DEPT OF **NUCLEAR TECHNOLOGY**

CHULALONGKORN UNIVERSITY

Presentation - 7

" QUALITY in CONSTRUCTION "

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OBJECTIVES of PRESENTATION

This presentation will discuss

the following topics :

- **Organization**
- **Planning**
- **Key elements of Quality Program**
- **Safety and security**
- **Performance of work**
- **Turn-over to Commissioning**
- **Assessment**

ACTIVITIES of PERFORMANCE GROUP

- **Planning of work**
  - **Detailed work assignments**
  - **Develop work schedules**
- **Enforce safety, security and fire protection regulations**
- **Administer contracts**
- **Control quality of work**
- **Train trades personnel**
- **Purchase construction materials and equipment**
- **Control special processes**
- **Set-up fabrication facilities**

ACTIVITIES of OVERSIGHT GROUP
(Resident Engineer)

- **Verification of work**
  - **Daily oversight of performance**
  - **Approval of completed work**
- **Interface with Design**
  - **Assess/authorize departures from design**
- **Review/approve construction procedures**
- **Review/approve test results**
- **Confirm record keeping**
- **Assess implementation of Quality and Safety programs**

KEY OUTPUTS of CONSTRUCTION ORGANIZATION

- **Delivery of a product (structure) within the specified budget and time objectives**

- **Assurance of meeting the Quality requirements as specified by the Design Authority**

- **Meeting the overall corporate and national objectives with respect to personnel safety and environmental considerations**

PRINCIPAL ACTIVITIES

of Supervisory Personnel

- **Control and supervision of tradesmen**
- **Setting up contractors at the site**
- **Establishing safe working conditions and ensuring compliance**
- **Planning and monitoring progress of work**
- **Ensuring that work is executed in accordance with design specification**
- **Arranging for hand-over of completed work**

PLANNING HIGHLIGHTS

- **Review of design specifications and codes**
- **Preparation of schedules**
  - **sequencing of work**
  - **fabrication**
  - **inspections and tests**
- **Ensuring material availability consistent with schedules**
- **Ensuring trained personnel available**
- **Inclusion of Quality requirements in plans**

PLANNING -

WORK BREAKDOWN TECHNIQUE

- **Divide work by hierarchical order of importance and magnitude**
- **Divide work into discreet, manageable work units**
  - **product oriented**
- **Determine expected duration and resource allocation**
- **Clearly assign responsibility**
- **Specify cooperating groups and sequencing of work**
- **Define the desired outcome (product)**

QUALITY PROGRAM -

CHANGE CONTROL

Changes to scope affect project definition within scope affect project development

Changes must be :

- **Based on NEEDS not WANTS**
- **Controlled by a procedure**
- **Documented, approved, authorized**
- **Impact of change must be :**
  - **evaluated re :**
    - **cost**
    - **schedule**
- **Plans and documentation updated**
- **Changes are very costly - should be avoided,**

HIGHLIGHTS of QUALITY PROGRAM

Interfacing :

- Construction organization interfaces with :
  - Design
  - Contractors
  - Commissioning and Operations
  - Regulatory Authority (Government)
  - Workers' representatives

Feedback of information to:

- Design Department :
  - optimize design and constructibility

- Other construction Departments:
  - learn from experience
  - transfer construction knowledge
  - improve planning
  - improve installation processes and controls

HIGHLIGHTS of SAFETY PROGRAM

- **Management commitment and example**

- **Setting standards and objectives :**
  - **safer at work than not at work**

- **Measuring performance**
  - **classification and frequency of injuries**

- **Investigation and analysis of accidents and "close calls"**

- **Identification of hazards**
  - **eliminate, contain, minimize consequences**

- **Training, indoctrination, education**

There is no winning attitude,
there is only

WINNING PERFORMANCE

CONTROL of SPECIAL PROCESSES

- **Piling, back-filling and compacting**
- **Concrete mixing and placement**
- **Welding**
- **Heat treatment**
- **Protective coatings**
- **Internal cleanliness of equipment**
- **Non-destructive examinations**

MATERIAL MANAGEMENT

- **Receiving - inspect for :**
  - **damage**
  - **availability of documentation**
  - **cleanliness, coatings and preservatives maintained**
- **Quarantine, if appropriate**

- **Storage**
  - **storage areas controlled and protected**
  - **items marked and identified**

- **Handling**
  - **avoidance of damage to equipment or finish**

- **Issue**
  - **correct material for each job**
  - **traceability of material maintained**

HIGHLIGHTS of CONTRACTING

- **Basis of selection**
- **Contract considerations**
- **Risk allocation**
- **Incentives**
- **Cooperation**
- **Long-term partnership**

avoid AMBIGUITIES

HOUSEKEEPING, CLEANLINESS and MATERIAL CONDITION

Processes which ensure that :

- **facilities**
- **equipment**
- **work areas**
- **access routes**

are KEPT in GOOD CONDITION

WHY DOES HOUSEKEEPING MATTER ?

- **Creates a very visible indication of the accepted standard**
  - **will vary depending on culture**
  - **must be understood and visibly enforced**
  - **influences staff's pride and morale**
- **Contributes to safe working environment**
- **It is easier to keep site clean and tidy than dirty and untidy**
- **It's either getting better or worse**
  - **if there is not a program to improve, then housekeeping will decline**

EXAMPLE of "A GOOD STANDARD"

- **Cleanliness and order evident throughout site**
  - **no accumulations of debris and dust**
- **Portable equipment (ladders etc..) properly stored**
- **Work areas tidy**
- **Trash containers available and not overflowing**
- **Parts and material not laying about**
- **Combustibles properly contained and protected**

TURN-OVER -

CONSTRUCTION to COMMISSIONING

- **Review of documentation**
  - as-built drawings
  - wiring diagrams
  - alignment records
  - calibration records
  - protection settings
  - test results
  - equipment history records
  - QA records(welding, NDT results)

all SIGNED and VERIFIED

TURN-OVER - CONSTRUCTION to COMMISSIONING

- **Inspection of Equipment**
  - conformity to Design
  - housekeeping
  - fire protection
  - special tools, spare parts
- **Operational requirements**
  - prelim. operating instructions
  - initial commissioning procedure
  - prelim. training delivered
  - operating routines in place
  - jumpers identified

TURN - OVER - CONSTRUCTION to COMMISSIONING

- **Formal take -over**
  - turn-over meeting
  - forms to be signed
  - equipment to be tagged
  - terminal points established
  - list of outstanding items