This information pertains to one of the Training and Dialogue Programs of the Japan International Cooperation Agency (JICA), which shall be implemented as part of the Official Development Assistance of the Government of Japan based on bilateral agreement between both Governments.
I. Concept

Background

Welding technology is applied to various industries such as automobile, aircraft, shipbuilding, steel making, rolling stock, construction of bridges and buildings, electronics, and others. Accordingly, current welding engineering does not simply require the manual skill of welders. The quality and reliability of welded structures and products are assured only when welding is carried out under the supervision of a qualified welding engineer and inspector who have adequate knowledge and experience in welding and inspection technology.

Therefore, it is very important to have qualified engineers who are able to manage practical and theoretical aspects of welding and inspection technology as they apply to the day-to-day running of welding fabrication, construction or maintenance. ISO 3834 “Quality requirements for welding” clearly requires for “Special Process” that the personnel to be involved as well as the welding procedures to be used in it shall be pre-qualified.

In order to bring up well-qualified engineers who are able to manage the welding construction and maintenance, the training program provides theoretical and practical knowledge of welding and inspection technology. Furthermore, as a means of proving what is to be achieved in the program, the international qualification for International Welding Engineer, Welding Technologist, and Welding Specialist has been introduced by the Authorized National Body of Japan (J-ANB) of IIW (International Institute of Welding), and this training program has been approved as an ATB (approved training body) by J-ANB since 2000. In addition, the international qualification for International Welding Inspection Personnel Standard Level (IWI-S) has been added to this program by the J-ANB since 2006.

The training course on welding technology, originally established in 1974, has been held since 1974 at Nagoya International Training Center, JICA as group training course. So far 339 participants from 56 developing countries have completed education and training in this field.

With this background, the group training program on Human Resource Development for International Welding Engineer, fiscal 2009 is organized by Chubu International Center, JICA, focusing on development of qualified welding engineers and professionals. This General Information is for those who intend to apply to the training program.

For what?
The program is aimed to develop internationally qualified welding engineers or inspectors who have adequate knowledge and experiences for the production of welded structures and parts with high quality and reliability in developing countries, and they will be expected to play important roles as core engineers in the field of welding for further developments of their country.
**For whom?**
This program is offered to those (e.g. technician, engineer, researcher, instructor, lecturer) who work in the industrial, academic or public sectors related to welding technology.

**How?**
Participants will have opportunities in Japan to learn fundamental welding technology, theoretical as well as practical technology through lecture, exercise, practice and on-site visits, which are all necessary for proper application of welding technology. Exposed to best practice and professional instructions in Japan, they will develop a greater understanding of how to manage different welding processes including methods of inspection and how to provide teaching and training to future welding engineers in their own country.

Moreover, participants will have chances to take the examinations of 4 (four) technical fields and of the international welding engineer qualification. In addition, the qualification examination of IWIP will also be implemented after the theoretical/practical NDI education. (To be not implemented this year) The pass or fail in the examinations and the level of qualifications become indices.
II. Description

1. Title (J-No.): Human Resource Development for International Welding Engineer (J09 No)

2. Period of program
   - Duration of whole program: June 13-Dec. 23, 2009
   - Preliminary Phase: June 13-July 13, 2009 (in a participant’s home country)
   - Core Phase in Japan: July 13-Dec. 23, 2009

3. Target Regions or Countries
   (Provisional) Indonesia, Philippines, Mongolia, Vietnam, Sri Lanka, Egypt, Jordan, Syria, Mexico, Tanzania, Malaysia, Thailand, Fiji, Turkey, Palestine, Jamaica, Panama, Argentina

4. Eligible / Target Organization
   This program is designed for organizations and industries utilizing welding technology such as welding engineers associations, technical colleges/vocational training schools teaching welding technology, and other organizations relating to welding engineering.

5. Total Number of Participants
   10 participants

6. Language to be used in this program:
   English

7. Program Objective:
   For education and training of internationally qualified welding engineers and inspectors who have adequate knowledge and experiences for the production of welded structures and parts with high quality and reliability in developing countries.

8. Overall Goal
   The quality and reliability of welded structures and products in developing countries are assured only when welding is carried out under the supervision of a qualified welding engineer and inspector who have adequate knowledge and experience in welding and inspection technology. The high quality and reliability of products can be improved by such high level production engineers who have been qualified based on ISO 9000s and IIW Qualification Scheme for welding personnel. (To be not implemented this year)
9. Expected Module Output and Contents:
This program consists of the following components. Details on each component are given below:

(1) Preliminary Phase in a participant’s home country
(June 13-July 13, 2009)
Participating organizations make required preparation for the Program in the respective country.

<table>
<thead>
<tr>
<th>Expected Module Output</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation for Report presentation</td>
<td>Preparation for Job Report presentation in Japan to introduce the present situation related to welding engineering, including job description and interests/expectations to the program.</td>
</tr>
</tbody>
</table>

(2) Core Phase in Japan
(July 13-Dec. 23, 2009)
Participants dispatched by the organizations attend the Program implemented in Japan.

<table>
<thead>
<tr>
<th>Expected Module Output</th>
<th>Subject and Methodology</th>
</tr>
</thead>
</table>
| [1] Welding processes and equipment; To understand the feature of various welding process and be able to describe the reason in selection of the best welding process from the viewpoints of quality, productivity, economy. | Lecture: Principles of welding, electronics, arc physics, equipment  
Exercise: Q & A exercise, discussion  
Practice: Welding, operation of welding equipment/robot  
Plant tour: Manufacturers of welding equipment, Fabricator |
| [2] Materials and their behavior during welding; To understand the mechanical properties of materials, and to be able to describe the reason in selection of materials for fabrication from the viewpoint of weld quality. | Lecture: Destructive testing, metallurgy, heat treatment, structure of weld joint, iron/aluminum alloy etc, welding consumables.  
Exercise: Q & A exercise, discussion  
Practice: Destructive testing, micro structure examination  
Plant tour: Manufacturers of materials |
| [3] Construction and design; To understand the effect of loads and destructive mechanics of structures, and to be able to design the weld structure from the viewpoint of quality/safety of weld structure. | Lecture: Basic theory of structure, joint design, fracture mechanics  
Exercise: Q & A exercise, discussion  
Practice: Destructive testing, fractography  
Plant tour: Manufacturers (shipbuilding, construction, etc.) |
| [4] Fabrication, applications engineering; To understand the influences of welding conditions on the weld quality, and to be able to prepare the WPS from the viewpoint of required quality of structures. | Lecture: Quality assurance, quality control, health and safety  
Exercise: Q & A exercise, discussion  
Practice: Case study  
Plant tour: Manufacturers (shipbuilding, construction, etc.) |
Non destructive inspection
To understand the features of various inspection methods, and to be able to describe the reason in selection of the inspection method and to evaluate the weld imperfections.

Lecture: Principle NDI, types of imperfections
Exercise: Q & A exercise, discussion
Practice: Handling of inspection equipment
Plant tour: Manufacturers (shipbuilding, construction, etc.)

(To be not implemented this year)

<Structure of the program modules>

(i) Theoretical Education (Part 1)

A) Welding processes and equipment
   (1) General introduction to welding technology
   (2) Histories of welding processes
   (3) Fundamental of electricity and electronic
   (4) Physics of welding arc
   (5) Power sources for arc welding
   (6) Manual arc welding with covered electrode
   (7) Introduction to gas-shielded metal arc welding
       (including MIG/MAG welding)
   (8) Tungsten-inert gas welding
   (9) Submerged arc welding
   (10) Resistance welding
   (11) Electron beam and laser beam welding
   (12) Gas welding and other welding processes
   (13) Surfacing
   (14) Fully mechanized processes and robotics
   (15) Brazing and soldering
   (16) Joint process for plastics and advanced materials
   (17) Welding experiment in laboratory
   (18) Thermal cutting and other edge preparation processes

B) Materials and their behavior during welding
   (1) Manufacture and designation of steels
   (2) Testing materials and the welded joint
   (3) Structure and properties of metals
   (4) Alloys and phase diagrams
   (5) Iron-carbon alloys and the phase diagrams
   (6) Heat treatments of base materials and welded joints
   (7) Structure of the welded joint
   (8) Plain carbon- and carbon-manganese steels
   (9) Cracking phenomena in steels
   (10) Fine-grained steels
   (11) Thermo mechanically treated steels (TMCP steels)
   (12) High strength low alloyed steels and its application
   (13) Low-alloy steels for very low temperature application
(14) Low-alloy creep resistant steels
(15) High-alloy (stainless) steel
(16) Introduction to corrosion
(17) Introduction to wear
(18) Protective layers
(19) Cast irons and steels
(20) Copper and copper alloys
(21) Titanium and Titanium alloys
(22) Aluminum and aluminum alloys and other metals
(23) Jointing dissimilar metals
(24) Metallographic examinations

C) Construction and design for welded structures
(1) Fundamentals of the strength of materials
(2) Basics of the weld design
(3) Design principles of welded structure
(4) Joint design
(5) Fracture mechanics
(6) Design of welded structures under different types of loadings
(7) Design of welding structures with predominantly static loading
(8) Behavior of welded structures under dynamic loading
(9) Design of dynamically loaded welded structures
(10) Design of thermodynamically loaded welded structures
(11) Design of structures of Aluminum and its alloys
(12) Reinforcing-steel welded joints

D) Fabrication, applications engineering
(1) Introduction to quality assurance in welded constructions
(2) Quality control during manufacturing
(3) Welding stresses and distortion
(4) Plant facilities, welding jigs and fixtures
(5) Health and safety
(6) Non-destructive testing
(7) Repair-welding
(8) Economics
(9) Fitness for purpose
(10) Measurement control and recording in welding
(11) Case studies

E) Theoretical Lecture for Welding Inspection Personnel
   (To be not implemented this year)

(ii) Practical Training (part 2)
This part does not aim at practical skills as a welder or welding operator but it is for gaining knowledge on the control of the different welding processes. The participants will become as familiar as possible with the difficulties and typical defects associated with incorrect use of different welding processes.

A) Practical operations
   1) Oxyacetylene (gas) welding and cutting
   2) SMAW (Manual Metal Arc welding)
   3) TIG (GTAW)
   4) MIG/MAG

B) Demonstrations or observations of welding processes
   1) Gouging,
   2) Brazing
   3) Plasma welding/cutting
   4) SAW (Submerged Arc Welding)
   5) Resistance welding
   6) Laser welding
   7) Electron beam welding
   8) Friction welding
   9) Diffusion bonding
  10) Explosion welding
  11) Other processes

C) Short group training in companies for practice
   1) Practice of overlaying
   2) Welding of special metal and alloys
   3) Practical operation of arc welding equipment and robots
   4) Non-destructive inspection

D) Practical Training for Welding Inspection Personnel (IWI-S)

(iii) International Institute of Welding (IIW) examinations

This training program is implemented according to an educational module of IIW. Before completion of the program the participants will have chances to take examinations on International Welding Engineer (IWE), International Welding Technologist (IWT), International Welding Specialist (IWS) and International Welding Inspection Personnel (IWI-S) according to their educational background. The participants will be awarded a Diploma of IIW when they pass the examinations successfully. See Access Conditions to IIW Examinations on page10.

*Remarks: The curriculum is subject to minor changes.

10. Follow-up Cooperation by JICA:
In this program, JICA might extend follow-up support to participating organizations that intend to develop the result of the project further. Please note that the support shall be extended selectively based on proposals from the participating organizations.
III. Conditions for Application

1. Expectations for the Participating Organizations:
   (1) This program is designed primarily for organizations that intend to address specific issues or problems identified in their operation. Participating organizations are expected to use the project for those specific purposes.
   (2) This program is enriched with contents and facilitation schemes specially developed in collaboration with relevant prominent organizations in Japan. These special features enable the project to meet specific requirements of applying organizations and effectively facilitate them toward solutions for the issues and problems.
   (3) Participants are expected to make due preparation before coming to Japan by carrying out the activities of the Preliminary Phase described in section II -9.

2. Nominee Qualifications:
   Applying Organizations are expected to select nominees who meet the following qualifications.

   (1) Essential Qualifications
   1) Current Duties: be presently in charge of welding engineering
   2) Experiences: have more than 3 years of experience in the field of welding
   3) Educational Background: be a university graduate in an engineering discipline or the equivalent
   4) Language: have a competent command of spoken and written English, which is equal to TOEFL CBT 250 or higher. (Experience has shown that some participants find themselves unable to make progress in training because of inadequate command of English). Please attach an official certificate for English ability such as TOEFL, TOEIC etc, if possible.
   5) Health: must be in good health, both physically and mentally, to participate in the Program in Japan.
   6) Must not be serving any form of military service.

   (2) Recommendable Qualifications
   1) Expectations for the Participants:
      Fundamental knowledge of engineering is required
   2) Age: be between the ages of twenty-five (26) and forty (40) years

   (3) Access Conditions to IIW Examinations
   1) International Welding Engineer (IWE): A holder of a diploma from universities or institutes in engineering (minimum 4 years study) or technical universities or medium universities in engineering (minimum 3 years study)
2) International Welding Technologist (IWT): A holder of a diploma of colleges or institutions in engineering (minimum 2 years study)
3) International Welding Specialist (IWS): A holder of a diploma of high schools in engineering, technical high schools, vocational engineering high schools of welding engineering (minimum 3 years study)
4) International Welding Inspection Personnel (IWI-S): A person who has passed the examination of IWE, IWT or IWS.

3. Conditions for Attendance:
   (1) to observe the schedule of the program,
   (2) not to change the program subjects or extend the period of stay in Japan,
   (3) not to bring any members of their family,
   (4) to return to their home countries at the end of the program in Japan according to the travel schedule designated by JICA,
   (5) to refrain from engaging in political activities, or any form of employment for profit or gain,
   (6) to observe the rules and regulations of their place of accommodation and not to change the accommodation designated by JICA, and
   (7) to participate in the whole program including a preliminary (preparatory) phase prior to the program in Japan. Applying organizations, after receiving notice of acceptance for their nominees, are expected to carry out the actions described in section II -9.
IV. Administrative Arrangements

1. Organizer:
   (1) Name: JICA Chubu

2. Implementing Partner:
   (1) Name: JICA Education and Training Committee, The Japan Welding Engineering Society (JWES)
   (2) URL: http://www.jwes.or.jp/
   (6) Remark: The Japan Welding Engineering Society is a non-profit organization founded in 1949, under the authorization of the Ministry of Economy, Trade and Industry, for the purpose of improving and promoting the spread of welding and other related technologies, which are fundamental to industrial development.

3. Travel to Japan:
   (1) Air Ticket: The cost of a round-trip ticket between an international airport designated by JICA and Japan will be borne by JICA.
   (2) Travel Insurance: Term of Insurance: From arrival to departure in Japan. The traveling time outside Japan shall not be covered.

4. Accommodation in Japan:
   JICA will arrange the following accommodations for the participants in Japan:
   JICA Chubu International Center (JICA Chubu)
   Address: 4-60-7 Hiraikecho, Nakamura-ku, Nagoya 453-0872, Japan
   TEL: 81-52-533-0220  FAX: 81-52-564-3751
   (where “81” is the country code for Japan, and “52” is the local area code)
   If there is no vacancy at JICA Chubu, JICA will arrange alternative accommodations.

5. Expenses:
   The following expenses will be provided for the participants by JICA:
   (1) Allowances for accommodation, living expenses, outfit, and shipping
   (2) Expenses for study tours (basically in the form of train tickets).
   (3) Free medical care for participants who become ill after arriving in Japan (costs related to pre-existing illness, pregnancy, or dental treatment are not included)
   (4) Expenses for program implementation, including materials
       For more details, please see p. 9-16 of the brochure for participants titled “KENSHU-IN GUIDE BOOK,” which will be given to the selected participants before (or at the time of) the pre-departure orientation.

6. Pre-departure Orientation:
   A pre-departure orientation will be held at the respective country’s JICA office (or Japanese Embassy), to provide participants with details on travel to Japan, conditions of the workshop, and other matters.
V. Other Information

1. Development Education
   For the promotion of mutual friendship, JICA Chubu encourages international exchange between the JICA applicants and local communities, including school and university students as a part of development education program. The JICA participants are expected to contribute by attending such activities and will possibly be asked to make presentation on the society, economy and culture of their home country.

2. Personal Computer
   Please bring your personal computer with LAN cable, if available, for your convenience on your responsibility.

For Your Reference

JICA and Capacity Development
   The key concept underpinning JICA operations since its establishment in 1974 has been the conviction that “capacity development” is central to the socioeconomic development of any country, regardless of the specific operational scheme one may be undertaking, i.e. expert assignments, development projects, development study projects, training programs, JOCV programs, etc.
   Within this wide range of programs, Training Programs have long occupied an important place in JICA operations. Conducted in Japan, they provide partner countries with opportunities to acquire practical knowledge accumulated in Japanese society. Participants dispatched by partner countries might find useful knowledge and re-create their own knowledge for enhancement of their own capacity or that of the organization and society to which they belong.
   About 460 pre-organized programs cover a wide range of professional fields, ranging from education, health, infrastructure, energy, trade and finance, to agriculture, rural development, gender mainstreaming, and environmental protection. A variety of programs are being customized to address the specific needs of different target organizations, such as policy-making organizations, service provision organizations, as well as research and academic institutions. Some programs are organized to target a certain group of countries with similar developmental challenges.

Japanese Development Experience
   Japan was the first non-Western country to successfully modernize its society and industrialize its economy. At the core of this process, which started more than 140 years ago, was the “adopt and adapt” concept by which a wide range of appropriate skills and knowledge have been imported from developed countries; these skills and knowledge have been adapted and/or improved using local skills, knowledge and initiatives. They finally became internalized in Japanese society to suit its local needs and conditions.
From engineering technology to production management methods, most of the know-how that has enabled Japan to become what it is today has emanated from this “adoption and adaptation” process, which, of course, has been accompanied by countless failures and errors behind the success stories. We presume that such experiences, both successful and unsuccessful, will be useful to our partners who are trying to address the challenges currently faced by developing countries.

However, it is rather challenging to share with our partners this whole body of Japan’s developmental experience. This difficulty has to do, in part, with the challenge of explaining a body of “tacit knowledge,” a type of knowledge that cannot fully be expressed in words or numbers. Adding to this difficulty are the social and cultural systems of Japan that vastly differ from those of other Western industrialized countries, and hence still remain unfamiliar to many partner countries. Simply stated, coming to Japan might be one way of overcoming such a cultural gap.

JICA, therefore, would like to invite as many leaders of partner countries as possible to come and visit us, to mingle with the Japanese people, and witness the advantages as well as the disadvantages of Japanese systems, so that integration of their findings might help them reach their developmental objectives.