

**Comments on Review of NuMI Infrastructure
Part II
July 20, 2001**

**Responses by Bruce Baller
May 7, 2004**

Cooling Water Systems
Presenter: D. Pushka

1. (Reviewer: D. Plant) Large vent fans will be needed in the pump room. These should be thermostatically controlled, each with a powered inflow louver.

It is not clear why the reviewer believes that special ventilation is required for the pump room. The ventilation system was designed with the presence of the pump skids in the design basis.

2. (Reviewer: D. Plant) Will the pond pump be interlocked to the LCW/ RAW water pump? This interlock will prevent the system from going closed loop and heating very rapidly. There should also be an “easy bypass” for the pond pump interlock for maintenance and special running needs.

Yes

3. (Reviewer: D. Plant) The extra pressure from the added head pressure may need some special consideration from the power supply group. I believe that heavier service hoses should be available for this. I strongly urge not adding extra pumps at the lower level just to reduce pressure levels underground. A more careful component and piping/hose selection now will save the aggravation of another water pump with all of the maintenance issues.

The power supply hosing is being upgraded to handle the higher pressure.

4. (Reviewer: D. Plant) A more complete review of the entire water system may be considered. I think that a system this size may take several days to evaluate completely. Good information has been supplied to the reviewers and the system seems well planned, but I think the ~1 hour allotted was not enough to get very deep into the “workings”. We have to get this system absolutely correct the first time as underground retrofits are very expensive. One example may be where is the fire protection water located in relations to LCW piping? What are the expected expansion/contraction interference numbers?

The additional expense of working in the underground areas is negligible. One hour of underground access training is required.

5. (Reviewer: R. Rucinski) I am not exactly clear on the location of the pond water to LCW tube and shell heat exchanger, but it looks like it may be located within the confines of two walls at each end in the MI-62 service building. Access provisions to one end for tube replacement and cleaning should be made.

OK

6. (Reviewer: R. Rucinski) Isn't there a water system for Fire protection? Water has to feed the sprinkler system and fire hose connection standpipes with large capacity pumps. I didn't see that equipment covered or included.

The fire protection system is provided by an approved sub-contractor and is outside the scope of this review.

7. (Reviewer: R. Rucinski) The amount of information presented was considerable. In order to do a decent peer review on the functionality, I estimate that it would take a person seeing the prints for the first time, a full 2-5 days to study the schematics and layouts that Dave Pushka presented. Since I cannot afford that luxury, I am hoping that there is some other mechanism in the NuMI organization to provide that oversight. I do note that Dave is listed as originator, checked, and approved on the schematics. That usually is a sign that many people are being pushed on a project and energies focused on their own areas of responsibility with little time to spare for real peer review or oversight. (I am guilty of the same sin on many schematics and drawings.)

The reviewer is proposing a much deeper review than we think is warranted.

Vacuum Systems

Presenter: D. Pushka

1. (Reviewer: S. Childress) Re: Vacuum interface with Main Injector Pumping specified in the upstream NuMI line needs to be evaluated carefully with the view point that it be compatible with maintaining the Main Injector vacuum levels.

OK

2. (Reviewer: S. Childress) Re: Decay vacuum pumps. If it provides a significant level of cost savings, the hot standby decay pipe vacuum pump could be smaller than the main pump, without the requirement for capability to pump down from atmosphere in 24 hours. It would need the capacity to maintain operational vacuum levels with some safety margin.

Two identical vacuum pumps are installed. The cost savings would have been minimal with a concomitant loss of redundancy.

3. (Reviewer: P. Martin) Vacuum Specification. The specification of 10^{-6} Torr is too loose; better than 10^{-7} Torr should be easily achievable. The practical specification is that it should be good enough that it does not significantly degrade the Main Injector vacuum, which is in the 10^{-8} Torr range. Terry Anderson should determine how to best achieve this, in consultation with Shekhar Mishra. The Lambertson magnets are a significant gas load due to the large surface area. The present design may be adequate since there is additional pumping on the Lambertsons. It just needs to be calculated. If not, additional pumping should be provided in the NuMI beamline, close to the Main Injector, but there should be sufficient capacity that one or two tripped pumps does not lead to degradation of the MI vacuum.

The technical vacuum specification is 10^{-6} Torr for beam transport reasons; to limit beam loss. The functional vacuum specification is $\sim 10^{-7}$ Torr; the region where (low maintenance) ion pumps operate reliably.

4. (Reviewer: D. Plant) I still am unclear about the isolation between the MI and the NuMI beam line. We most certainly need good isolation in this area. Pumping speed should be at least on par with what is available presently in the rest of the MI.

There is no vacuum isolation between MI and NuMI. This would require the presence of a vacuum window, which would impose an unnecessary loss point.

Gas Systems

Presenter: D. Pushka

Cable Tray System

Presenter: B. Ducar

1. (Reviewer: S. Childress) Re: Cable pulls down shafts. More detailed planning needs to be done for the actual shaft pulls. For heavier cables - such as 500 MCM - cable weight is an issue, and intermediate support must be planned.

The Service Buildings & Outfitting contractor installed the shaft cables.

Communication Ducts

Presenter: B. Ducar

1. (Reviewer: R. Rucinski) The communication "Ducks" seem straightforward and handled.

FIRUS

Presenter: B. Ducar

CATV System

Presenter: B. Ducar

1. (Reviewer: S. Childress) Two CATV hardlines are currently specified for the pull down each shaft. Almost certainly there will be demand for many more CATV lines than this - which are cheap to install at the beginning and quite expensive as a later addition. Recommend that the two specified lines in each shaft be changed to a much larger number - perhaps 10 for each shaft.

OK

Telephone System

Presenter: B. Ducar