

REVISED



THE GOVERNMENT OF THE REPUBLIC OF MALAWI
MINISTRY OF AGRICULTURE, IRRIGATION AND WATER
DEVELOPMENT
KAPICHIRA DAM AND SHIRE VALLEY IRRIGATION
PROJECT

VISIT REPORT BY PANEL OF EXPERTS

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REPORT ON VISIT TO KAPICHIRA DAM

1. Introduction

As per instructions of Ministry of Agriculture, Irrigation and Water Development Republic of Malawi Messrs Jonathan Hinks and Aslam Rasheed visited Kapichira Dam on Oct 6, 2015 for meeting with ESCOM, Technical Feasibility Consultants and Shire Valley Irrigation Project. The Visit was coordinated by Mr. R.M.A Champiti; Project Technical Team Coordinator Shire Valley Irrigation Project. Consultant's team leader Mr. Jo, Jin Hoon and irrigation engineer also joined the meeting.

Prior to departure for Kapichira a meeting was held with Mr. Champiti at his office in Blantyre. It was informed that a Joint Venture of Korea Rural Community Cooperation, Dasan Consulting Company of Korea and GK Works Civil and Structural Engineers Malawi has been appointed consultants for technical feasibility of the Shire Valley Irrigation Project. The contract was signed on July 9, 2015 and the Consultants mobilized on July 13, 2015. The Consultants have submitted an Inception Report which has been reviewed and a revised report will be submitted by October 14, 2015. It was further informed that request for proposal for hydraulic modeling of the intake has been issued to 6 short listed firms and proposals are due in by 4 November 2015. Messrs Jonathan Hinks and Aslam Rasheed advised that preliminary design and tentative location of the intake should be given priority as these will be required for the Consultant for hydraulic modeling.

Prior to departure from Blantyre a meeting was held with Mr. Champiti and Mr. Benson Sumani Chief Irrigation Officer where the salient points of the visits and conclusions and recommendations were discussed.

2. Summary of discussions

At Kapichira Dam the team was briefed by Mr. W.W.Liabunya Power Station Manager Kapichira Hydropower station and Mr. Archibald Kandoje.

The Kapichira Dam comprises an 830 m long rockfill dam with a clay core, with a maximum height of 30 m at the foundation. A ski jump concrete spillway on the left bank with five openings controlled by sluice gates (each 15.24 m wide and 13.50 m high) has discharge capacity of 8,750 m³ per second. From the dam there is a 8.8 m square to circular tunnel (with the downstream 76 m long section steel lined) which leads to the power station via a surge shaft/tower. The dam was designed by TAMS of New York and Knight Piesold of UK and was completed in 1999.

Adjacent to the right abutment there is a fuse plug spillway integral with the dam. The spillway and fuse plug operating together can pass the PMF. The crest at this point is about a metre or so lower than the crest of the main dam and is located across the old bed of the river.

It is concluded from discussions that no formal inspection of the dam and other works has been carried out since its completion. Piezometer readings are taken by staff of central office and are

said to be stable although no readings have been taken recently. No feedback is given to the local office. No report on the analysis of piezometric data was available at site.

No seepage was observed downstream. Seepage is not measured by the Project staff. The spillway gallery is also reported to have little seepage.

There is no programme for monitoring settlement along the dam crest or at other structures.

It was reported that erosion occurred on the upstream face of the embankment in 2004 near its junction with the spillway. The damage was repaired. It was pointed out that the cofferdam for construction of the spillway was not removed and is submerged in the water. At the time of erosion part of the old coffer dam was also washed out.

The spillway has 5 radial gates, which are power operated. The standby generator is operated three times a week to ensure availability when it is needed. One of the gates (gate 3) is presently out of operation due to breaking of rope, which is being replaced.

The operation of the gates is decided by the Station staff based on reservoir levels. The staff has no access to hydrometrological data from upstream. Sensors are installed to open the gates automatically in case of high flood. It is desirable that there should be written instructions to the operating staff with regard to the operation of the spillway gates.

50 cumecs flow is continuously released downstream as environmental flow and for flushing sediments. The flushing is done through spillway generally every month. For the last two months no flushing was done due to water shortage.

A prefeasibility study for expanding the capacity of power house has been completed. However no decision has been made to proceed with feasibility study.

The Power house has 4 units of 32 MW each, which require 67 cumecs for generating 32 MW. The total discharge required by 4 units is 268 cumecs to produce 128 MW.

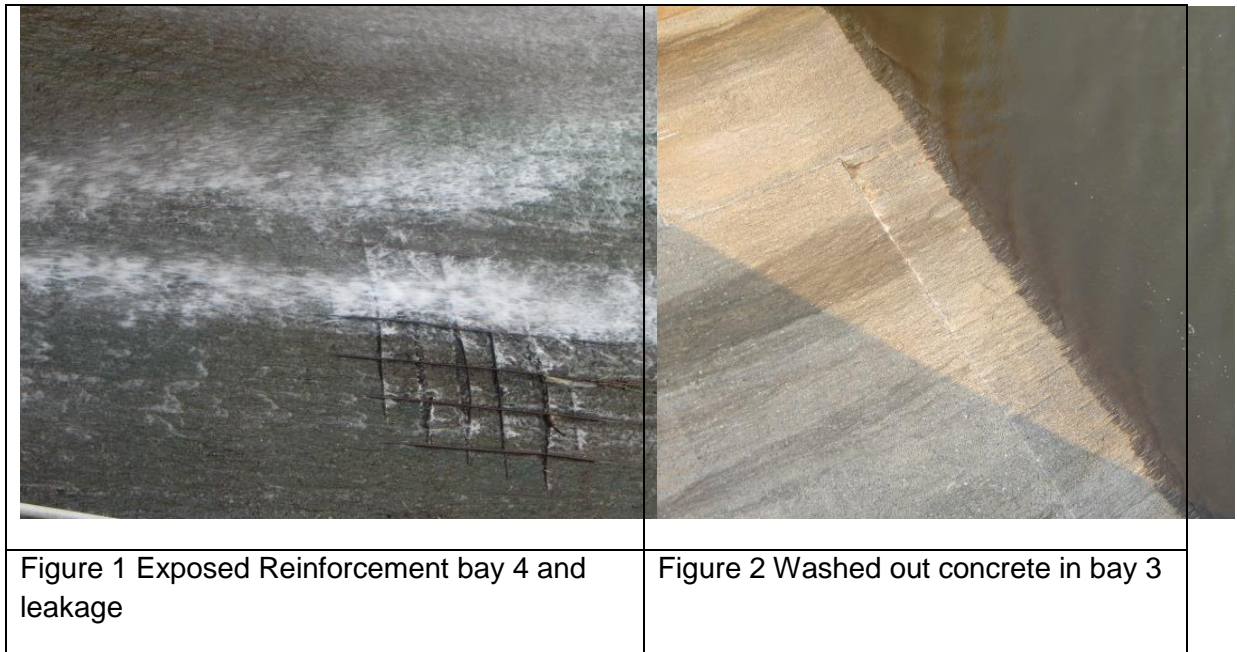
3. Observations

Weeds and bushes are growing on the upstream and downstream slopes of the embankment.

Observations from the deck of the spillway indicated that:

1. The sloping chute of Bay 1 shows normal wear and tear.
2. Cracks are observed on chute of Bay 2.
3. Cracks are observed on Chute of Bay No 3. Some concrete near the toe has been washed away.
4. In Bay No. 4 reinforcement is exposed in one block.
5. The bottom seals of most of the gates are not effective and leakage is taking place.



The above described conditions are shown in the photographs in Figures 1 and 2



4. **Conclusions and Recommendations**

- The Kapichira Dam is a large dam as per ICOLD Guidelines. In accordance with International Commission of Large Dams (ICOLD) Bulletin No. 59 on Dam Safety Guidelines, dams require periodic safety inspections. A dam safety inspection plan incorporates (1) routine dam safety inspections to be undertaken by the Dam Operation Staff of the owner, (ii) Annual and 5-yearly (comprehensive) dam safety inspections to be undertaken by experienced Dam Safety Experts together with the Dam Operation Staff of the owner, (iii) special inspections to be undertaken following major floods, earthquakes etc., (iv) Dam Safety Reviews, (v) Potential Failure Modes Analysis (PFMA) and (vi) Risk Assessments. It is recommended that a programme for dam safety inspection be implemented for the Kapichira dam. The first independent inspection should be conducted within a year of the date of this report.
- The dam and other structures are being managed by the Power House staff. It is recommended that a qualified civil engineer be appointed by ESCOM for operation and maintenance of the dam and other structures.
- The damages on the concrete chute should be repaired as per recommendation of a qualified civil engineer. This should be done within a year of the date of this report.
- Weeds and bushes growing on the upstream and downstream slopes should be removed taking care that the fill material and riprap are not disturbed.

The POE is not seriously worried about the short term safety of the dam. However if the dam is never inspected and defects are not corrected then safety could ultimately be compromised.

	
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