Location, Operation & Maintenance Of Discharge Shaft Of Ash Pond For Fly Ash Disposal

Guide: **Prof. R. K .Grover**
JEC, JABALPUR

Sunil Singhai
ME (Geotech) IVth Sem
JABALPUR ENGINEERING COLLEGE
JABALPUR, MP

Co-Guide: Prof. Rajesh Jain
JEC, JABALPUR

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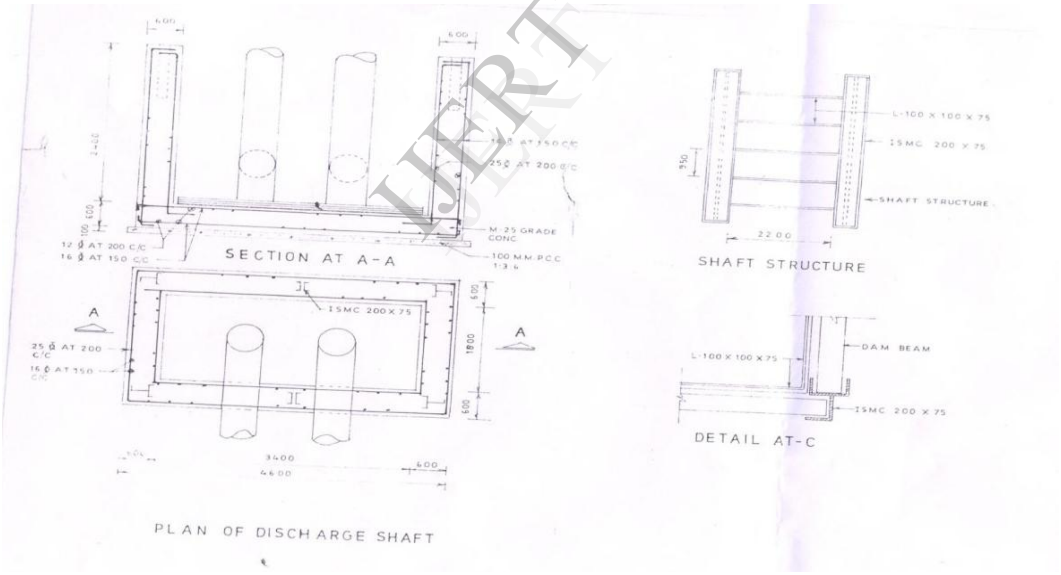
Abstract: Thermal Power Stations using coal in boiler and produce huge quantity of fly Ash/bottom ash as Industrial waste. Next to mining (including excavated over burden and failings) coal ash more than 100 million M.T. produced per annum presently in India. Very few quantity of fly ash is utilized and balance huge quantity is stored in Ash Pond. Therefore, proper maintenance of Ash Pond is essential to safeguard against failure of Ash Pond. This paper describes operation, maintenance and strengthening of Discharge Shaft or Decant Tower. No well defined provision of construction, operation and maintenance exist for Ash pond. Therefore, this paper describes various issues related to ash pond discharge shaft.

1. INTRODUCTION Fly Ash/Bottom ash produced after combustion of coal in thermal plants is pumped in the form of slurry in a ratio of 1 part ash and 4-20 part of water. High Concentration Slurry Disposal (HCSD) system requires less quantity of water than traditional pumping system of slurry. The water, after decantation is allowed to drain through discharge shaft or decant towers.

2. LOCATION OF DISCHARGE SHAFT Discharge Shaft are constructed inside the Ash Pod around the periphery of the bund. Locations and number of discharge shaft depends on mainly following points:

a) Area of the Ash Pond: Discharge shaft of various size (4.6 Mt X 2.4 Mt,1.8 Mt X 1.8 Mt are constructed to facilitate discharge of water. Discharge Shaft (1.5 Mt x1.5 Mt) size is normally constructed for an area 15-20 Acre. However, minimum two discharge shaft are constructed for ash pond area having less than 20 Acre so that one shaft can be utilized as standby in case of maintenance of other shaft. These shaft also discharge storm water during monsoon and keep the earthen bund safe from breach/crack/wash away.



b) Type of raising: Ash pond is constructed in stages. The height of dam is gradually increased after raising of fly ash level. This also saves the overall cost compared to first stage construction. Raising of embankment are commonly done by following method:

i) Upstream method
ii) Downstream method
iii) Central line method

Therefore location of discharge shaft is decided on the method which will be adopted for raising of embankment in future. For upstream raising method, location of discharge shaft should be decided keeping in view of number of stages as embankment will be constructed inside the ash pond. Therefore, discharge shaft should be constructed at least 40 Mt away from initial embankment. In case of downstream and central line raising system no such situation arise.

c) Drainage: Discharge shaft should be constructed at suitable location so that decant water can be easily drained out by gravity. For proper drainage of storm water during monsoon, diameter of hume pipe should be sufficient, normally 800-1000 mm diameter is preferred. These pipes are firmly encased in concrete blocks or supported by pedestal wherever necessary.

d) Design of Steel Structure: Normally Mc 125 mm channel for 1.8 Mt X 1.8 Mt Dicharge shaft and Mc 200 for 4.6 Mt X 2.4 Mt discharge shaft with sufficient bracings are fabricated and grouted in concrete. Precast concrete dam beam is placed between these channels as soon as level of ash is rises. Gradually wet fly ash exert pressure all 4 sides on the dam beam, which ultimately beard by the steel section. As soon as level of ash raised in the dyke, steel structure are also raised by welding steel section with suitable bracing.

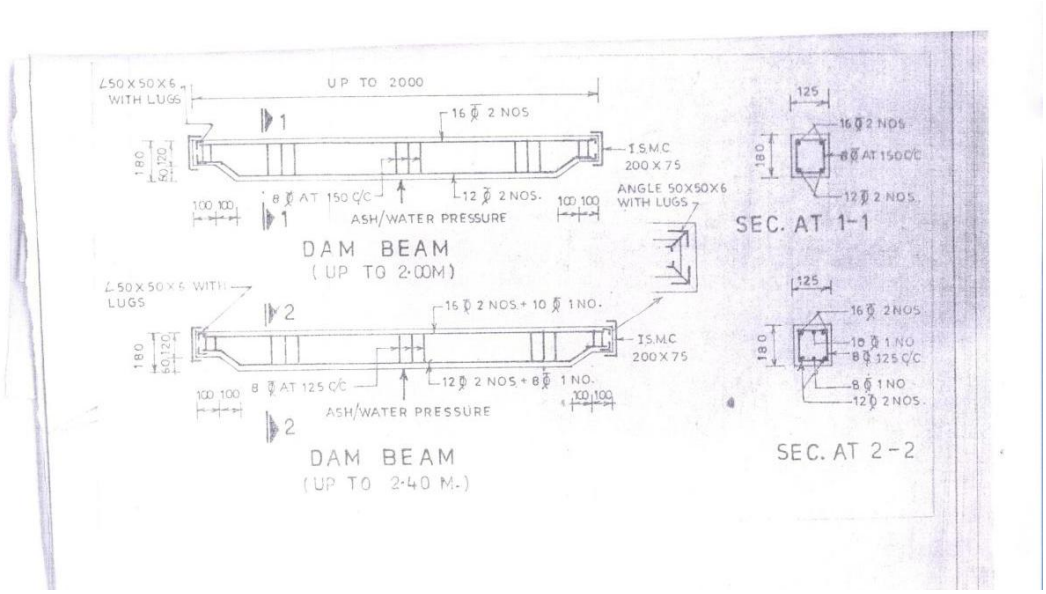
3. OPERATION OF DISCHARGE SHAFT Ash slurry pumped from thermal power station form a heap at the discharge point. This heap is

spreaded manually by forming drains inside bund so that water can travel atleast 50-100 Mt in shape of garland so that ash particle settle down and clear water may pass through discharge shaft having turbidity below 100 PPM.

4. MAINTENANCE OF DISCHARGE SHAFT:

A. Due to continuous contact of water and pressure of fly ash steel section including bracings of discharge shaft may corrode. Therefore, periodical maintenance of discharge shaft is essential. Anti corrosive painting on steel structure may be carried out annually. Prior to painting if necessary additional bracing my also be provided by welding to maintain regular dimension of discharge shaft.

B. PLACING OF DAM BEAM Precast concrete dam beam are placed on the discharge shaft as the level of ash rises so that only clean water (free from suspended particle of ash) may drain through discharge shaft. Precast dam beam having smooth surface and well shaped so that it can be perfectly filtered in the grooves (M.S. channel 125X125X8 mm). For retaining ash slurry through minute opening jute bags can be utilized.



C. ALUM DOSING: Alum Block is placed on the water channel approaching to discharge shaft so that suspended ash particle may settle rapidly.

5. STRENGTHENING OF DISCHARGE SHAFT: Gradual raising of earthen bund of ash dyke; ash pressure on the discharge shaft increased gradually. Due to continuous contact of water and chemical action, structural steel used for erecting discharge shaft and welding joint loose strength. There may be possibility of collapse of discharge shaft suddenly may create environmental hazard. Therefore strengthening of discharge shaft may be done after 20 Mt raising of ash dyke by following way.

Provide 1 Mt Dia. prefabricated M.S. pipe having sufficient perforation of suitable length are placed inside the discharge shaft. Length of these pipes may vary from 60 to 80 CM so that they can place inside discharge shaft. These pipes having cleats at both ends so that inter connection locking may be provided with help of nut-bolt. Bottom

most M.S. pipe having sufficient grove so that it can be fitted on horizontal pipe. Filter material is filled in the discharge shaft to drain clear water to low lying aeras.

6. SUMMARY This paper highlights main issue regarding strengthening of discharge shaft of Ash Dyke. Observations, pre-caution for maintenance of ash dyke are based on experience at various ash dyke sites.

References: 1. Gandhi S.R.(2005) Design and Maintenance of Ash Pond for fly ash disposal, IGC-2005, 17-19 Dec. 2005 Ahmedabad pp 85 to 89.

2. Gandhi S.R. Raju, VS and Kumar V (1997) "Management of Ash Ponds" Narosar Publishing House, New Delhi.

3. Geoenvironmental Engineering by Shashi K. Gulhati and Manoj Datta, Tata Mc.Graw Hill Publishing Co. Ltd., New-Delhi.