End-of-Training Report

Two-Days Training on Quality Assurance/Quality Control in Construction for Earthquake Additional Financing Project AJK, held at Muzaffarabad. (June 30 to July 1, 2010)

Conducted By

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1.0 Background

The World Bank has provided International Donor Assistance (IDA) to Azad Jammu Kashmir (AJK) to support:

(i) The reconstruction / rehabilitation of primary schools,
(ii) The reconstruction and repair of government office buildings and
(iii) The repair of village access roads.

The works are situated in four districts affected by the earthquake. The Project Coordination Unit (PCU) is in charge of the overall management of the implementation activities carried out by the technical line departments of the affected district and sub-district offices.

While most of the civil works activities are being carried out by hired contractors, a relatively new initiative for construction of 99 school buildings through community participation has also been undertaken. This approach was adopted and piloted as an alternative to the competitively contracted works where scattered sites were bundled into packages.

Due to a lack of planning/logistical capacity and the harsh terrain, the contractors faced difficulties in meeting their completion dates. Standard Operating Procedures (SOPs) were developed by the International Labour Organisation's (ILO) Technical Assistance team to assist the PCU in implementing the community awarded works. This has helped the communities, in some cases, to achieve better results than contracted works.

An area of concern was the quality of construction work, especially in the community participated works. There was a general lack of awareness of quality assurance (QA) / quality control (QC) procedures in construction. Validation tests were carried out by a third party (UET Peshawar) and these were both destructive and non-destructive (NDT) in nature. While the Earthquake Additional Financing Project (EAFP) staff is aware of destructive testing methods, NDT is relatively new to them.

2.0 Objectives of the Training

i. Capacity building of the implementers and monitors of construction works to understand the basics of QA/QC in construction.

ii. Reinforce the participants' understanding of the importance of QA/QC procedures.

iii. Improve quality of construction in the field.

iv. To develop a better understanding of NDT techniques as this is relatively new to the PCU engineers.

v. As a result of this training, the EAFP technical staff is expected to be more aware of quality issues and the testing techniques available, to ensure that construction meets specified standards.

vi. Obtain better test results in the field and result in fewer retrofitting/demolition cases at sites.

3.0 Methodology Adopted for the Training

A two-day interactive workshop was organised by the Project Coordination Unit at Muzaffarabad for all technical staff of the EAFP to expose them to current best QA/QC practices. The target group for this training comprised of technical staff of the EAFP (25 persons) handling construction works – both contracted and community works.

The Council for Works and Housing Research was approached by Engr. Naveed Athar Sheikh of M/S EN EM and Associates to submit a technical and financial proposal for imparting training to EAFP Staff on Quality Assurance and Quality Control with emphasis on Non-Destructive Testing Methods. The proposal was accepted by the Project Coordinating Unit, AJK dated 25.6.2010 (Appendix -1 to 4, Pages # 15 to 25)

Day 1 (30.6.2010) was dedicated to classroom presentations, discussions, to provide exposure to the quality concepts. A total of 12 lectures were presented to the participants that covered the following topics:

- Significance of Quality Assurance and Quality Control in Construction
- Non-Destructive Testing For Quality Assurance and Quality Control In Construction
- Re-Bar Data Scan for detection of steel in concrete.
- Micro Core Extraction of concrete cores for assessing quality of concrete.
- Assessing quality by using Re-Bound Hammer Test Method
- Ultrasonic Pulse Velocity Tests for concrete.
- Cut and Pull-Out (CAPO) test Method for concrete.
- Introduction to Advanced NDT Methods.
- Presentation of four Case Studies of actual Non-Destructive Testing conducted by CWHR at several locations for rehabilitation of old/existing concrete structures and verification of the quality of concrete in some on-going construction works.

Training material comprising of handouts and CD's were distributed to the participants during the training session. (See Appendix - 5 to 10, Pages # 26 to 87).

Non-Destructive Testing equipments were also put on display during the class room sessions and participants were motivated to see the equipment. The technicians/trainers were available to give briefing about the use of equipment and responded to the questions raised by the participants.

Day 2 (1.07.2010) was spent in the field to witness and on job use of NDT instruments on project site with hands-on training in the field to improve EAFP staff skills in QA/QC.

An under construction two room primary school located at Baglota near Kohala Bridge, (Tehsil and District Muzaffarabad) was selected by the PCU Officers for demonstrating Non-Destructive Testing on concrete members. The team from CWHR demonstrated the NDT Methods and also allowed the technical staff of EAFP to participate in the testing process and to draw inferences from the results obtained through NDT Methods.

Although, the technical staff of the EAFP was a little sceptical about the complexity of Non-Destructive Testing Methods, however by the end of day, a lot of interest was generated and a sense of confidence was felt amongst the trainees about the reliability/accuracy of test results obtained at site.

(Pictorial report of the two-day training programme is placed as Annexure-1, Pages # 5 to 14)

4. Conclusions and Recommendations of Trainers

Although the participants/ technical staff of EFAP were conscious about the significance of Quality Assurance and Quality Control for construction works, however, most of the participants were not aware of some basic test methods that can be conveniently carried out at site to check and control the quality of materials that are used in construction.

Pre-construction measures, viz. attaining desirable mix proportions by using specified aggregates, cement, water ratio and etc needs to be thoroughly explained to the technical staff, so that desired strength of concrete is achieved. The trainers felt that more extensive training should be imparted, preferably in a laboratory, where simple equipments are readily available for testing the quality of materials used for preparing concrete. Mix design method is the most important area which needs special attention and the technical staff must be thoroughly trained for it.

Third party validation is being carried out by UET Peshawar for all the schools constructed by EAFP. They have assessed the quality of construction using both destructive and non-destructive test methods. On the basis of their tests, the validators have categorised the constructed schools and have passed them or partially passed them subject to their rehabilitation of minor to major nature. Some schools have failed the validation and have been recommended for demolition.

In view of the above comments, the following recommendations are proposed:

i. The CWHR may impart comprehensive training on pre-construction testing of construction materials and train the technical staff in mix design of concrete. The training programme could be conducted at any of the material testing laboratory at Muzaffarabad.

ii. CWHR is equipped with a range of sophisticated equipments that can be truly classified as non-destructive testing equipment as compared to the NDT methods already being adopted at site. NDT equipment are very expensive and require special skills to operate and draw inferences from their results. It is proposed that CWHR may collaborate with UET Peshawar (third party valuators) to check the adequacy of structures already constructed by the EAFP technical staff.

iii. CWHR can depute a four member team comprising of two qualified/well experienced engineers/officers and two technicians to carry out reliable non-destructive tests viz. CAPO Test, Ultrasonic Pulse Velocity Test, Detection of Re-Bars, estimation of their sizes, concrete cover to reinforcement, ascertain the potential of corrosion on concrete due to steel trusses placed on concrete members, vulnerability of concrete members to ingress of moisture that would cause harmful effects during freezing and thawing of moisture within concrete.

iv. In order to avert similar disasters as caused by the October 8, 2005, it is imperative that concrete buildings constructed by the communities as well as through contractors in AJK, must be thoroughly checked/tested before their commissioning and handed over for occupation and use.

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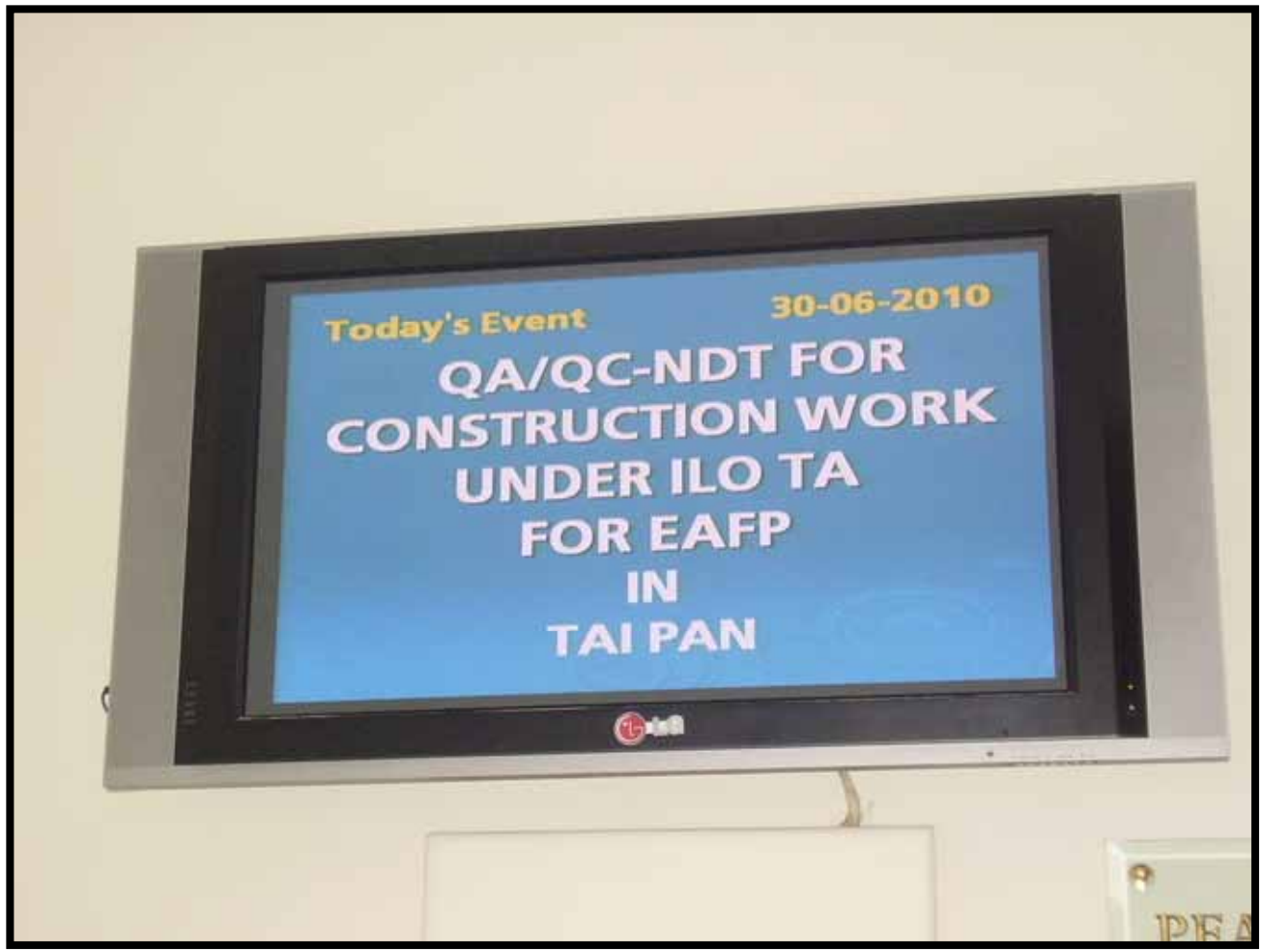


The information bulletin displaying the training event at TAI PAN Hall, Pearl Continental Hotel, Muzaffarabad.

A view at the TAI PAN Hall, Pearl Continental Hotel, Muzaffarabad. The participants are focusing on presentation by CWHR.

QA/QC Training at Muzaffarabad by CWHR

Lead Trainer from CWHR giving an Introduction of the Council and Trainers for the training.

Concepts of NDT being explained with respect to actual case studies conducted by CWHR.

Engr. Asif Hussain is presenting a lecture to the participating trainees on the use and significance of Ultrasonic Pulse Velocity Testing as non-destructive testing procedure.

Use and significance of Re-Bar Data Scan, another NDT Equipment is being explained to the trainees.

A group photograph of training organisers, trainers and participants taken at the conclusion of Day 1. (30.6.2010)

Different views of the under-construction school at Baglota near Kohala, District Muzaffarabad. This school was pre-selected for actual demonstration of NDT methods to assess quality of construction.

This primary school is under construction at the same location where an erstwhile school was destroyed during the earthquake on 8.10.2005.

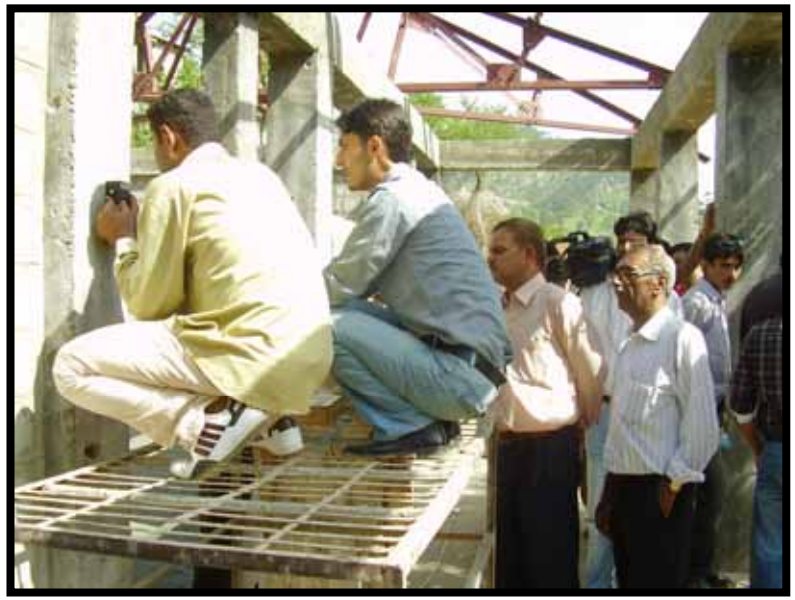
The Graveyard of the martyrs gives a grim picture of the damages and loss of lives that occurred on account of poorly constructed buildings.

QA/QC Training at Muzaffarabad by CWHR

A demonstration and hands-on training session in progress at the under-construction sample school.

Basic test principles and interpretation of test results are being explained by the trainers from CWHR.

QA/QC Training at Muzaffarabad by CWHR



CAPO Test was performed at 3 different locations at the sample school.

Interpretation of CAPO Test results are being explained to the trainees and correlation with other NDT Methods also explained with demonstrations.

QA/QC Training at Muzaffarabad by CWHR

Comparison of results obtained by using Pulse Velocity Test Method and CAPO Test Method are being carried out by trainees.