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RDKB KELLY CREEK DAM
2018 ANNUAL INSPECTION REPORT

Revision 0

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Introduction

On November 8, 2018, Austin Engineering Ltd. (Austin Engineering), performed the 2018 annual dam safety inspection for the Regional District of Kootenay Boundary's (RDKB) Kelly Creek Dam, located near Fruitvale, BC. Two representatives from the Village of Fruitvale also attended the site with Austin Engineering and provided access to the facility and answered questions related to operations and maintenance of the dam during the inspection.

The purpose of this inspection was to confirm the Kelly Creek Dam is continuing to function safely and also to satisfy the dam safety requirements for the Ministry of Forests, Lands and Natural Resource Operations. The inspection was performed in accordance with the Canadian Dam Association, following the *Dam Safety Guidelines 2007 (2013 Edition)* and the requirements of the BC Dam Safety Regulation.

Background Information

The Kelly Creek Dam was originally built in the late 1940s to provide water service to the Village of Fruitvale. The dam has an intake structure which allows operators to control water supply from Kelly Creek, which flows from the upland slopes of Mount Kelly, Stott Peak and several un-named ridges; the watershed is primarily privately managed forestland that is subject to the Private Managed Forest Land Act.

The dam is a gabion reinforced concrete gravity structure and is rated as a 'significant' consequence dam under the Ministry of Forests, Lands and Natural Resource Operations's Water Management Branch File No. D350120-00 dam failure consequences classification criteria. Prior to the inspection, Austin Engineering reviewed all available information on the dam and noted that upgrades were undertaken in 1982 to remediate degradation that had previously occurred to the concrete from freeze/thaw cycles and to increase the reservoir storage capacity.

Observations

Austin Engineering performed a visual inspection of the Kelly Creek Dam and below are the observations recorded during the assessment. Austin Engineering found that most of the recommendations from last year had been successfully completed as outlined below in the observations:

- Austin Engineering reviewed monthly checklists provided by the operator and noted that regular inspections are occurring on a monthly basis as required.
- The conveyance pipe behind the lock block retaining wall at the east end of the reservoir had a failure since the last inspection. The operator suspects this was due to equipment loading when clearing ice from the piping. At the time of inspection:
    - The conveyance piping had been replaced and was functioning.
    - The drainage swale behind the lock block had been reestablished and was effectively conveying seepage from the slope above around the south side of retaining wall structure.

  - There were signs of movement evident in the upper blocks on the lock block wall. This is suspected to be a result of reestablishing the conveyance piping after failure and is not necessarily a sign of slope instability. We do, however, recommend monitoring these blocks for movement.
  - Lower lock blocks in the retaining wall showed staining, suggesting that seepage was occurring; however these blocks were dry at the time of inspection.

- The access road to the south abutment that was previously established from Old Mill Road is in good condition; however, the road is still fenced in and is not a functional equipment access point until a gate or opening is provided.
- Leakage noted in previous years at the south abutment was not visible at the time of inspection; however, review of monthly inspection reports indicates that this is still occurring throughout the year, and is likely a function of reservoir levels and seasonal conditions. The crack on the upstream south (left) wing wall suspected to contribute to this leakage was observed to be mostly submerged and still requires further investigation as noted in previous reports.
- The operator present at the time of inspection was not able to confirm whether the spillways or low-level outlets were exercised during the previous calendar year.
- The fencing at the east end of the property was damaged during snow removal from the previous year.
- A rubber side seal on the south side of the south (left) spillway gate was found to be damaged.
- Settlement around the intake structure was noted, measured, and photographically compared and appeared to be consistent with previous years.
- Vegetation on the steep south (left) side of the reservoir that was removed in a previous year appeared to be sufficiently maintained.
- The Water Treatment Plant intake structure located on the north side of the dam was noted to have cracking on the western wall. This crack appeared to be consistent with photos from previous years' inspections and suggests differential settlement of the structure has occurred in the past.
- Steel platform members and connections on the upstream side of dam face are showing signs of failure.
- The concrete of the exposed concrete face of the dam was observed to be in generally good condition where visible.

Overall the Kelly Creek Dam continues to have a high level of operational safe guards and security due to the following factors:

- The dam is secured and the premises are monitored, encompassing the whole facility.
- Inflow to the dam can be reduced (or even stopped by the accessible intake flow control.

- The facility structures and compound area in the vicinity of the dam are well maintained indicating the operators perform their duties with care.
- The SCADA system that monitors the dam levels is linked with an alarm that dispatches operators when dam forebay levels are high.
- The Kelly Creek Dam has Monday to Friday on-site presence and 24-hour on-call operations personnel (who are notified by SCADA and security alarms).

Recommendations

After the inspection and visual assessment of the Kelly Creek Dam, Austin Engineering has the following recommendations to ensure the continued safe operation and maintenance of the Kelly Creek Dam:

1. Continue to monitor the left abutment directly behind the upstream concrete wall for seepage during monthly inspections. Special attention should be paid to this location in the spring when seepage is expected to be highest.
2. The crack on the upstream south (left) wing wall still requires further investigation. Drawdown of the reservoir may be required to expose the crack for further inspection, but we recommend inspection with an underwater camera first.
3. An equipment access gate should be added to the fencing to provide functional vehicle and equipment access between Old Mill Road and the south (left) abutment.
4. Damage to the perimeter fencing at the east boundary should be repaired to maintain site security.
5. No equipment or vehicles should be parked on the pad above the lock block wall on the east side of the dam as the additional weight may put undue pressure on the saturated soil and piping which could lead to destabilization of the lock block wall. The wall should be monitored for signs of movement.
6. Ensure that the spillway gates and low-level outlet valves are exercised annually as recommended by the CDA Dam Safety Guidelines and required by the BC Dam Safety Regulations.
7. Replace or repair the damaged rubber side seal on the south side of the south spillway gate to ensure a good seal is maintained on the spillway gate.
8. Continue the Dam safety inspections for this ‘significant’ dam on monthly basis as required by the BC Dam Safety Regulations.
9. Continue to monitor the steep slope on the south side of the reservoir for stability and vegetation management and continue vegetation management downstream of the dam.

10. Repair or replace the steel structure exhibiting signs of failure on the upstream side of the dam face.

11. Report any changes in the dam's condition to the Dam Safety Engineer when discovered in the field or noted on the monthly inspections.

Conclusion

Overall, the Kelly Creek Dam is in good condition; however, the recommendations above, in conjunction with current operating practices, will ensure the continued operation of the facility in a safe manner and improved overall maintenance of the structure.

We trust this report and the attached reference photos are to your satisfaction, and if you have any questions or concerns, please do not hesitate to contact us at any time.

Sincerely,

Roger Austin, P.Eng.
Dam Safety Engineer
Austin Engineering Ltd.

Enclosed:

- Reference Photos

Reference Photos

Photo #1: Intake gravity drop without screens.

Photo #2: Gap in the stairs at intake structure is consistent with last year.

Photo #3: Intake overflow outlet.

Photo #4: Reservoir with conveyance pipe discharge.

Photo #5: The lock block wall and conveyance pipe at the east end of the reservoir.

Photo #6: Lock block wall behind conveyance pipe shows signs of movement. Possibly from pipe repair. Monitor for changes.

Photo #7: Lower lock block wall shows signs of seepage.

Photo #8: Drainage swale behind lock block wall has been re-established.

Photo #9: Fencing along east boundary damaged by snowplow.

Photo #10: Upstream view of spillway access walkway and reservoir.

Photo #11: Trees on south (left) bank have been removed.

Photo #12: Access road to south abutment lacking gate/fence opening.

Photo #13: View of south abutment from downstream.

Photo #14: No seepage visible at south abutment during inspection.

Photo #15: Gabion basket on south abutment show signs of settlement and movement away from concrete wall, but appear to be consistent with previous years.

Photo #16: View of north abutment from downstream.

Photo #17: Steel platform connection members exhibit shear failure and connection failure.

Photo #18: Rubber side seal damaged on south side of southern spillway gate.

Photo #19: Spillway discharge flow observed from downstream.

Photo #20: Intake valves and housing.

Photo #21: Low level outlet.

Photo #22: View of crack from interior wall.

Photo #23: View of crack from exterior wall.

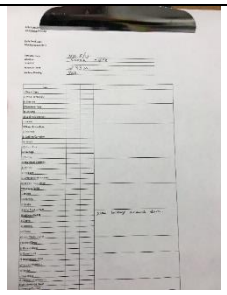

Photo #24: Kelly Creek Dam Monitoring Checklist.