FANSTEEL RESPONSE TO:

REQUEST FOR ADDITIONAL INFORMATION

WASTE RETENTION POND

FANSTEEL METALS INC.

TAC NO. 4655

DOCKET NO. 040-07580

REVIEWED BY: O. Thompson, G.B., D.S.E., N.R.R.

A-25

ITEM 362.15

In order to avoid some potential construction problems, and to provide more safety for the entire system, the location of the proposed pond has been shifted to the west so that the closest point to the existing Basin 2 is now 65 feet. For the same reasons, the pond was also shifted to the south so that the closest point to the axis of the natural stream is now 95 feet. However, the natural stream is also being diverted to the north so that the distance between embankment toe and stream axis will be even greater.

It should also be noted that Basin 2 does not contain a liquid, but a solid to semi-solid process residue that is capable of supporting a man walking on its surface. The residue has a consistency similar to hardening putty, and is getting harder all the time. Basin 2 is full and has been taken out of service.

In our revised response of September, 1978, Item 362.11, are presented two cross-sectional views of the proposed basin. Revisions were made incorporating the movement of the pond to the south and west, relocation of the drainage ditch and the existing ground water table. Also shown are the limits of excavation on all sections, revised soil profiles and ground water levels which are compatible with the boring logs.

The side slope values for all embankments are three horizontal to one vertical.

The east-west cross-section in the September, 1978 response gives the relationship between the proposed basin and the old Basin 2. Excavation limits are shown and the level of Basin 2. Basin 2 does not contain water, but contains a semi-solid.

ITEM 362.16

In our March 1978 original response, the noting of the water table in Section D-D as being below Elevation 484 was an error based on false data. This has been corrected in our September 1978 response.

In Table II, below, are recorded water table elevations obtained at various times while bore holes were drilled in the project area for various purposes.

TABLE II

Water Table Elevations

Bore Hole	Date of Reading			
	9-2-75	12-8-77	7-5-78	7-20-78
Well 4	514		510	
Well 5	512		510.5	
Well 6	516		514	513.7
Well 7	516		515	514.5
Well 8	511		514.2	514.3
Well 9	512		512.3	512.3
Bore Hole 2		512.2		514
Bore Hole 3		511.5		
Bore Hole 4		513.7		
Test Pit SW				511.5
Test Pit NW				510.5

ITEM 362.17

The estimated water table fluctuations were based on data available which indicated that the water table fluctuates between 511 and 516, a five foot fluctuation.

It should be noted from our September 1978 response that after the French drains are installed, the area interior to the drains will be dewatered. Thus, there will no longer be any ground water present, nor any fluctuation.

ITEM 362.18

A new ground water contour map has been prepared for inclusion in our September 1978, Part II, Typical Hydrologic Engineering Questions For Mill Retention Ponds, question 3.

The location and elevations of ground water readings used to develop the ground water contours are shown. It should be noted that this map shows "as is" ground water contours. After the dewatering program is completed, the area will be in the dry.

ITEM 362.19

The entire purpose of installing the exterior French drain system is to dewater the basin area. After the area is dewatered, excavation will be accomplished in the dry.

The French drain under the longitudinal centerline of the basin is to pick up water from possible leaks. It is not intended to function as part of the dewatering system.

ITEM 362.20

This question has been fully covered in our response to Item 362.5 of our September 1978 response.

The French drain system will remove all ground water as a potential source of pore water build up and the impervious liner will prevent the basin liquid from becoming a source, consequently, there will not be pressure build up in the embankment soil.

Leak penetration into the embankment as a source of excess pore water was calculated (See Item 362.6) and it was found that the coefficient of permeability of the soil was so low that over a 30 day repair period, the leak would penetrate only 0.03 inch into the embankment.

ITEM 362.21

The revised design for the embankment is for a homogeneous soils mass. There will be no impervious core-shell configuration.

The physical properties used in the slope stability analysis are recorded on the summary sheet for the critical circle, which is a part of Item 362.5 of our September 1978 report.

The soil samples taken from the dike borings (D-1 and D-2) were blended together in the laboratory. Th log samples identified as SAND contained some clay. When these samples were blended with the CLAY samples, the resulting composite sample was called CLAY because it had over 50 per cent finer than the 200 mesh sieve, classified as a CL soil, had a very low coefficient of permeability, and was plastic (PI = 12.7). It is felt that this situation would also obtain in the field.

The direct shear tests were made on remolded samples that the laboratory attempted to remold to 95 per cent of standard Proctor density at optimum moisture content. It is easier to obtain the correct moisture content than it is to obtain the correct density. We were about four per cent high on the density. In the slope stability analysis, the average cohesion of the soil was taken as one-half the test values to allow for variations in moisture content, which do affect this value. The dry density at 95 per cent standard Proctor density (103.2 pcf) was used in calculating the slice weights.

ITEM 362.22

In our September 1978 response (Item 362.5) is presented the results of the critical circle analysis using the Method of Swedish Slices. These cases were evaluated assuming zero excess pore pressure and no seepage. Justification for these assumptions are fully covered in the September 1978 response.

ITEM 362.23

As part of the response to Item 362.5 of our September 1978 response, calculations were made for the total settlement of the foundation soil plus the embankment. It was determined that the maximum anticipated settlement was on the order of 1.7 inches with lesser settlements for lesser embankment heights.

Even when full settlement occurs, there is enough natural slack in the liner so that it will not be over stressed due to embankment settlement.

ITEM 362.24

Our feeling that the shale at this site is not overly susceptible to slaking and swelling is based, primarily, on our experiences with shale in areas close to the project.

We concede that all shale will slake to some extent when exposed to moisture and air; but even if it does, it will revert to weathered, in place clay, which will also have a very low coefficient of permeability.

ITEM 362.24A

This item was apparently generated through a misunderstanding of the total design concept.

It is not desirable at all to place granular material, such as graded filters under a liner since this would greatly increase the possibility of puncturing the liner. A clay soil is best as subgrade for the liner.

The vent system is vital to the project. A method of venting natural gas from under the liner is totally necessary. Otherwise, gas bubbles will form causing the liner to swell. This swelling then creates other problems.

After the installation of the French drain system, seasonally high ground water will not occur. The soil under the basin will remain dry.

ITEM 362.25 Fansteel Answer

As shown in the "Liner Layout" drawing a French drain is located in the center of the pond underneath the liner. This French drain will slope towards the one end of the pond and discharge into the small sump. An 8" in diameter pipe will extend along the interslope of the dike under the liner to the sump as shown in the drawing. A small submersible pump is placed down the length of the pipe to the sump.

As stated earlier, the exterior French drain system will remove all ground water from within the area of the pond. This French drain is expected to continue to drain ground water seepage from the exterior of the area. It will drain into the sump located at the Northeast end of the pond as shown in the drawings. Water samples will be taken from the sump for routine water analyses at regular intervals.

In addition, it is projected to install two observation wells, one on the North dike and another on the South dike of the new pond. Each observation well will extend to EL 500, which will be a short distance into the shale area. The bottom six feet of the well liner will have openings to allow seepage into the observation well. These wells will be monitored on a routine basis.

The monitoring of wells would be under the direction of an authorized water chemist. The Fansteel chemical laboratory is certified by Oklahoma Water Resources, the Oklahoma Health Department and EPA to perform the water analyses.

ITEM 362.26

The construction specifications are contained in the document prepared by the Muskogee Engineering Company, entitled "Standard Specifications for Waste Disposal Pond - Fansteel Metals". The Muskogee Engineering Company has been contracted to provide the testing services during the construction of the pond. All tests shall be documented and weekly progress reports will be also documented.

ITEM 362.27

This item is not completed as of September 11, 1978.

However, an adequate supply of good clay type fill is available. Since the utilization of the French drain system, the type of fill becomes less critical.

ITEM 362.28 Fansteel Answer

The slurry type wastes will be discharged to the lined pond by gravity or pumping through a 1½" to 3" in diameter hose. The hose will extend into the pond to insure complete discharge into the pond. The slurry will be discharged into the pond on a daily routine, with an estimated 1,000 to 3,000 gallons being the daily quantity. After the solid settles out and an accumulated of 2' to 5' of clear decantate forms on the surface, an increment quantity of decantate will be removed regularly by a surface mounted sump pump to the lime neutralization system. At this time there are no plans to recover values from the solid wastes.

ITEM 362.29

All berms were eliminated when the embankment design was revised. Both upstream and downstream embankment slopes will be on a constant three horizontal to one vertical slope, regardless of the height of the embankment.