DAM SAFETY AND TECHNOLOGY TOOLS DURING CONSTRUCTION

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ABSTRACT

The objective of dam project specific handbook is to prepare a minimum guideline manual for safety, health and environment management system on-site during and post construction. This document as per standards uses Center Public Works Department (CPWD) Safety, Health and Environment (SHE) Manual.

In recent time the increase in application of technology in flood risk has helped Dam design and construction too. Hence including technology options as part of SHE manual could be a good option.

This project specific document should include technology information related to flood disaster, dam break, flood warning communication etc. and is intended to be used by engineers, contractors, on-site workers, architects working on barrage Project.

1. INTRODUCTION

The tools used for flood risk modeling are typically used for dam related planning and design. The application these tools are also useful during and post construction. In addition to these tools the inspection and monitoring using various checklist can be converted to digital format. This document shares some technology best practices beneficial for dam design and safety during construction.

2. DAM BREACH MAPPING

Consequences of barrage failure during construction and post may include loss of life, injury, and general disruption of the lives of the population in the inundated area. The analyses leading to consequence assessment and classification of the dam typically include the following steps: characterization of hypothetical dam breach, flood wave routing, inundation mapping, and evaluation of the impacts for site activities, workers and property. Based on the mapping and water levels evacuation routes, worker assembly area etc. can be planned.

In recent times technology has help us provide real-time breach mapping as the storm event is active. This helps focus on the critical areas that will require attention.
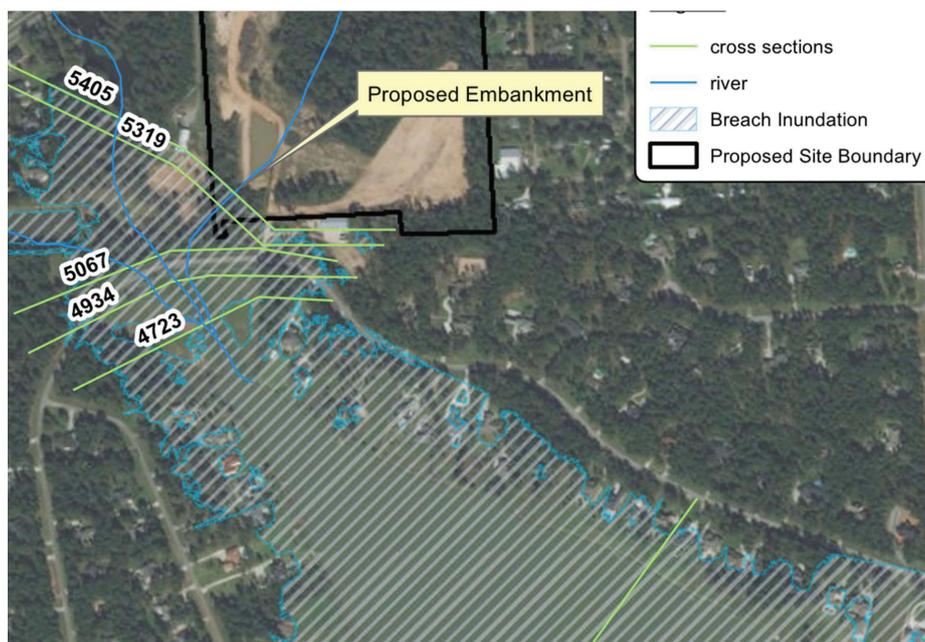

Figure 1 : Dam Breach Map

3. ON-SITE FLOOD WARNING SYSTEM

The flood warning application allows site personnel to monitor flooding conditions throughout the site limits. As water levels rise, flood plains map and warning points alert personnel to areas on site potential passage or flooding issues. The floodplain map can be either an interactive tool or an exhibit available on the tablet or phone for use anytime. This should help save property and life of workers on-site.

Figure 2 : Typical Inundation Map

4. MONITORING SYSTEM

Dam safety monitoring technology during and post construction using GPS, sensor and software application. This can be monitored by centralized unit. This can monitor status of construction; frequent data can be collected to monitor any design changes. The historic data collected during construction can be used for forensic and diagnostic purpose.

5. EMERGENCY DATABASE

An emergency database should be prepared and made available digitally. The database should include contact information for all workers with postal address, phone number, emergency contact, email addresses etc. This will help to contact during emergency conditions. It should also include contractor, owner, consultant related information so that everyone can be informed. The digital database with access to all employees should be very helpful for immediate communication and action.

6. COMMUNICATION

Technology has come a long way in an incredibly short period of time. Take advantage of technology such as walky-talky, WhatsApp, skype etc. and use it to enhance communication on the construction site.

7. SAFETY SOFTWARE APPS

1. The mobile cameras onsite to capture safety issues. Mobile technology saves employees the time of running to find the nearest computer (or worst, the nearest paper form) since they'll likely always have their mobile device on or near them.

2. Recording an incident can be as simple as opening an app on smartphone and filling out a quick form. Incident reporting apps allow workers to easily take and attach photos, as well as pinpoint their exact GPS coordinates.

3. SHE Apps also allow workers to conduct inspections onsite. The applications can work with or without an internet connection, so it's perfect for field use.

8. DOCUMENTATION

The inspection and monitoring checklist used during construction and post can filled digitally. This also helps to revisit any old information. Also transfer of information from onsite to office is quicker.

9. DRONE APPLICATION

During recent years the use of unmanned aerial vehicles (UAVs) or drone technology for the inspection and monitoring of dams and levees has increased. The advantages of using Drone is related to personnel safety, flexibility, speed and volume of data acquisition, and cost. Although drones are a cost-effective and efficient contribution to inspections, there are regulatory requirements for use and challenges with data acquisition that should be known before you fly.

10. SUMMARY

The elements covered in this paper are not limited and there will be more options as technology evolves. Hence technology should be used for benefit of optimizing Dam design and improve safety during and after construction. The data collected during the process can help in future for design diagnostics, reference for other works and standards improvement.