Chapter 12

Conventional Facilities

12.1 Introduction

The conventional systems for the proposed Neutrino Factory include all necessary infrastructure required to support the operation of the facility. This includes, but is not limited to, the following: site improvements, below-grade enclosures, support buildings, target hall, access shafts, utilities, and conventional cooling systems.

12.2 Structures

12.2.1 Transport Tunnel and Egress Spurs

Approximately 9500 linear feet of arch-plate tunnel will be installed in order to accommodate the accelerator. This will be made of galvanized corrugated steel with a reinforced concrete floor. The tunnel will vary in diameter from 16 to 26 feet. The steel structure can not be used in those areas where, the magnetic field is not contained and/or where high radiation is anticipated, in that case, the structure will be made of reinforced concrete. The facility requires approximately 650 linear feet of concrete tunnel. Emergency egress will be placed along the tunnel according to Life Safety requirements. Access spurs for component installation and maintenance shall be provided. Emergency ventilation for the tunnel will be provided, along with humidity control and heating.

12.2.2 Support Buildings

Four pre-engineered metal frame structures shall be built to accommodate the cryogenic plants necessary for the facility. Two of these are 19,000 S.F. each, while the other two measure 10,000 S.F. Each shall have roll-up access doors for equipment installation, personnel egress doors, HVAC, and lighting.

There will be six power supply/support buildings designed and constructed, in order to house power supplies, vacuum equipment, and instrumentation/controls. Five of these building will provide a service area of approximately 20,000 square feet each. The sixth building shall be half this size. Each structure shall have roll-up access doors for equipment installation, personnel egress doors, HVAC, and lighting.

Klystron buildings running parallel to the tunnel shall be provided. The total area required is approximately 70,000 square feet. As with the other support structures, each klystron building will have roll-up access doors for equipment installation, personnel egress doors, HVAC, and lighting.

12.3 Soils, Earthwork, and Shielding

Brookhaven National Laboratory sits on an area located within the Atlantic Coastal Plan. The basic Biotite Gneiss bedrock formation underlying the area is encountered at depths on the order of 1500 feet below mean sea level. The site is located near the center of Suffolk County, on a glacial out-wash plain. The overburden soil consists of sand and gravel deposits that extend to the bedrock surface. A few clay layers may exist, the Gardiners clay layer at a depth of 200 feet being the highest elevation. Soil borings indicate a medium-compact to compact granular soil quite suitable for building in the area of the proposed Neutrino Factory. Existing cut-and-cover technology will be used to install the facility tunnel.

It is anticipated that earthen berms will be utilized over the facility for radiation protection. Approximately 20,000 cubic yards of soil will be excavated in order to install the tunnel as outlined above. An additional 1.4×10^6 cubic yards of fill will be installed to provide a minimum of 20 feet of soil cover over the tunnel area for radiation protection. A portion of this additional fill is required to elevate the muon storage ring. Shielding in the target area shall be supplemented with 15,000 tons of steel plate and 300 cubic yards of poured concrete.

12.4 Conventional Power

The estimated essential electrical load for the facility is 150 MW of conventional power. This will require a new 138 kV overhead line from the offsite commercial grid. A further study as to whether this power is available from offsite sources is presently being carried out. For this estimate it is assumed that this power will become available from outside commercial power providers. The facility will also require three substations that will transform the 138 kV power to a usable 13.8 kV. It is anticipated that major power supplies will be designed to accommodate a 13.8 kV input voltage. Various step-down transformers providing 480 kV to the site will also be necessary.

12.5 Cooling Water

Cooling water will be required primarily in support of the facility's cryogenic system. There will also be a number of conventionally powered devices used in the facility that will directly require cooling water. Conventional cooling shall be provided via a number of evaporation, recirculating type cooling towers, pumps, and distribution piping, placed in the general vicinity of the cryogenic support buildings.

12.6 Site Improvements

While most of the facility will be built in an undeveloped section of the laboratory, there are a number of locations where the facility does impact existing utilities. These utilities will need to be rerouted or removed in order to accommodate the new construction. The existing BLIP facility will also require dismantling and demolition, or relocating, in order to accommodate the proposed Neutrino Facility superconducting linac.

New parking areas will be required for the facility. Approximately 300,000 square feet of asphalt paving will be installed for service roads and parking lots. Storm water drainage, geo-membrane material, grading, clearing and grubbing will also be required. Geo-membrane material will be installed over the target area and transport system, as well as the muon storage ring/detector area.