



Overview of Dam Safety in Malaysia

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1. INTRODUCTION

It has been reported that since 1960, there have been at least 25 dam failures in the United States that caused one or more fatalities. The worst of those failures in terms of fatalities was the 1972 failure of the Buffalo Creek tailings dam which devastated a 16-mile long valley with 6000 inhabitants. As a result of that failure 125 people were killed and 3000 were left homeless. All of the failures in the United States since 1960 have resulted in 318 deaths.¹

In Malaysia, we have not had the experience of any such failures. However as the dams in the country get older, we cannot avoid but to face the reality that we have to take notice of the conditions of these dams from the safety point of view. We should not wait until failure occurs which may endanger public safety. For the record, an Inter-Departmental Committee on Dam Safety was established in May 1986 under the stewardship of the Public Works Department Malaysia.² The members of the Committee were the Drainage and Irrigation Department Malaysia, National Electricity Board, Penang Water Authority, Malacca Water Board, Muda Agricultural Development Authority, Sabah Electricity Board and Sarawak Electricity Supply Corporation.

Apart from conducting awareness programs on dam safety, the Committee has successfully published in October 1989 the Guidelines for Operation, Maintenance and Surveillance of Dams. It is a general guideline intended to be used as a general guide for drawing specific procedures and practice to suit site and management conditions of individual dams. The guidelines are applicable to all dams (except tailings dams) that are termed "referable dam" which are defined as follows:

- Dams which are 10 meters or more in height and have storage

capacity of more than 20,000 cubic meters.

- Dams which have a storage capacity of 50,000 cubic meters or more and are higher than 5 meters.

2. FOCUS OF THE GUIDELINES

The focus of the Guidelines is on operation and maintenance, surveillance and safety review.

The operation and maintenance stresses the need for the preparation of an operation and maintenance manual for each dam, giving clear assignment of responsibilities for operation and maintenance activities, for routine inspections and the need for adequate instructions and arrangements for emergency actions.

The surveillance and safety review draws attention to the responsibility of the owner of a dam with regards to surveillance activities. Surveillance is defined as "the continuing examination of the condition of a dam and its appurtenant structures and the review of operation, maintenance and monitoring procedures and results in order to determine whether a hazardous trend is developing or appears likely to develop." Thus the underlining concept of surveillance is:

- the need for monitoring and inspection of a dam

throughout its active life by trained personnel; and

- the regular inspections to be carried out by qualified and experienced engineers, and the periodic safety reviews by independent and competent engineers suitably experienced in dam technology.

3. PRESENT SCENARIO

More than sixteen years have passed since the Guidelines were published and do we know if it has been diligently

followed by dam owners? If not, what are current conditions of the dams in the country?

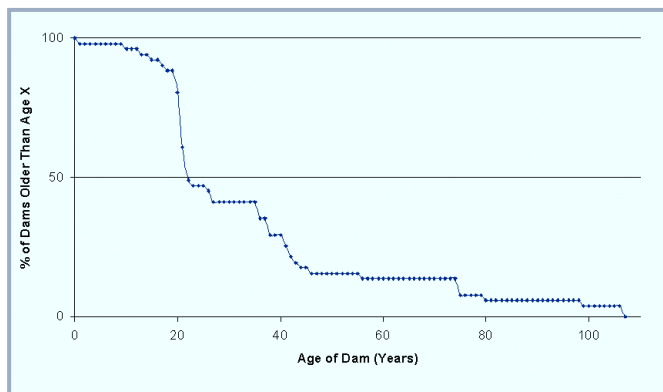
Let us take the scenario in the United States as reported in the Infrastructure Report Card 2005 of the American Society of Civil Engineers which can be summarised as follows:

*"Since 1998 the number of unsafe dams has risen by 33% to more than 3500. While federally owned dams are in good condition, and there have been modest gains in repair, the number of dams identified as unsafe is increasing at a faster rate than those being repaired. \$10.1 billion is needed over the next 12 years to address all critical non federal dams—dams which pose a direct risk to human life should they fail."*³

Like any other man-made structures, dams deteriorate. It is interesting to note that the public may assume that once a dam is constructed it is acceptable to leave it alone without any maintenance. Believe it or not, the impression that the public has on a dam whether it is earthfill or concrete is such that a dam is a massive and strong structure and that it will not fail. Has anyone thought that the building you live in and the mega mall you visit will fail? Of course not if these structures are maintained. As with other man made structures whether it be cars, buildings, airplanes or power stations, a significant investment is essential to maintain the benefits and assure safety that society demands. Deferred maintenance accelerates deterioration and causes any structure to be more susceptible to failure.

The numbers of dams under the responsibilities of the various organisations are as follows:

- TNB – 16 dams
- DID/JKR/private – 35 dams



About 60 percent of the above dams are of earthfill type. From the above statistics the age of these dams are plotted to reflect the distribution of ages of dams in the country.

From the graph above, the median age is now about 20 years. However some 20% (10 dams) are in the range which problems often begin to manifest. It is also worth noting that the safety review of the Bukit Merah Dam (1906) was conducted in 1998. The Dam Safety Review of the Sungai Perak Hydroelectric Scheme comprising the Temengor (1978) and Chenderoh (1930) dams was carried out in May 2003. There are no public records to ascertain the maintenance that have been conducted in the rest of the older dams in the country. Save to mention that it may have been constrained by shortage of funds and manpower as experienced in developed countries such as in the United States.

Apart from the Guidelines, there is no framework or regulatory requirement to ascertain the safety and integrity of dams in the country. However, if these structures are covered

under insurance the insurer will usually insist on periodical safety and surveillance inspections.

3.1 FINANCE AND HUMAN RESOURCE

As dams age, owners face major decisions about the allocation

of finite financial and human resources to ensure continued safe operation. Under normal conditions, a dam may need to be inspected at regular intervals. The frequency of the inspections is usually determined by experienced engineers who will take into account all relevant factors and data and any trends in the behaviour of the particular dam following earlier inspections, reports and safety reviews.

All these exercises require competent people and funds. Unless the program of ensuring the safety of dams is adequately funded, the safety of the public within the vicinity will be in danger. The funding must be adequately provided to cover physical maintenance of the dams as well as training of staff. To quote the situation in the United States:

“Four years ago, few state dam safety programs were adequately funded or staffed. Today, that situation remains the same. On average nationwide, there are 268 state regulated dams per full-time equivalent (FTE) staff. In 13 states, this number exceeds 500, and four report more than 1200 dams per FTE staff. In 1998, a Texas House

Committee recommended adding 15 staff members to that state’s six-member dam safety team; today there are still only six staff members responsible for inspecting nearly 7500 dams. One Texas official commented that “because of inadequate staffing, some dams would not be examined for three centuries.”³

4. POLICY OPTIONS

There is still an alarming lack of public support and education about the need for proper maintenance and repair of dams. Unless a dam fails, dam safety is not usually in the public view, although it is an issue that affects the safety of thousands of people who could be living and working in the path of a sudden, deadly dam failure.

5. CONCLUSIONS

With the privatisation of the various government agencies and the stress on financial returns, it can be argued that maintenance of these dams may have taken a back seat. ■

REFERENCES

- [1] Mississippi Department of Environmental Quality, Office of Land and Water Resources-Dam Safety Program.
- [2] Malaysian Inter Departmental Committee on Dam Safety-Guidelines for Operation, Maintenance and Surveillance of Dams, October 1989.
- [3] Infrastructure Report Card 2005, ASCE.



Failure of the spillway gate at Folsom Dam, USA (July 1995)



Teton Dam, USA (June 1976)