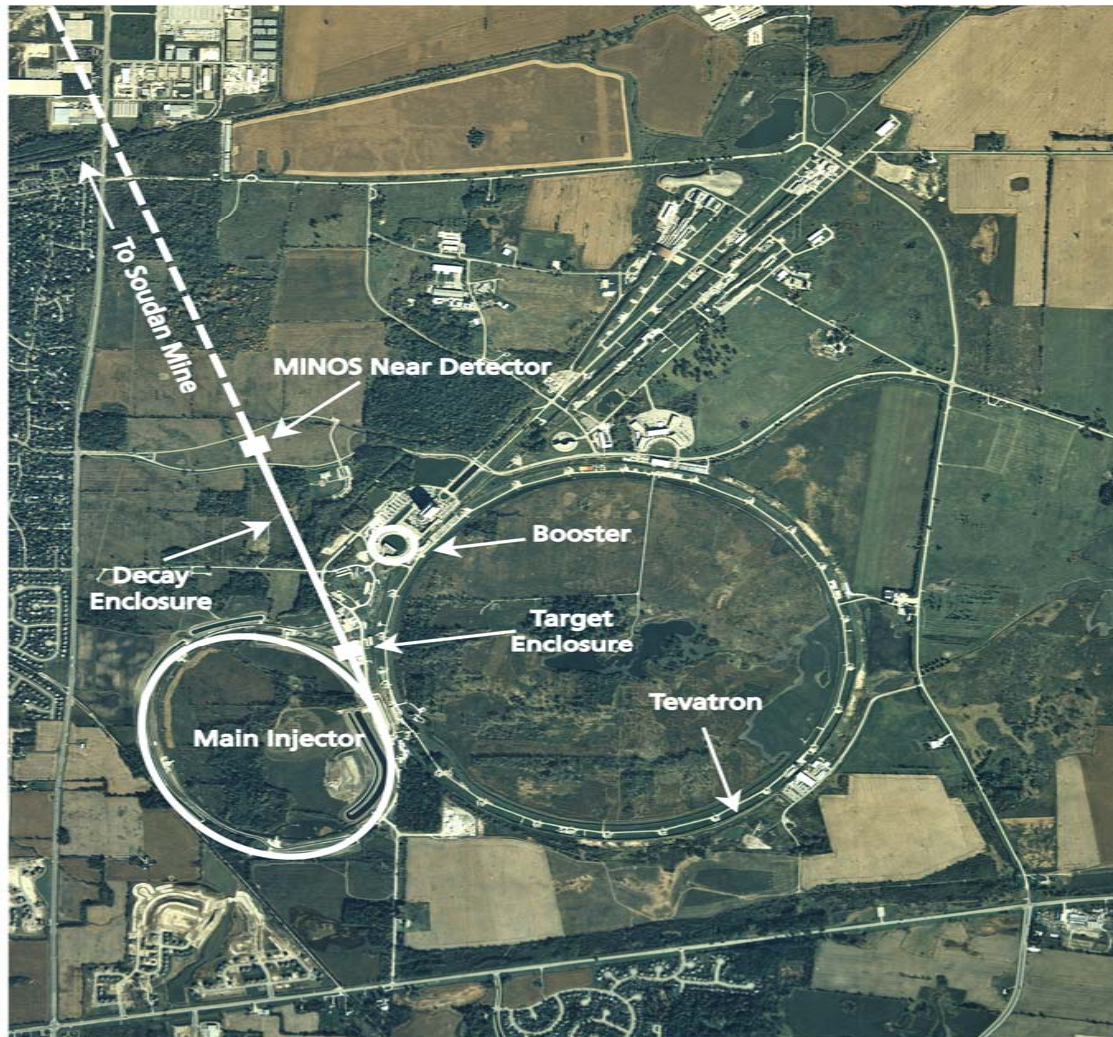




# NuMI / MINOS Overview

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# Project Requirements

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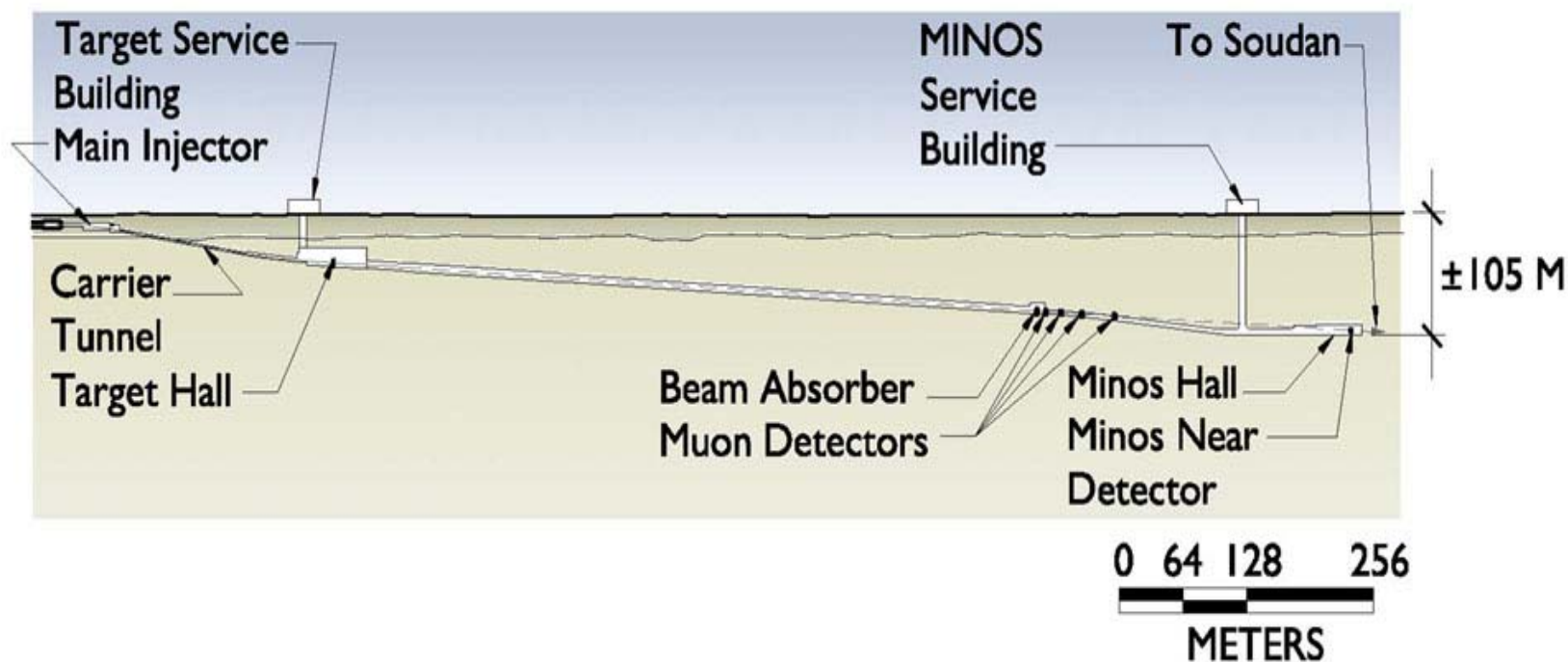
## Basic Requirements:

- Extracted Proton Beam from the Fermilab Main Injector
- Proton Beam Transport line to a production target
- A focusing system to point mesons into a decay region directed towards the experimental detectors
- Hadron absorber
- Muon shield
- Near detector on the Fermilab site
- Far detector at the Soudan Underground Facility



# NuMI Fermilab Facility (elevation view)

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# MINOS Experiment

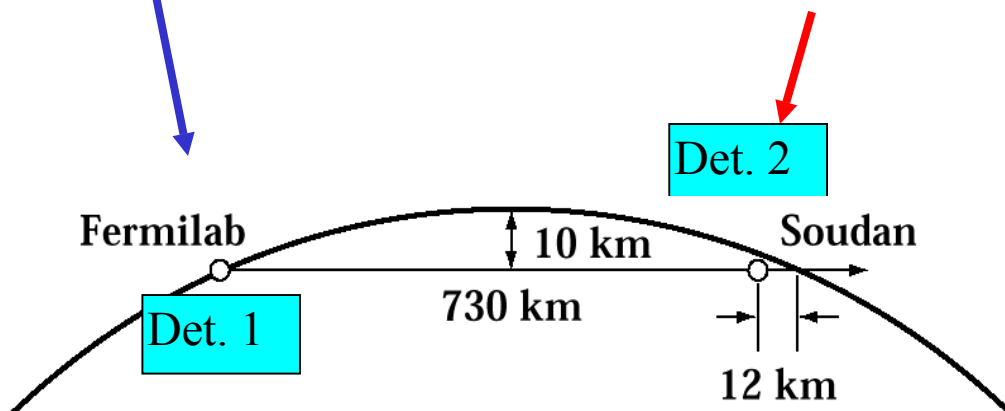
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Two Detector Neutrino  
Oscillation Experiment  
(Start 2005)

Near Detector: 980 tons

Far Detector: 5400 tons





# Conventional Construction

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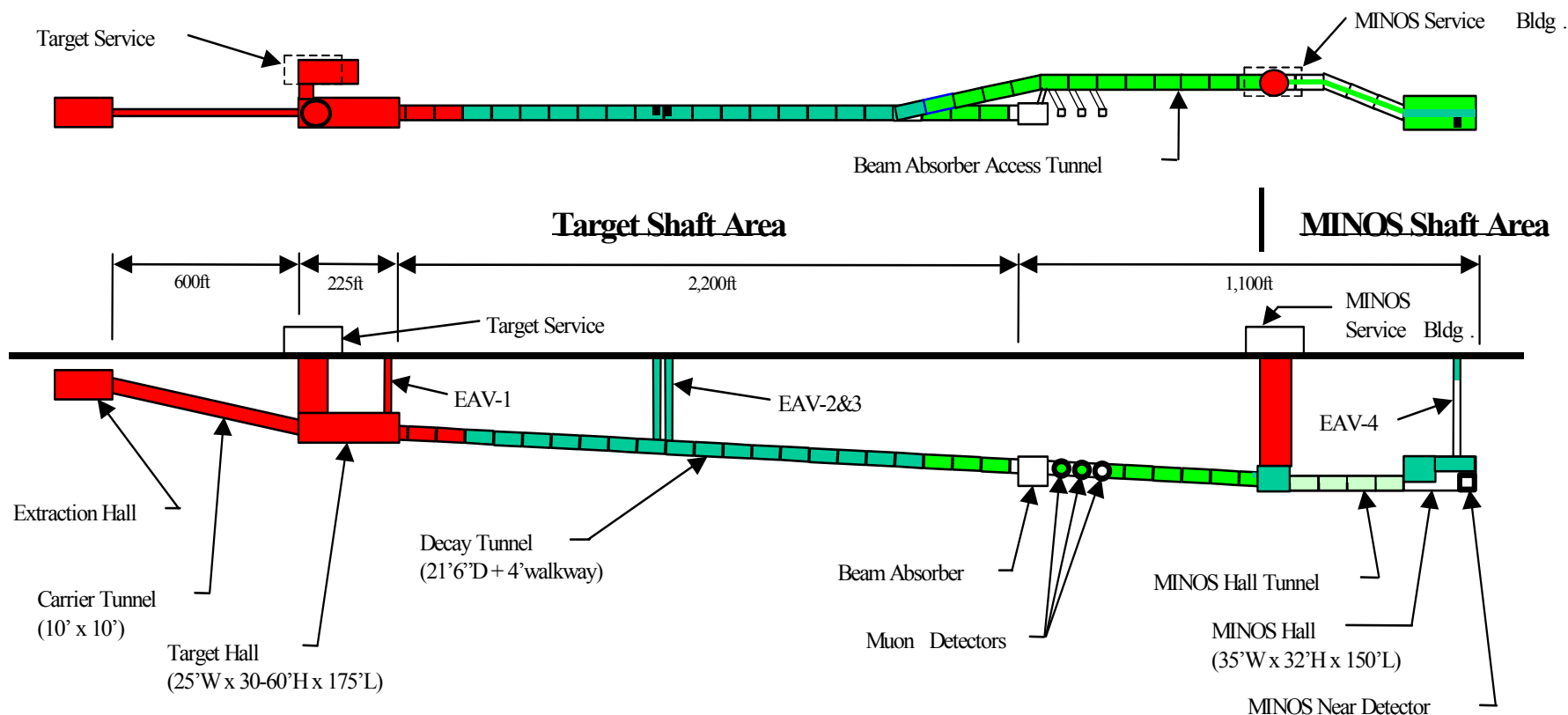
- This has been the primary schedule driver & with major cost impact
  - « Tunnel Boring Machine effort completed Dec. '01.
  - « Drill & blast excavation of absorber cavern, decay tunnel trim-out, muon alcoves progressing well.
  - « Decay pipe and shield installation now on critical path
- Projection: Completion of underground tunnels & halls in October 2002
- Service Buildings/Outfitting Bid package ready for bids. Project construction completion late 2003.
- Very significant attention to both schedule & cost





# NuMI Tunnels and Halls Construction Progress

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# NuMI Decay Tunnel

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# Soudan

## Underground Laboratory

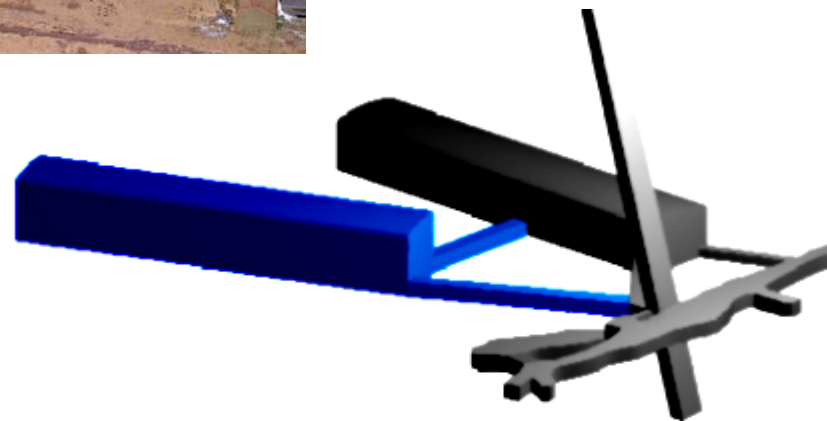
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Photos by Jerry Mc

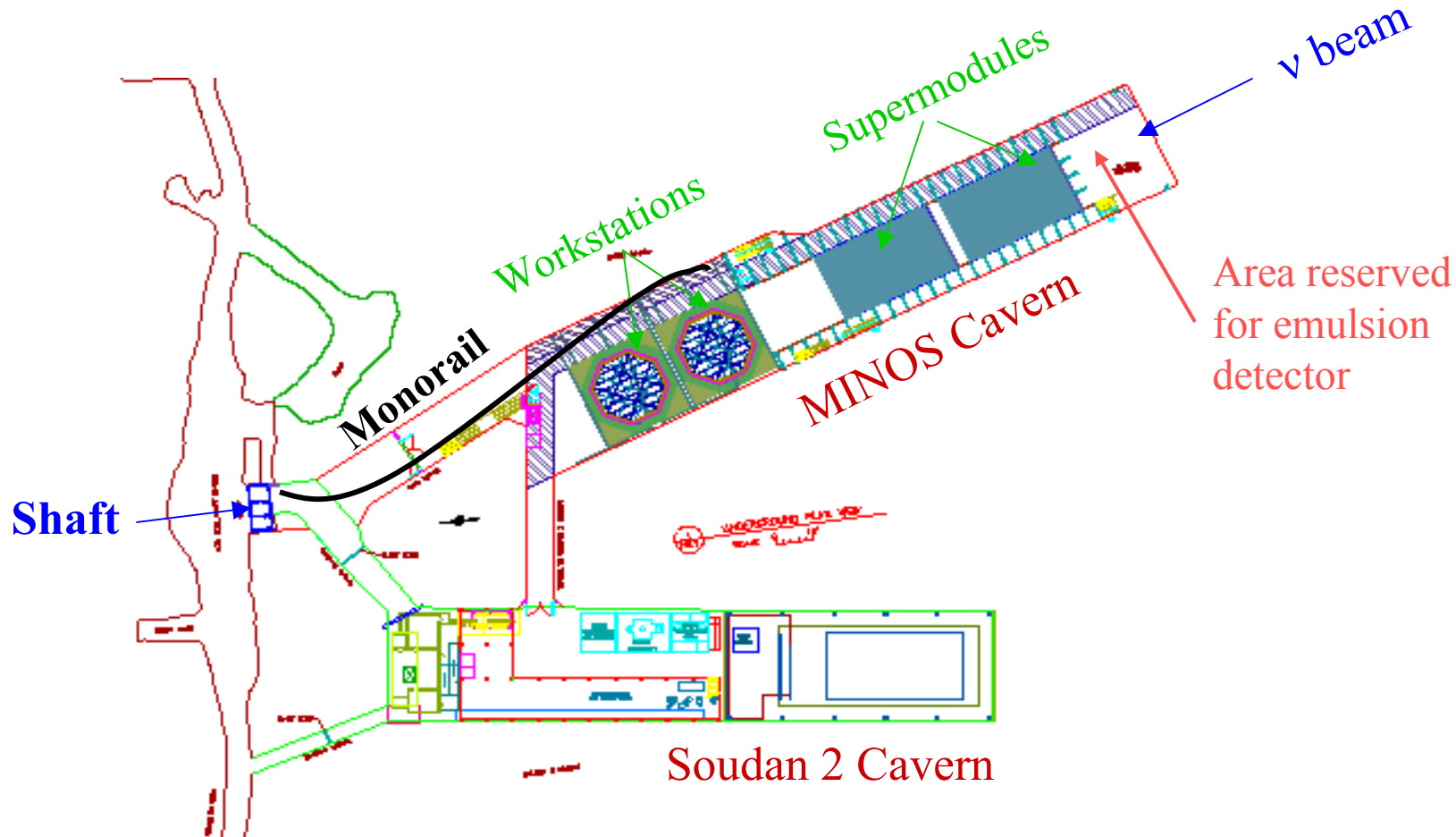


The Soudan shaft limits  
objects to a maximum size  
of  
1m by 2m by 9m





# Far Detector Cavern Layout





# Status: Main Injector

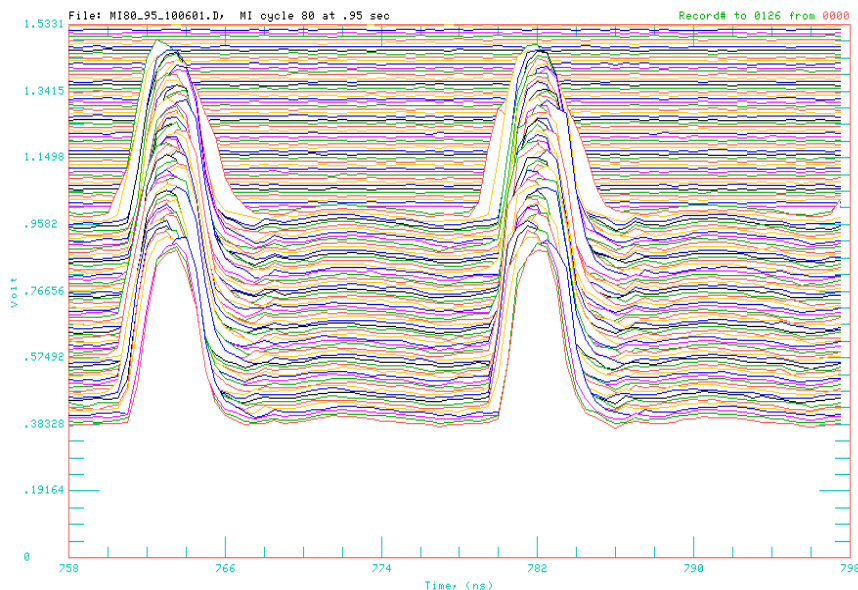
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- Reliable operation in single batch mode (for PBAR production) to  $4.5 \times 10^{12}$  protons / cycle. (NuMI operation will use additional 5 Booster batches.)
- Strong top priority for Collider effort including Recycler (A major effort, recent successes)
- NuMI beam study group (led by A. Marchionni) formed in Summer '01. Measurements ongoing of MI beam parameters important for NuMI operation.
- Initial NuMI installation efforts at MI interface during machine down-days. (stands, magnets, utilities)



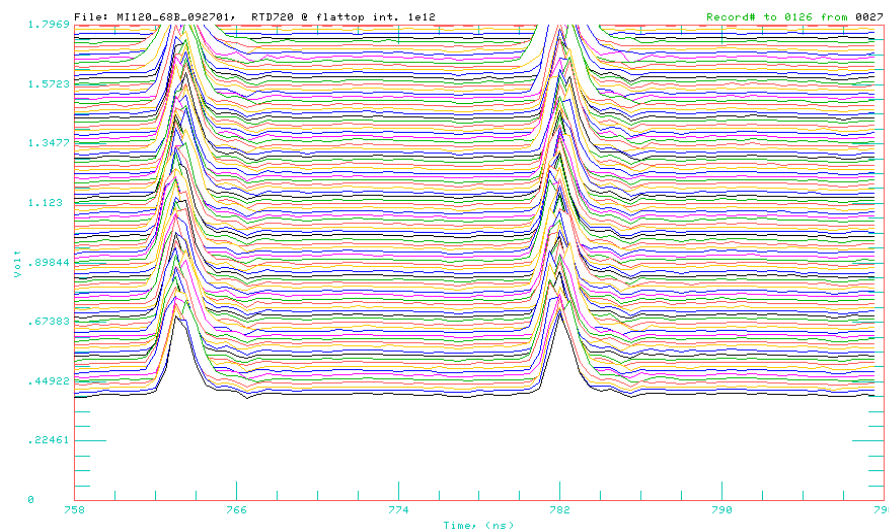
# Resistive Wall Monitor Measurements in Main Injector

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← Flattop, intensity  $\sim 4 \cdot 10^{12}$

Flattop, intensity  $\sim 1 \cdot 10^{12}$  →







# Beam Technical Components

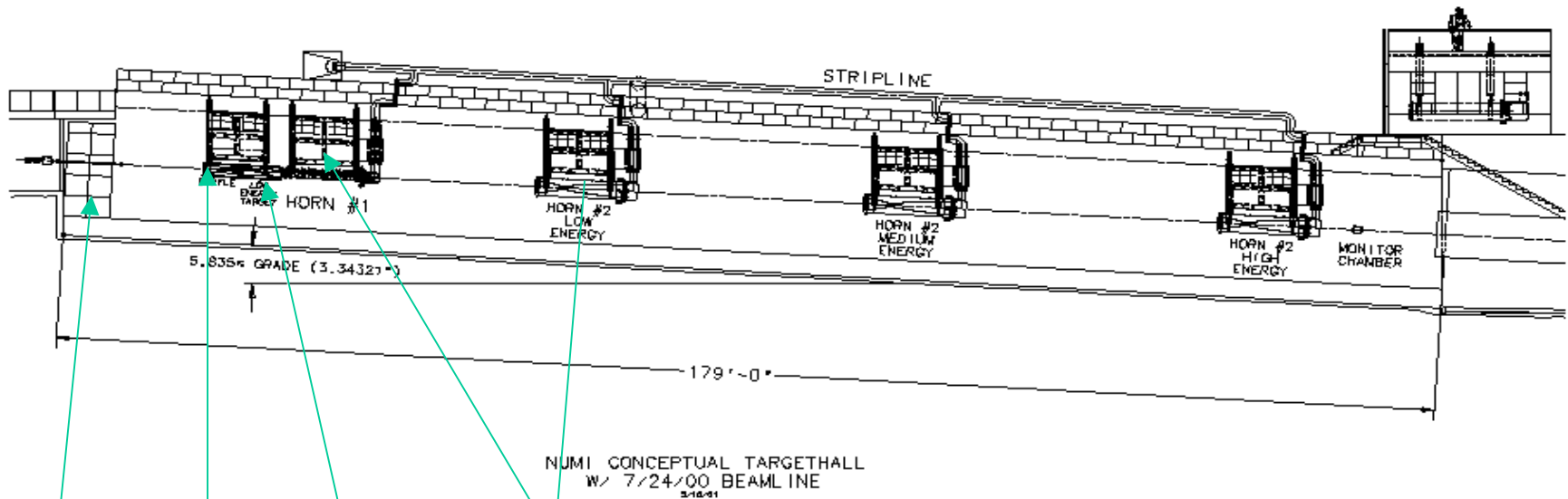
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- Considerable technical progress being made in all areas
  - « Design status  $> 70\%$  complete for all systems
  - «  $> 2.0$  million pulses on prototype horn with operational PS
  - « Beam monitoring technology choice made
  - « Accelerator and extraction beam studies for NuMI
  - « Proton intensity working group
- Significant system improvements (from original baseline) have been required with extraction / primary beam designs and some target hall systems
- FY 2003 is major procurement year
  - « Driver is funding profile



# Neutrino Beam Production Devices and Target Pile

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Two Types of Magnetic Focusing Horns

Pion Production Target

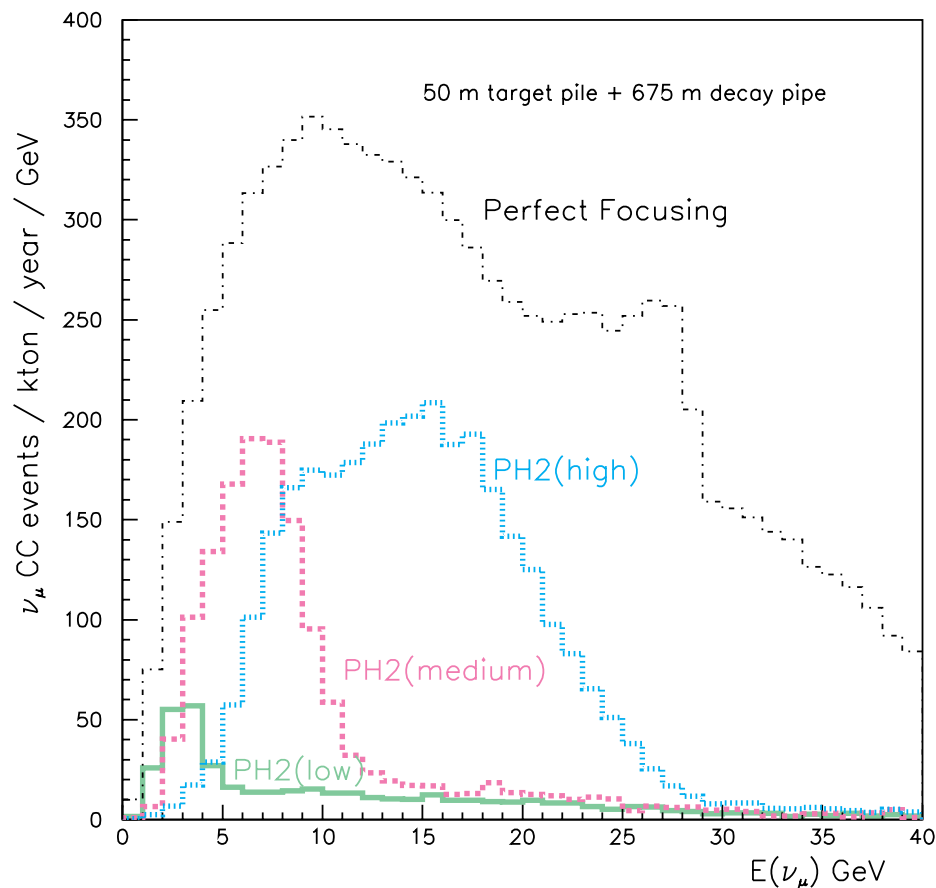
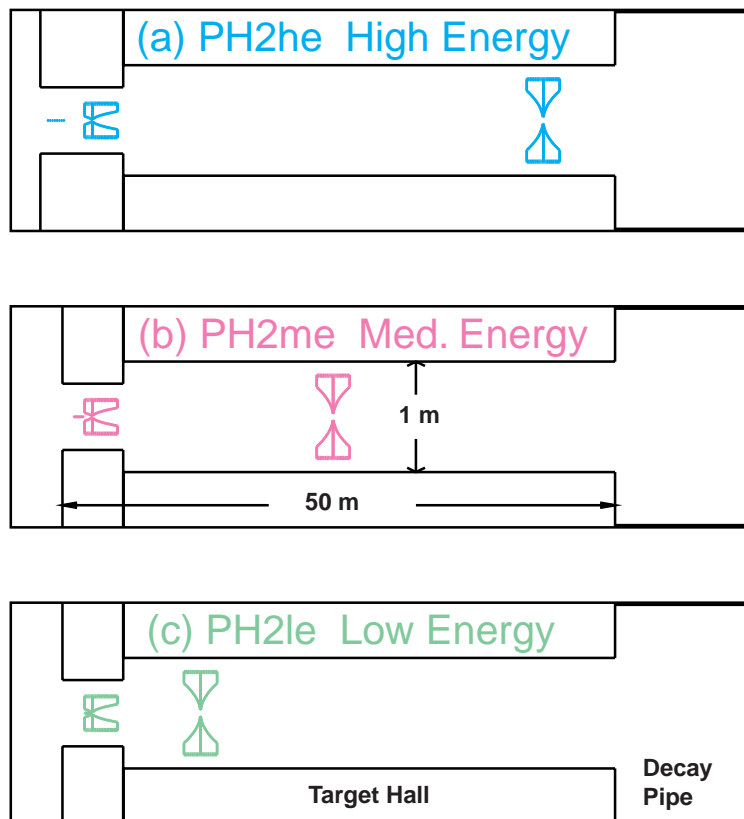
Baffle to protect horn from beam accidents

Target Hall Radiation Shielding



# Tuning Neutrino Spectra by Horn/Target Reconfiguration

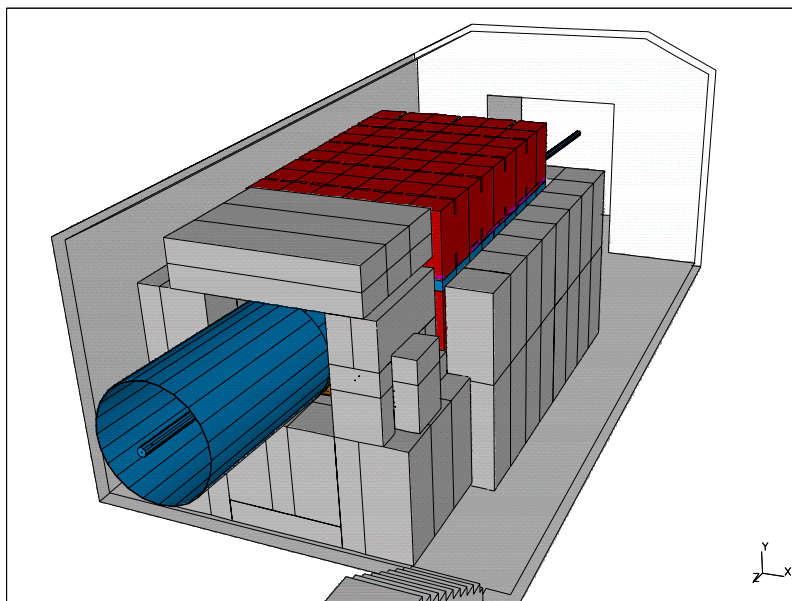
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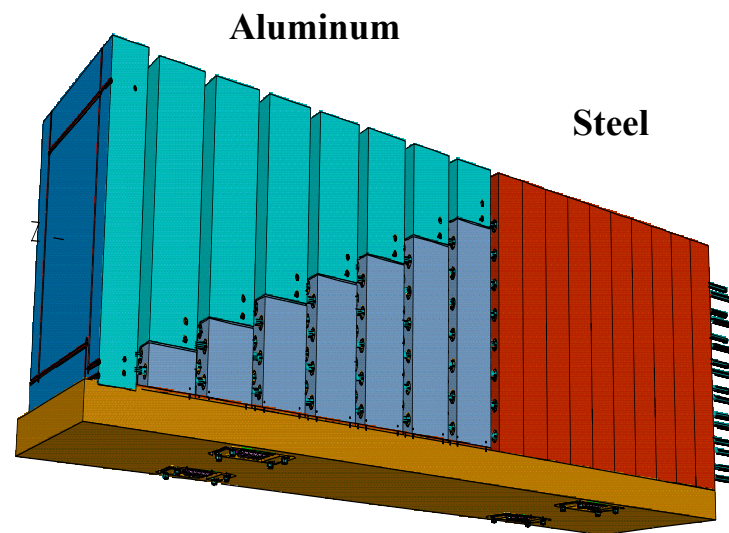
# Hadron Absorber

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Plotted by cillings on 16-Mar-2001 - File: completed\_absorber.pdf

**Absorber Cavern / Shield**



**Absorber Core**



# MINOS Detector

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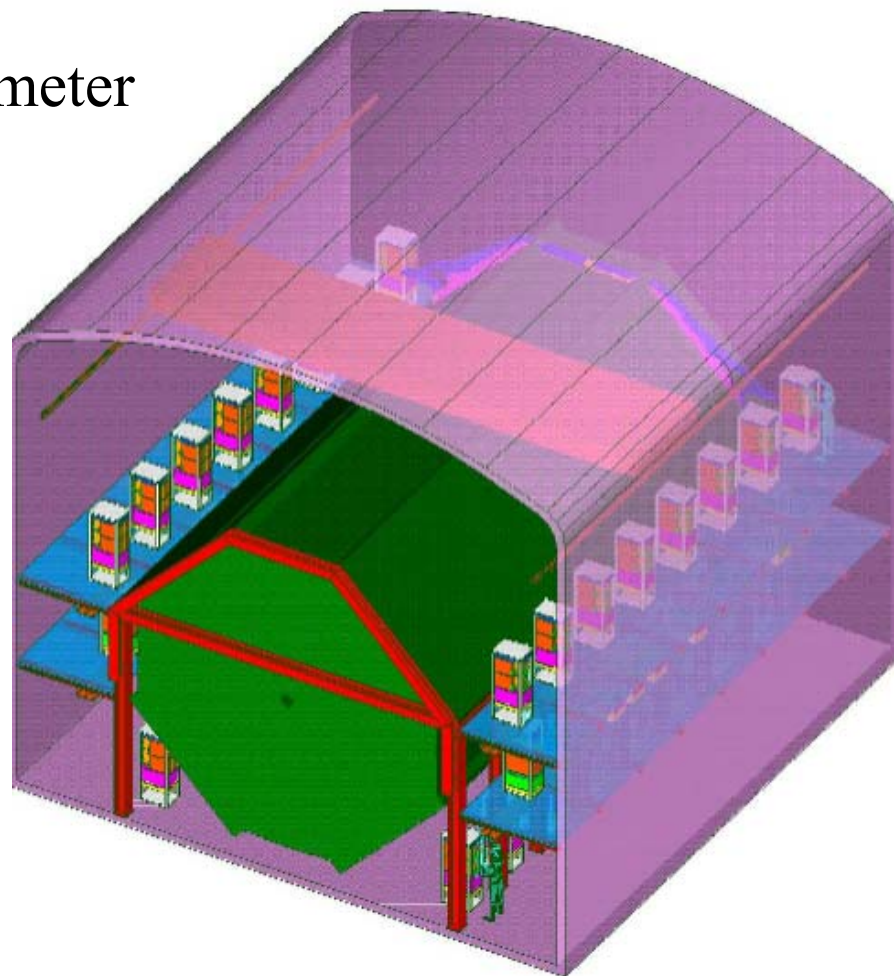
- **Detector Construction is on schedule and on budget**
  - « Cost : Well understood with good contingency
  - « Schedule: Have been meeting all internal milestones
  - « Far detector installation:  $> 100$  modules installed as of mid January  
Now more than 1 kTon in & instrumented. Are installing  $\sim 6$  modules / week.
- **Excellent technical progress has continued**
  - « Production of all major components (steel, scintillator & electronics) for Far detector now geared up, and providing deliveries to meet installation schedule
  - « Good progress on preparing for Near detector assembly
  - « Calibration Detector analysis underway and next run scheduled



# MINOS Far Detector

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- 8m Octagonal Tracking Calorimeter
- 486 layers of 2.54cm Fe
- 2 sections, each 15m long
- 4.1cm wide solid scintillator strips with WLS fiber readout
- 25,800 m<sup>2</sup> active detector planes
- Magnet coil provides  $\langle B \rangle \approx 1.3\text{T}$
- 5.4kt total mass



Half of the MINOS Far Detector



NuMI



MINOS

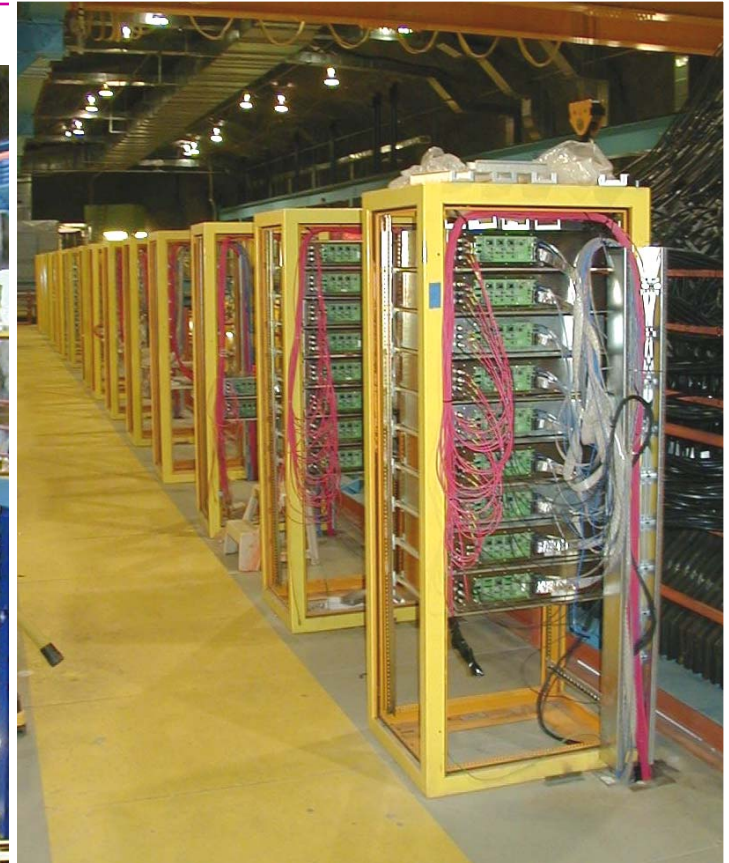
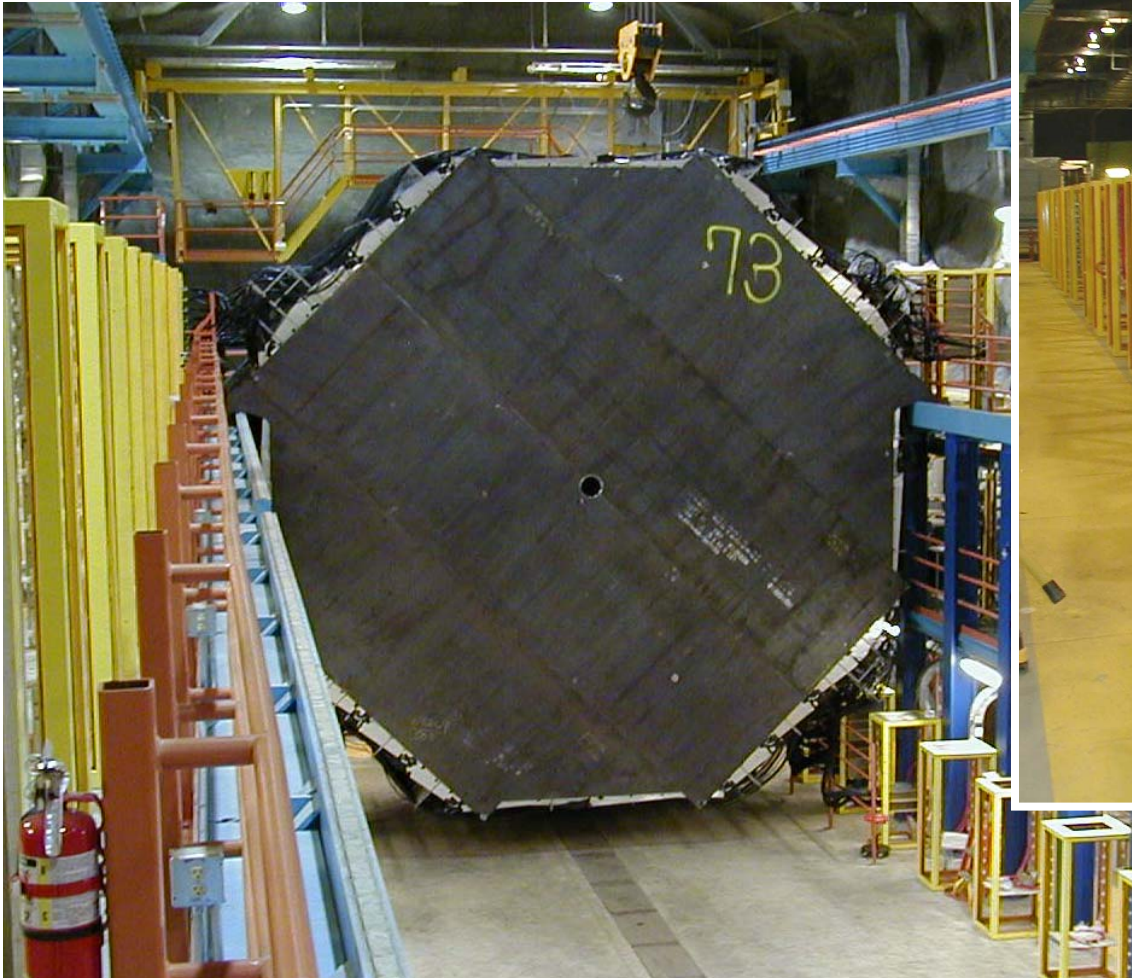
# Far Installation

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# Near Detector Construction

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## Construction underway in New Muon Hall





# NuMI/MINOS Schedule

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- 
- Baseline change proposal recently approved
  - Critical path remains completion of the civil construction at Fermilab and subsequent installation of NuMI technical components
  - Project far detector complete and operational by late 2003
  - Near detector complete and tested late 2004
  - Beam commissioning ~ end 2004/ early 2005