



# Director's Review of NuMI Installation

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## NuMI Main Injector Installation

*Rick Ford*

April 8 - 9, 2003



# January '03 Shutdown Wrap-Up

Director's Review of  
NuMI Installation  
Planning  
April 8 – 9, 2003  
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- Planning
- Accomplishments
- Issues
- Template for the Future



# Jan '03 Planning

- Shutdown length, start date, outline of major tasks
- MS Project schedule
- Find resources > limited
- Planning meetings
  - « NuMI/operations
  - « Recycler/MI
  - « Alignment
  - « Level 3 meetings
  - « Daily planning meetings during shutdown



# Accomplishments

- 12 Magnets > SY/TeV to magnet factory.
- Electrical work
- LCW piping in stub
- Extraction channel magnet stand relocation & mods.
- New dust wall





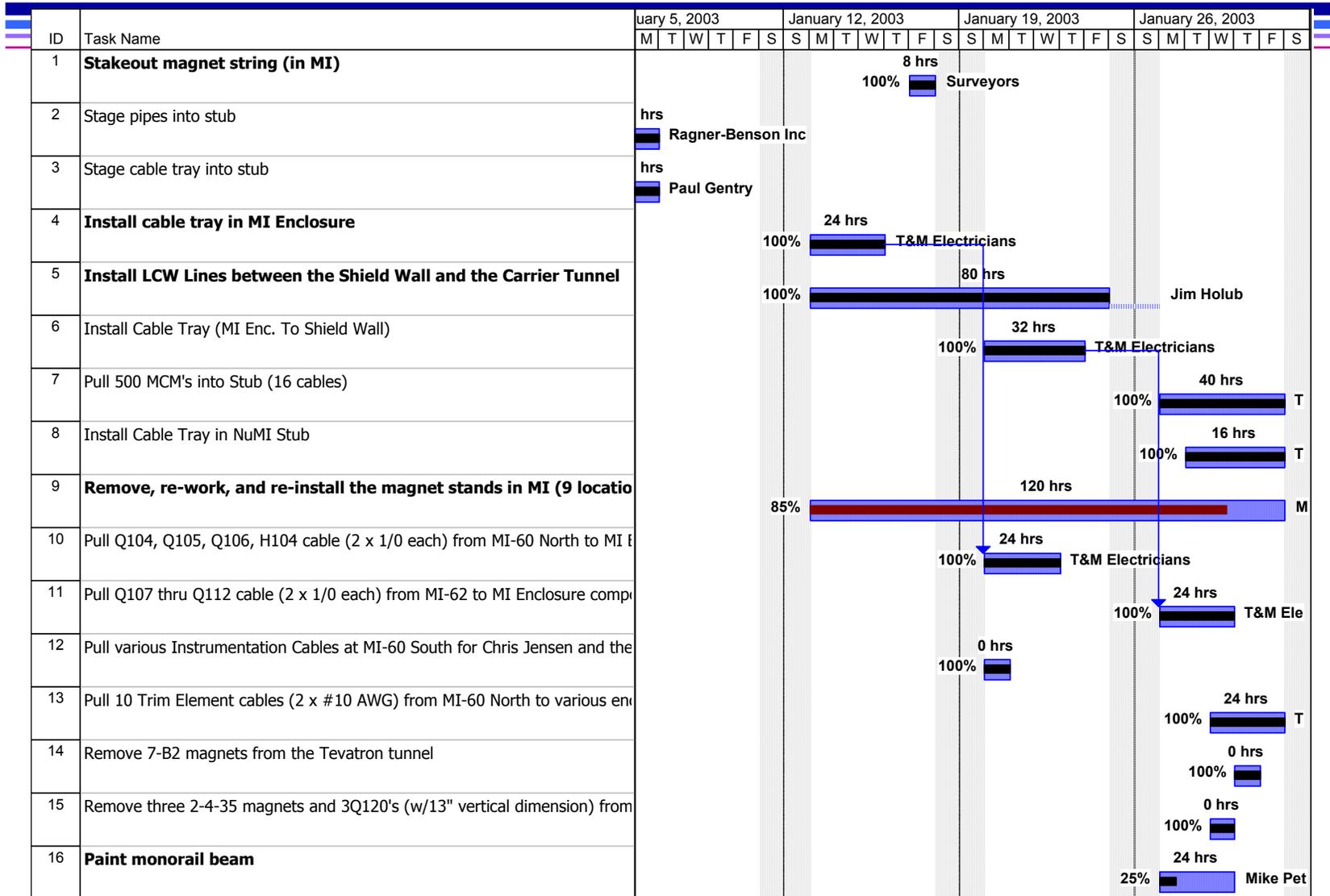
# Accomplishments





MINOS

# Jan '03 MS project





# Jan 03 Shutdown





# Issues

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- Since shutdown was not specifically for NuMI there was a big change in length/scope of shutdown on short notice.
  - Last minute assignment of task managers.
  - Magnet stand drawing problems due to incomplete as-built information.
  - Incomplete safety review process for magnet stands.
  - Not enough task managers.



# Template for the Future

- Need to know firm timing and length of shutdowns with sufficient lead time to have contracts in place. (>2 months)
- Task managers must be assigned well in advance of shutdown in order to become familiar with tasks and find resources.
- Installation drawings/instructions must be completed sufficiently before start date to uncover potential design/safety concerns and have time to modify.
- Devices must be installation ready.
  - « All safety reviews/tests completed (see installation spreadsheet), parts in hand, devices staged



# Future MI Shutdowns

- MS Project driven by start date, logical task order, and geography completed (not resource driven yet).
- Still working to fit in 6 weeks each. We have not yet explored double shifts, double crews, OT, etc.
  - « Summer '03 -> 8 weeks
    - \* A bottoms up estimate by MSD is nearly complete showing roughly the same duration.
    - \* Magnets need to be ready for power tests between '03 & '04
  - « Summer '04 -> 7 weeks
- Plan is somewhat flexible, i.e. some tasks are modular and can be moved if one shutdown is slightly longer or shorter, but the integral is needed.
- Unscheduled shutdowns
  - « Opportunities to shorten scheduled shutdowns?



# Unscheduled Shutdowns

- Since Jan. there have been several unscheduled shutdowns including 2 weeks for magnet replacements.
- Unscheduled shutdowns are typically controlled access for various good reasons.
- Almost all currently available NuMI tunnel work is Davis-Bacon.
- T & M contractors are not typically trained or allowed to controlled access, therefore very little NuMI work gets done during unscheduled shutdowns.
- NuMI would welcome any ideas or assistance to take advantage of these unscheduled shutdowns, e.g. possibly go to supervised access for any shutdowns expected to exceed 1 day?



# Summer '03 Project Chart

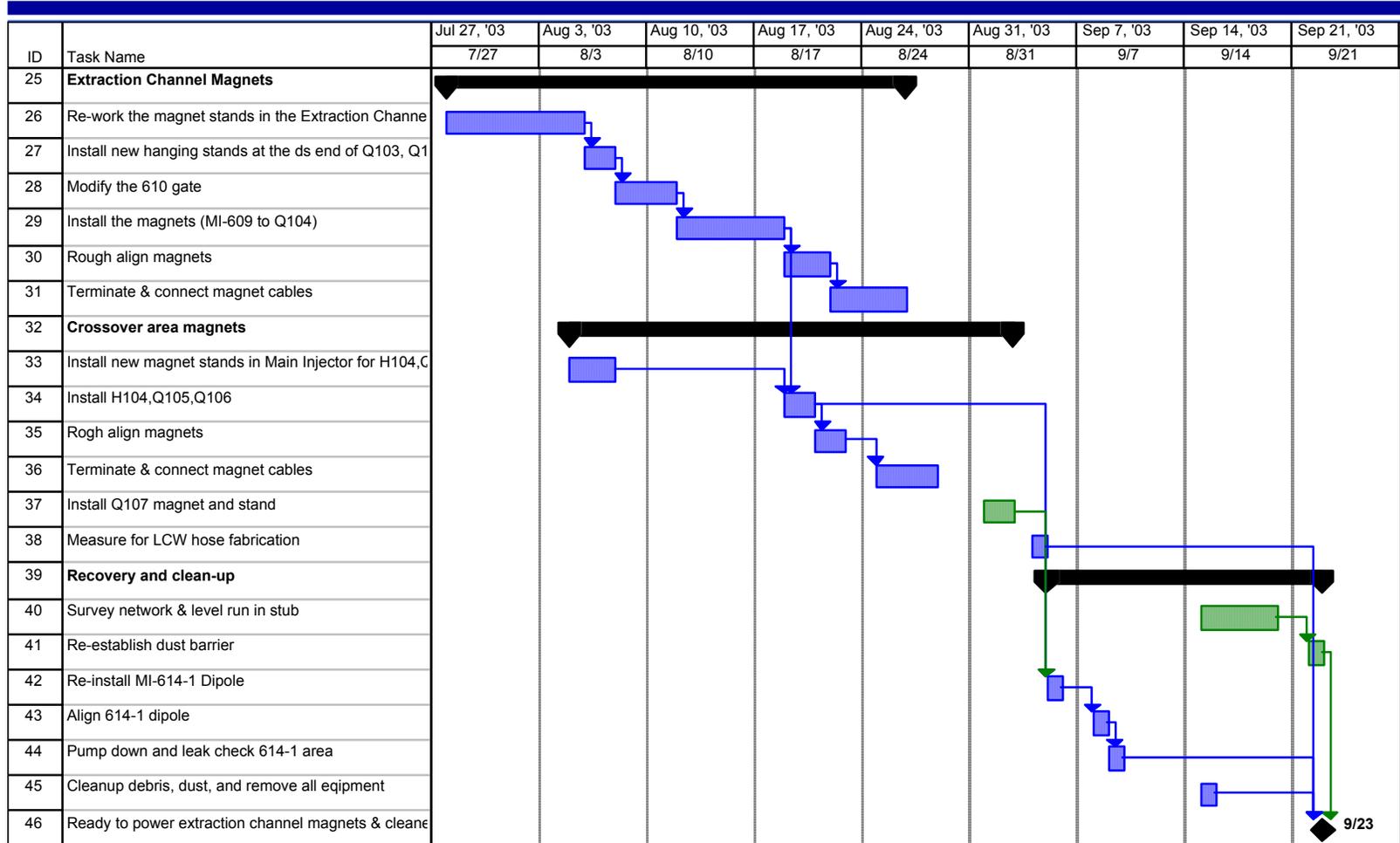
## MINOS

ID	Task Name	Dur	Jul 27, '03 7/27	Aug 3, '03 8/3	Aug 10, '03 8/10	Aug 17, '03 8/17	Aug 24, '03 8/24	Aug 31, '03 8/31	Sep 7, '03 9/7	Sep 14, '03 9/14	
1	<b>NuMI stub prep work</b>	<b>35 days</b>	[Black bar spanning from 7/27 to 9/7]								
2	<b>Survey</b>	<b>8 days</b>	[Black bar spanning from 7/27 to 8/4]								
3	Level Run	1 day	[Blue bar from 7/27 to 7/28]								
4	Unplug 2 MI-60 Sight Risers	1 day	[Blue bar from 7/28 to 7/29]								
5	Perform survey drops from 2 sight risers	2 days	[Blue bar from 7/29 to 7/31]								
6	Stakeout magnet string (in stub)	1 day	[Blue bar from 8/3 to 8/4]								
7	Install brass and tie-rods	2 days	[Blue bar from 8/4 to 8/6]								
8	<b>Mechanical</b>	<b>20 days</b>	[Black bar spanning from 7/27 to 8/17]								
9	Remove MI-614-1 Dipole	1 day	[Green bar from 7/27 to 7/28]								
10	Remove A150 beam pipe section from xover area	1 day	[Green bar from 7/28 to 7/29]								
11	Remove rad fence from stub and install new rad. fence in cal	3 days	[Green bar from 7/29 to 8/1]								
12	Remove 30' wall and plywood wall	5 days	[Green bar from 7/29 to 8/3]								
13	Complete the installation of the LCW Lines	6 days	[Green bar from 7/29 to 8/4]								
14	Install and Test Monorail	10 days	[Green bar from 7/29 to 8/8]								
15	Clean-up debris & dust from tunnel	1 day	[Blue bar from 8/17 to 8/18]								
16	<b>Electrical</b>	<b>7 days</b>	[Black bar spanning from 8/24 to 8/31]								
17	Complete instrumentation cable tray in Stub	2 days	[Green bar from 8/31 to 9/1]								
18	Install 500MCM cable tray in stub	3 days	[Green bar from 9/1 to 9/4]								
19	Pull Instrumentation Cables in stub	5 days	[Green bar from 9/4 to 9/9]								
20	<b>Magnet Installation</b>	<b>29 days</b>	[Black bar spanning from 7/27 to 8/26]								
21	<b>Stub Magnets</b>	<b>9 days</b>	[Black bar spanning from 8/17 to 8/26]								
22	Install stands in NuMI Stub (assemble, align, anchor)	5 days	[Green bar from 8/17 to 8/22]								
23	Install magnets in NuMI Stub	5 days	[Green bar from 8/22 to 8/27]								
24	Rough align stub magnets	3 days	[Blue bar from 8/27 to 8/30]								
25	<b>Extraction Channel Magnets</b>	<b>22 days</b>	[Black bar spanning from 7/27 to 8/19]								
26	Re-work the magnet stands in the Extraction Channel	7 days	[Blue bar from 7/27 to 8/3]								
27	Install new hanging stands at the ds end of Q103, Q104	2 days	[Blue bar from 8/3 to 8/5]								



MINOS

# Summer '03 Project Chart









# What's Missing?

- LCW commissioning
  - « During short shutdowns and while MI running
  - « Issues with magnet contamination
  - « Ross Doyle to massage and implement Dave Pushka's plan
  - « Consensus on plan with LCW group
- Magnetic Shielding for Recycler
  - « Potentially large effort depending on tests.
  - « Need magnets operational in '03
  - « Piecework can be done with techs during short shutdowns.
  - « Iteration if needed.
- MI instrumentation move



# Contingency Plan

- Summer '03
  - « Alignment network - 1 week
  - « Instrumentation cable tray and cable pull - 1 week
- Summer '04
  - « It is important to identify issues well in advance if we are to begin commissioning following this shutdown



# Manpower

- Since the last installation review, we have put considerable effort into identifying additional manpower in the Beams Div. to help with the NuMI effort.
- Thus far the following new people have agreed to help on NuMI related projects:
  - \* George Krafczyk - Elec. - L3 mgr
  - \* Joel Misek - Mech.
  - \* Rob Reilly - Mech.
  - \* Dave Augustine - Mech.
  - \* Ross Doyle - LCW
  - \* Mike Petkus - Task Mgr.
- We expect several more task mgrs named soon.



# Planning Meetings

- Meetings with Ops/MI/recycler/alignment were useful to identify interferences and resource issues.
- Need detailed installation planning meetings.
- Daily (9am) planning meetings during shutdowns were useful.



# Main Injector Installation Summary

- Jan '03 shutdown went very well
  - « Accomplished tasks we set out to do
  - « Worked well within matrix of other BD projects.
  - « Identified issues and solutions for future shutdowns
- Summer '03 and '04 issues identified
  - « Want magnets including Lambertsons powered in '03
  - « Manpower & resources
  - « Working to minimize length of shutdowns
  - « Device readiness