From:	Mark Valeriote
To:	Miskolczi, Iozsef
Subject:	Panda Diversion Dam
Date:	Tuesday, February 22, 2011 10:29:58 AM
Attachments:	As-builtConstRpt.pdf

Iozsef,

Here's the section and photos from the Panda Diversion Dam that I showed you this morning.

Mark

gauge and areas where low densities were measured received additional compaction. The surface profile elevation of Zone A was approximately 460.4 to 460.6 m in the lakebed section, progressively increasing to 462.0 at the west end of the west key trench (Photograph 3, Appendix E). This operation was the initial placement phase of Zone A material since the final design elevation of this zone is 461.1 m. The second stage of Zone A placement was carried out following completion of core construction.

Upon completion three test pits were excavated to evaluate initial Zone A fill placement and to install PVC pipe for temporary thermistor installation. These test pits were located as follows: one upstream of the core area in the central portion, one downstream of the core area in the central portion and one in the west key trench. Single bead thermistors were installed on January 31, 1997 upstream of the core and in the west abutment at locations shown on Drawing 11580-4A (Appendix A). The temporary thermistors gave an indication of the freeze-back evolution of Zone A material placed below lake level (detailed temperature information is included in Appendix D, Table D-1). In the central area, the lower thermistor placed 0.85 m below surface indicated that a temperature of -2°C was reached eight days after fill placement (February 7). In the west abutment, the thermistor placed 1.0 m below fill surface reached a temperature of -2°C fifteen days after infilling (February 14).

4.2 PLACEMENT OF ZONE B MATERIAL (CORE)

Preparation of Zone B material was done by mixing 20 mm minus sand and gravel with hot water in a small mixing pit located downstream of the dam core adjacent to the east abutment (Photograph 4, Appendix E). The hot water was produced using a heater unit contracted from Ceda Reactors of Grande Prairie, Alberta. This unit was able to warm the water to a temperature of 80°C at a rate of 8,000 l/hour. A 64,000 litre storage tank was placed at the construction site to maintain continuous water supply without delays due to water truck availability.

The material was mixed in the pit using a John Deere 992E excavator. The excavator then loaded the slurry into the bucket of a Cat 992 loader which would then tram the material to the dam site. The material was then spread and back-bladed using either a Cat 966 or 950 loader (Photograph 5, Appendix E).

Design drawings show that the base elevation of Zone B (core) material was 461.1 m. This was modified to place the core in direct contact with the saturated Zone A material,

at elevations ranging from 460.4 m to 462.0 m, thus ensuring a continuous section of ice-bonded saturated material. Prior to placing Zone B material, the surface of the Zone A material was cleaned using a bull hose (compressed air) mounted on the excavator. The first lift of Zone B material was placed on February 11 to an elevation of 460.75 m. This initial lift was used to level the surface of Zone A material. The temperature evolution of each lift of core material placed was monitored using single bead thermistors embedded in the material. The core material was required to reach a temperature of -2°C or colder before a subsequent lift could be placed. This criteria was respected for all lifts as shown in Table D-2 (Appendix D). Core material placement was completed on February 21 with a total of 9 lifts placed (Photograph 6, Appendix E) with an average lift thickness ranging between 250 and 300 mm.

Frozen core samples of Zone B material were recovered using a concrete core barrel. The core samples were used to determine bulk density and moisture content allowing calculation of the degree of ice saturation. Two core samples were recovered from all lifts except lift #1 and all samples were photographed. Photographs 7 and 8 (Appendix E) present typical examples of a core sample. The results of density, moisture content and degree of saturation are given in Table 1. Two samples of mixed material delivered to dam area were obtained from each lift to determine mixture bulk density and moisture content to ensure that the mixing technique was adequate. Mixture density of Zone B material was determined using a concrete yield mold in accordance with CSA CAN 3-AZ3.2-M90 procedure. Table 2 presents the results of these tests.

Mixture samples obtained from lifts #2, 4, 6 and 8 were submitted for particle size distribution analysis. The results presented in Appendix C show that the gradation respected the specified gradation.

The frozen core samples were split horizontally and examined for apparent voids. One portion of the sample was used for moisture content determination, and the other was used for bulk density determination. All samples appeared well saturated with small micro-air bubbles similar to entrained air in concrete.

Photo 3
"Zone A" Material Placed to Lake Level - Looking East along Dam Centreline (97/02/09)

Photo 4
Mixing Pit for" Zone B" Material (97/02/18)

Photo 7
Typical Core Sample "Zone B" (97/02/19)

Photo 8
Typical Core Sample "Zone B" (97/02/23)