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MINUTES OF MTA PROGRESS MEETING
TUESDAY, MAY 23, 1950

Present: UCRL: Alvarez, Barton, Brobeck, Cooksey, Farly, Gordon, Lofgren, Martin, McMillan, Norton, Panofsky, Reynolds, Serber, Sewell, Street, Thornton, Twitchell

CRDC: Hildebrand, Powell

AEC: Fidler, Fleckenstein

Reynolds reported that bids are out for excavations for the site. Brobeck reported that the site facilities are under consideration. Decision as to where the drift tubes will be assembled depends on the availability of sufficient crane capacity for handling them. There is plenty of space available for storage and sub-assembly work at Livermore. Alex Hildebrand reported that the building design is going ahead. CRDC is waiting on the signing of the contract with the AEC which is needed before funds can be obligated. Brobeck reported that bids are out on the vacuum pumps. Marvin Martin said agreement has been reached on the general arrangement of piping but the design will go no further at present because of other things that are more important.

Marvin Martin described the liner as being made from panels varying in dimensions from 9' x 6'8" to 9' x 13'4" joined to form a 20-sized tapering prism. The panels will be cooled by water tubing placed on the outside. The edges of the panels are turned inward for joining by solder and rivets.

A great deal of discussion by everyone was had, with general objection to the design from an electrical standpoint. The main objections raised by the electrical people are cross-currents through the joint, solder on the joint, and sharp edges. No one could say definitely how serious the objections were. However, from previous experience, designs of this type have not proven satisfactory. If an arc-over occurs it would go towards the sharp points and there would be sputtering of solder within the tank.

Martin explained that the main reasons for the present design were for ease in assembly because the holes could be off by 1/16th of an inch and still be made to line up. If the design is such that the holes have to be drilled with the panels in place, then the whole tank is tied up for the assembly of the liner. Brobeck summed up the arguments for and against the present method of joining the liner panels by saying that mechanically this appeared the simplest and quickest; however, they would look into other designs to better satisfy good electrical properties.

There was a great deal of discussion concerning the out-gassing of the system.

Alvarez pointed out that with the pumping speed of the pumps to be used the out-gassing would be no problem. A liter of solid material could be pumped out in a day at 10^{-5} mm Hg. In the discussion of out-gassing, consideration of refrigeration was brought up and also that of heating of the liner to speed up the out-gassing. It was decided that neither would be designed into the equipment and would only be put in if later found to be desirable. McMillan wondered if the inclusion of a steam-jet refrigeration unit would be of any value in the cooling water problem. It was decided that the cost would be too great for the benefit gained. The present thinking on the cooling water system is that treated water will be used for the liner cooling and distilled water for the drift tube cooling. The distilled water is used in the drift tube to cut down the amount of induced activity. McMillan objected to having an open cooling water system for the liner because of the induced activity in the cooling water -- nitrogen 16— which would be detected by a survey crew down wind. Although it was not considered dangerous, people would object to being able to detect activity from the machine. Marvin Martin suggested that if they are troubled with induced activity in the cooling water system for the liner then they will make a closed system; however, they will continue the present thinking of an open cooling water system and cooling towers. Marvin Martin reported California Research & Development was to make a study of cooling tower costs compared with rf power costs in operating at the temperature now specified.

Hildebrand reported that they were making a study of the most efficient temperature for operation from a power consumption standpoint. They will report on this as soon as the study has been completed.

Brobeck indicated that research was to be done on the problem of induced activity in the cooling water. Lofgren stated that he has offered to make this study and will do so just as soon as he is told which type of water will be used. Reynolds reported, and Fidler confirmed, that the AEC would obtain a report on similar studies made at the Arco plant. The report has been requested but not received.

Gordon inquired about which of two methods was to be used for joining the drift tube sections. The drift tube could either be joined on a longitudinal cut or a transverse cut. It was decided that a transverse cut was preferred. Martin described the present design for transmission line entrance to the cavity. He sketched a spring-loaded contact designed especially to prevent radiation losses through the holes. Martin sketched the present design method for supporting the drift tubes. This is by means of insulators and by-pass condensers at the top of the liner cavity. Baker inquired as to the type of condensers to be used for the drift tubes. When informed that consideration was being given to vacuum-type condensers he raised objections because of past experience and suggested, instead, consideration of the ceramic type, which hold up better under operation. Martin reported that the present design of the vacuum tank has included additional ports through which it was originally thought that ion catchers between drift tubes could be supported. It was decided, however, that such devices would do no good. These ports are to be left in the final tank

and placed so that they will "see" the beam. They may prove useful in later work. Marvin Martin described the present method of design for bending the end diaphragm for purposes of adjustment. The present design shows aluminum alloy sections for the diaphragm. The stems from two rising stem valves which operate independently are to be attached to the end diaphragm so that it can be moved in a horizontal direction. Since this adjustment will not be made frequently, no provision for motorizing and operating remotely has been designed. However, if it seems desirable such a design can easily be incorporated. The forces on drift tubes were mentioned. Between drift tubes No. 1 and No. 2 the preliminary estimate of the force is about $2\frac{1}{2}$ tons. To offset the unbalance on drift tube No. 1 Dr. McMillan suggested inserting a coil before drift tube No. 1. Brobeck stated that more work would be done in looking into the forces between drift tubes and studies would be made to decide what to do about these forces just as soon as a definite magnet design for the drift tubes was established.

Panofsky reported on some focusing calculations made using the IBM set-up in Building 30. These calculations were made considering different amounts of magnet power. Panofsky stated that over the first 100° phase angle studied the output energy varies only by 9.1% of the input. In a plot of the ratio of maximum radial excursion of the beam to the initial excursion as a function of phase angle, Panofsky showed that the curves for both present design operation and 25% less magnet power operation were very similar. The only difference was that the ratio for the 25% less magnet power showed a peak of approximately 8 in a phase angle region covering approximately 20°; this shows that some beam loss would occur for a 9" diameter injection aperture and a 3' maximum I.D. of the drift tubes. Over the entire range for normal magnet power it was shown that no excursion ratio is greater than $5\frac{1}{2}$. These calculations were made for beams which were both divergent from 2.3 feet away from the first drift tube and convergent toward a point 2.3' inside the machine in which cases the excursion did not exceed $5\frac{1}{2}$. Panofsky summed up his report by saying that savings in magnet power could be effected without greatly increasing the focusing problems. A further saving could be effected by making use of a converging beam. The results of these calculations show that the focusing will not be a major problem in the design since there is a 100° phase angle to play with. The saving of magnet power will be most noticeable in the design of the first drift tube magnet and not so much in succeeding drift tubes.

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