work description with process description of the work process for reaching the target and the knowledge required
iv. Quality assurance requirements for the ingoing elements
v. Quality assurance description of the outgoing elements
vi. Work package description for the work to be done
vii. Reference to available resources for the work
viii. Reference to environmental resources or requirements or restrictions
ix. Requirements for knowledge, prerequisite or knowledge that has to be obtained
x. Cooperation strategy with other in a defined group or to related groups

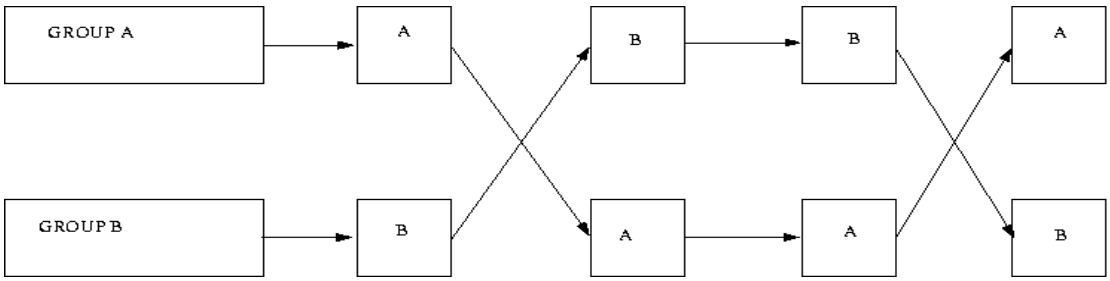
However, some basic prerequisite knowledge must be mastered by the production staff in order to follow the knowledge requirements. The knowledge and competence requirements include:

- Ability to work in a multicultural environment with the colleagues due to exchange of mobile personnel across borders and among mechanical industry companies
- Ability to understand and communicate the content in the job packages to the colleagues in a multilingual working environment
- Ability to understand his/her responsibility in the production chain and to communicate the need for knowledge.
- Ability to search for relevant learning and training material when needed.
- To understand how a process plan might be visualized by utilizing a project plan.



A general design of a learning element. This element consists of both theoretical content as well as practical work. We can also see that the practical task, when completed shall be verified by the student as well as by a 3-part. This will both ensure that the student feel responsible for the part itself, but also be aware of the quality assurance aspect which is very important withing the welding activities. This is a simplified design where no loops are included in the process flow.

A central philosophy within fabrication is that the person who produce a product shall not be the one carrying out the quality control of the same product. To establish the same methology in education one aims at introducing an alternative production flow whereby the product alternate between students or student groups.



A product is alternating between students during the fabrication process. When produced by student A at a certain stage then student B will carry out the quality control of the part. Student B will then use the part from A in his own production and then transfer it back to A for the following quality control.

This means that the students shall be familiar with and use the definitions and actions that are common in the industry. It will consequently be mandatory to switch the objects for this purpose in order to avoid that a person verifies himself. If defects or non-conformance is found then the necessary corrective actions have to be carried out by the student.

The use of objects should reflect the typical industry environment that is domination in the area where the course is held in order to create a more relevant training domain. But when this is done, then he other examples and references in the material should be selected from a similar industrial background in order to make tis relevant fro the student .

Delivery.

The structure described here is a structure that can be used in different environments. The structure has not been designed for a special delivery method. However, when that has been said, it is possible to use a highly structured an d rigid structure whereby you may control an verify all steps of the student,
If that is the correct way of carrying out the course is of course another question.
The structure that follows is a an idea of which elements that a course should contain, if its running as a web course or if its running as a face-to face course without having access to the web itself.

Normative references
In the following table is a list of some of the European (EN) standards within the welding sector. This list is not complete.

Bold documents are of special importance

DokNo	Name	Year
EN 287-1	Qualification test of welders - Fusion welding - Part 1:Steels	3. 2004
EN ISO 9606-2	Qualification test of welders - Fusion welding - Part 2:Aluminium	1. 1999
EN ISO 9606-3	Qualification test of welders - Fusion welding - Part 3; Copper and copper alloys	1. 1999
EN ISO 9606-4	Qualification test of welders - Fusion welding - Part 4: Nickel and nickel alloys	1. 1999

EN ISO 9606-5	Qualification test of welders - Fusion welding - Part 5: Titanium and titanium alloys	1. 1999
EN ISO 15607	Specification and qualification of welding procedures for metallic materials - General rules (ISO 15607:2003)	2004
EN ISO 15609-1	Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO 15609-1:2004)	2004
EN ISO 15614-1	Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2004)	2004
EN ISO 15610	Specification and qualification of welding procedures for metallic materials - Qualification based on tested welding consumables (ISO 15610:2003)	2004
EN ISO 15611	Specification and qualification of welding procedures for metallic materials - Qualification based on previous welding experience (ISO 15611:2003)	2004
EN ISO 15612	Specification and qualification of welding procedures for metallic materials - Qualification by adoption of a standard welding procedure (ISO 15612:2004)	2004
EN ISO 15613	Specification and qualification of welding procedures for metallic materials - Qualification based on pre-production welding test (ISO 15613:2004)	2004
EN 288-9	Part 9: Welding procedure test for pipeline welding on land and offshore site butt welding of transmission pipelines	1999
EN ISO 3834	Welding coordination - Tasks and responsibilities	2005
EN ISO 3834-1	Quality requirements for welding - Fusing welding of metallic materials - Part 1: Guidelines for selection and use	2005
EN ISO 3834-2	Quality requirements for welding - Fusing welding of metallic materials - Part 2: Comprehensive quality requirements	2005
EN ISO 3834-3	Quality requirements for welding - Fusion welding of metallic materials - Part 3: Standard quality requirements	2005
EN ISO 3834-4	Quality requirements for welding - Fusion welding of metallic materials - Part 4: Elementary quality requirements	2005

EN 756	Welding consumables - Solid wires, solid wireflux and tubular cored electrode-flux combinations for submerged arc welding of non alloy and fine grain steels - Classification	2 2004
EN 970	Non-destructive examination of fusion welds - Visual examination	1998
EN 1011-1	Welding - Recommendations for welding of metallic materials - Part 1: General guidance for arc welding	1998
EN 1011-1/A1	Amendment A1 - Welding - Recommendations for welding of metallic materials - Part 1: General guidance for arc welding	2002
EN 1011-1/A2	Amendment A2 - Welding - Recommendations for welding of metallic materials - Part 1: General guidance for arc welding	2004
EN 1011-2	Welding - Recommendations for welding of metallic materials - Part 2: Arc welding of ferritic steels	2001
EN 1011-2/A1	Amendment A1 - Welding - Recommendations for welding of metallic materials - Part 2: Arc welding of ferritic steels	2004
NS-EN 1011-3	Welding - Recommendations for welding of metallic materials - Part 3: Arc welding of stainless steels	2000
EN 1011-3/A1	Amendment A1 - Welding - Recommendations for welding of metallic materials - Part 3: Arc welding of stainless steels	2004
EN 1011-5	Welding - Recommendations for welding of metallic materials - Part 5: Welding of clad steel	2003
EN 1418	Welding personnel - Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials	1998
EN ISO 4063	Welding and allied processes - Nomenclature of processes and reference numbers (ISO 4063:1998)	2000
EN ISO 5817	Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections (ISO 5817:2003)	2003
EN ISO 6520-1	Welding and allied processes - Classification of geometric imperfections in metallic materials - Part 1: Fusion welding (ISO 6520-1:1998)	1998

EN ISO 6520-2	Welding and allied processes - Classification of geometric imperfections in metallic materials - Part 2: Welding with pressure (ISO 6520-2:2001)	2002
EN ISO 9692-1	Welding and allied processes - Recommendations for joint preparation - Part 1: Manual metal-arc welding, gas-shielded metal-arc welding, gas welding, TIG welding and beam welding of steels (ISO 9692-1:2003)	2004
EN ISO 9692-2	Welding and allied processes - Joint preparation - Part 2: Submerged arc welding of steels (ISO 9692-2:1998) (Corrigendum AC:1999 incorporated)	1998
EN ISO 9692-3	Welding and allied processes - Recommendations for joint preparation - Part 3: Metal inert gas welding and tungsten inert gas welding of aluminium and its alloys (ISO 9692-3:2000)	2001
EN ISO 9692-3/A1	Amendment A1 - Welding and allied processes - Recommendations for joint preparation - Part 3: Metal inert gas welding and tungsten inert gas welding of aluminium and its alloys	2004
EN ISO 9692-4	Welding and allied processes - Recommendations for joint preparation - Part 4: Clad steels (ISO 9692-4:2003)	2003

Page	*Title*	*Comment*

Table with reference literature to be read in addition to the course documentation for the individual modules. This table to be compiled according to the national availability of reference literature.