Horn 2 Relocation to ME Shielding Reconfiguration

June 5, 2007

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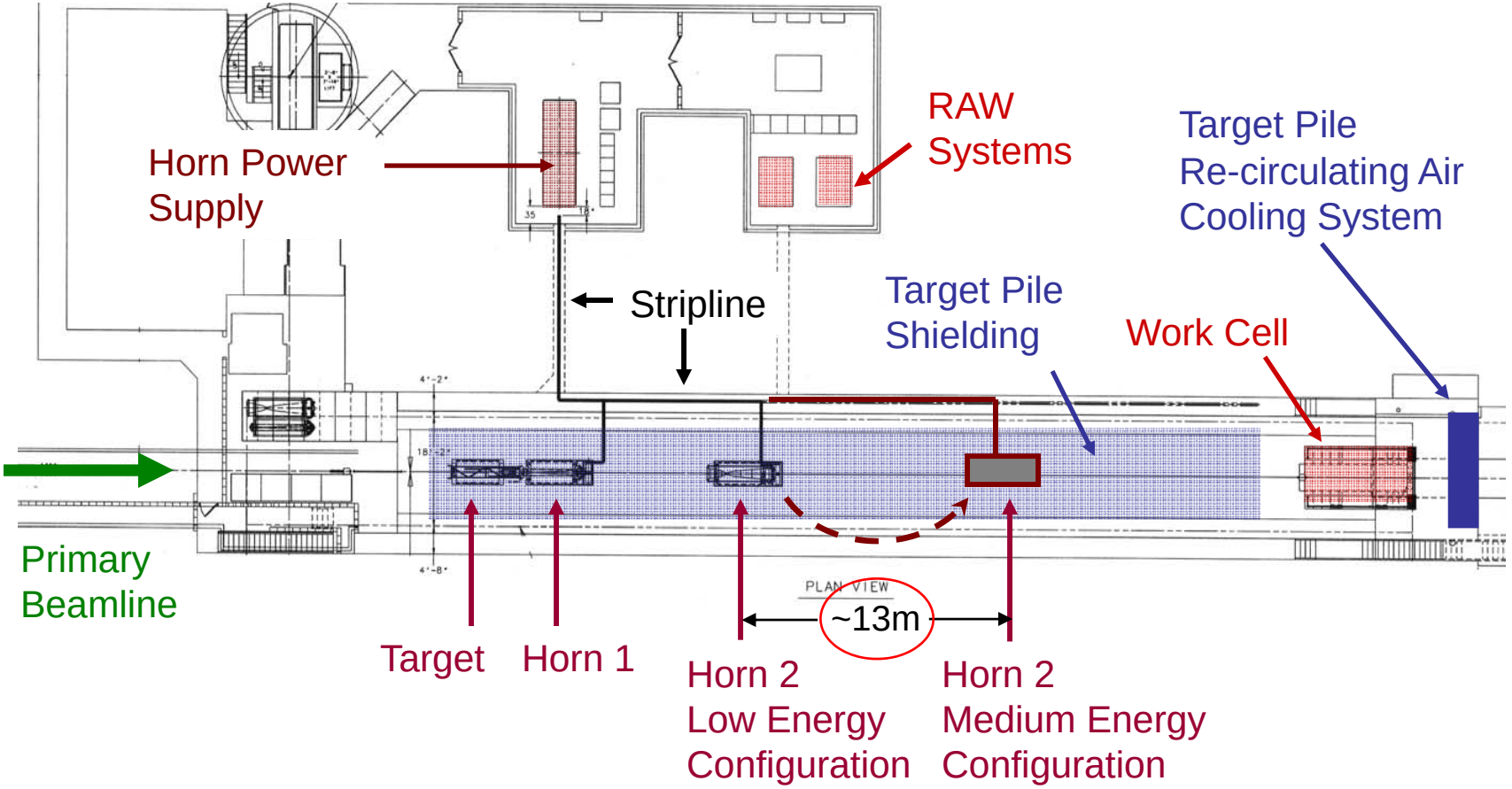
ANU Target Hall Infrastructure, WBS X.0.3.3.2.2

CD-2/3a Director's Review Breakout

Overview

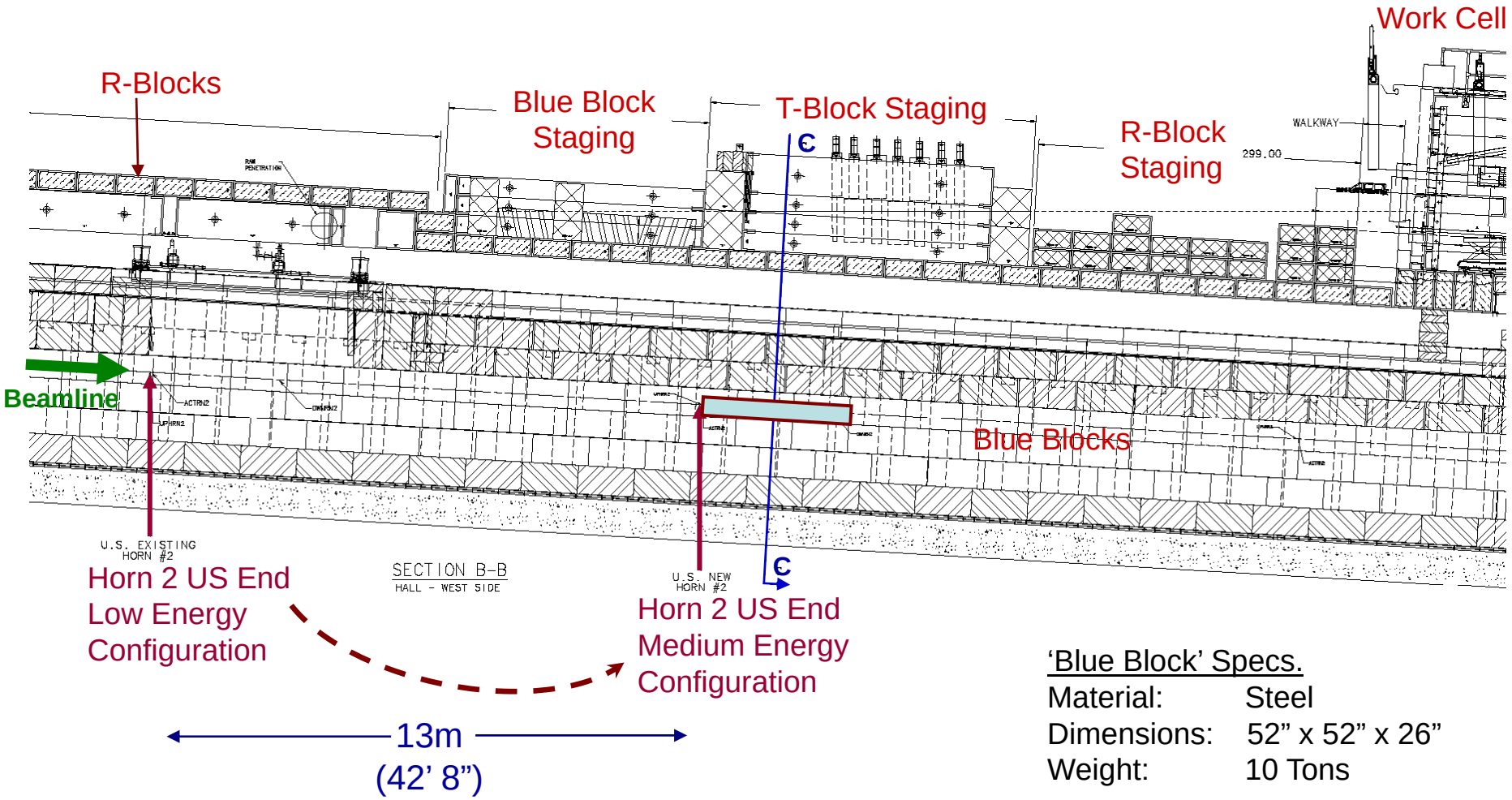
- Existing Target Hall Layout & Shielding Arrangement
- Changes Required for Medium Energy Configuration
- Horn 2 ‘Dummy’ Module & Shielding Plug
  - cost saving alternative that eliminates dummy module
- Available Target Hall Space Concerns
- Blue Block Remote Handling & Management
- Summary of Basic Tasks Involved in the Shielding Reconfiguration

Target Hall (Plan View)



Target Hall (Section View)

Showing Longitudinal Section Through Target Pile Shielding

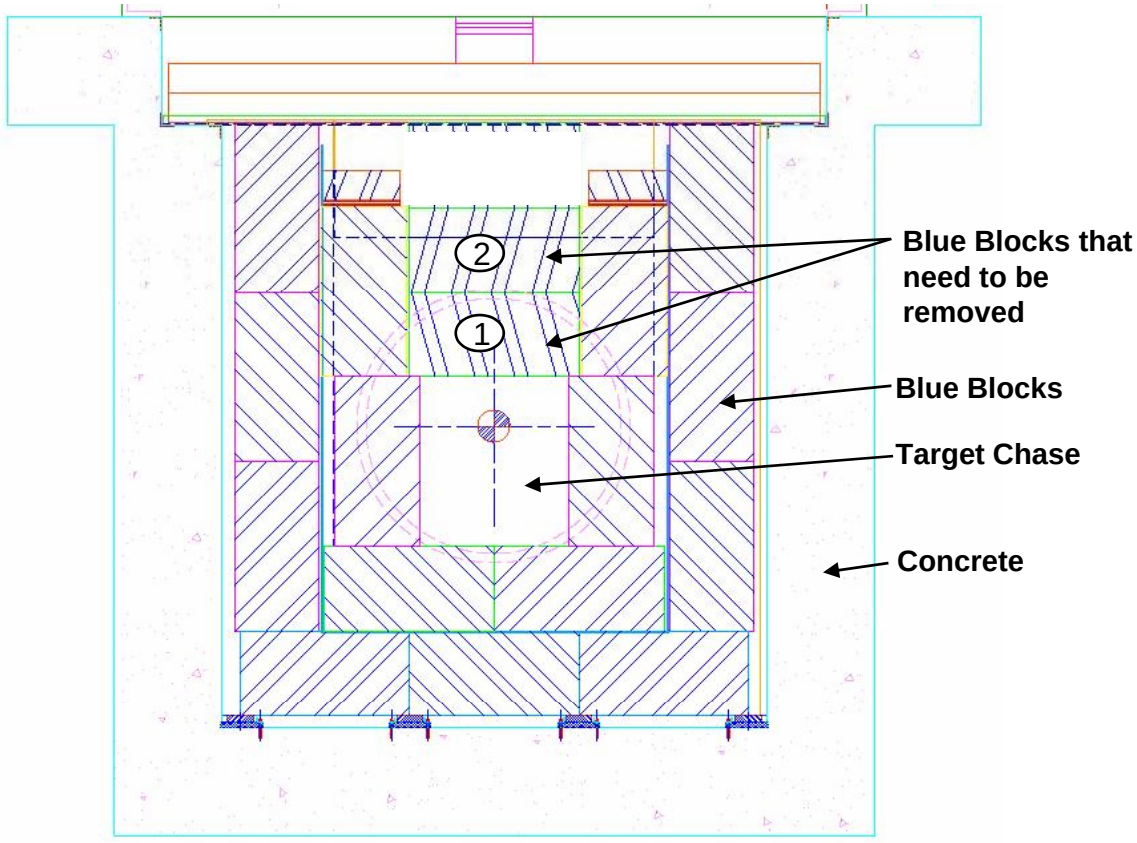


'Blue Block' Specs.

Material:	Steel
Dimensions:	52" x 52" x 26"
Weight:	10 Tons

Shielding Cross Section

Section C-C Showing Blue Block Stacking Order



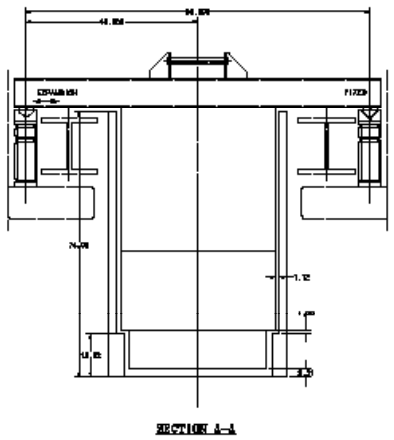
Target Hall Shielding Section C-C
at Medium Energy Location

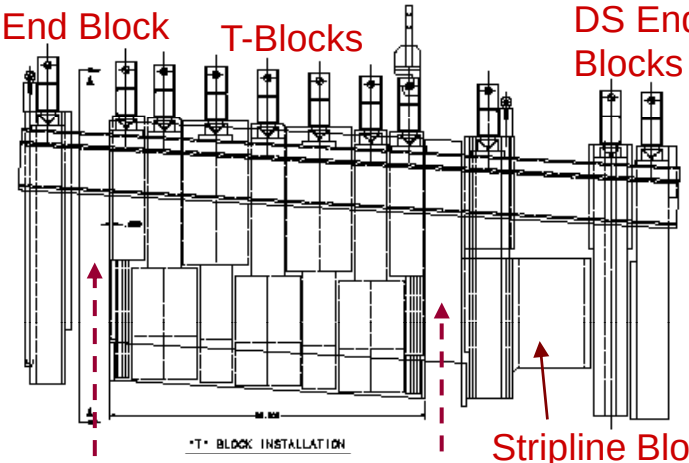
Changes Required:

- At the Medium Energy position, only the center row of Blue Blocks (marked 1 & 2) will have to be removed to make space for Horn 2
- Total of approximately 9-12 Blue Blocks will need to be extracted & relocated/stored
- This work is planned for the Accelerator Upgrades Shutdown after completion of Collider Run II operations

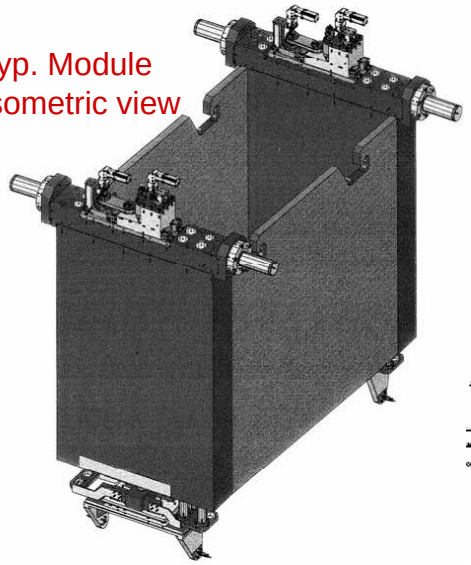
Horn 2 Dummy Module & Shielding

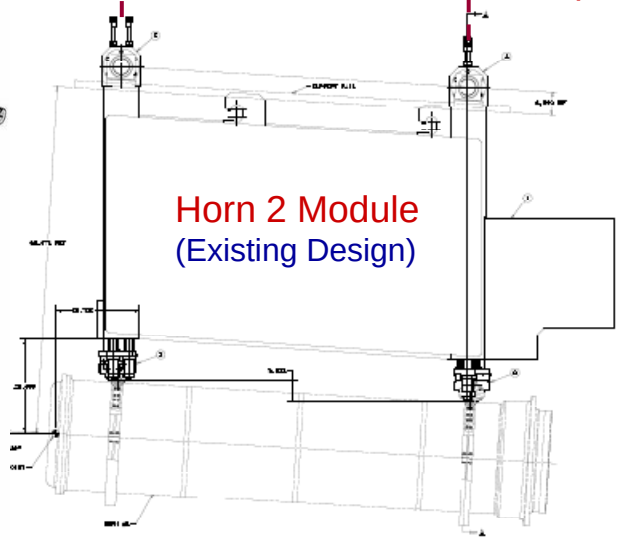
(this is what is costed in the RLS)

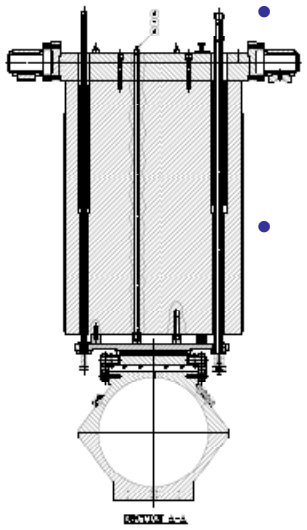




Typ. Module Isometric view







Plan is to:

- Build an identical but simplified 'Dummy' horn module assembly which will act as a shielding plug
- Build an identical set of shielding blocks (T-blocks, End blocks, & Stripline Block)
  - Allows for Horn 2 to be moved back to the LE position if the need arises
  - Possible to re-use some of the Blue Blocks in place of the dummy module (not the most viable option)

H2 Relocation using Dummy Module

- New "Dummy Module"
- New set of T-blocks
- Accelerator Upgrades Shutdown: Reconfigure Shielding & Prep ME Location
  1. Re-locate T-block staging area, remove R-blocks over ME
  2. Remove 8-10 blue blocks, some could be taken up-shaft for storage
  3. Install new Carriage, T-block Support Tube weldment, and Dummy Module
  4. Install new T-blocks, install air barrier, install R-blocks
- NuMI Upgrades Shutdown: Move Horn 2 to ME
  1. Remove R-blocks over LE and ME position (possibly upshaft for staging)
  2. Remove and stage LE T-blocks, remove Horn 2 and place in work-cell
  3. Remove and stage ME T-blocks, remove and directly place Dummy Module in LE position, install T-blocks in Dummy module
  4. Install air barrier in LE position, install R-blocks
  5. Install Horn 2 in ME position, install T-blocks, install R-blocks

Pros: well understood concept, 'relatively' low risk, work can be split over 2 shutdowns, easy to move Horn 2 back to LE position in future or store a defective module, no blue block remote stacking in high radiation areas

Cons: Need 2 T-block staging areas (not enough space) + introduces new large equipment (e.g. dummy module) in an already very limited space, high cost

Cost Saving Alternative

- Eliminates new “Dummy Module”
- New T-block design that is wider to fill module void, plus new set of T-blocks to replace module end blocks

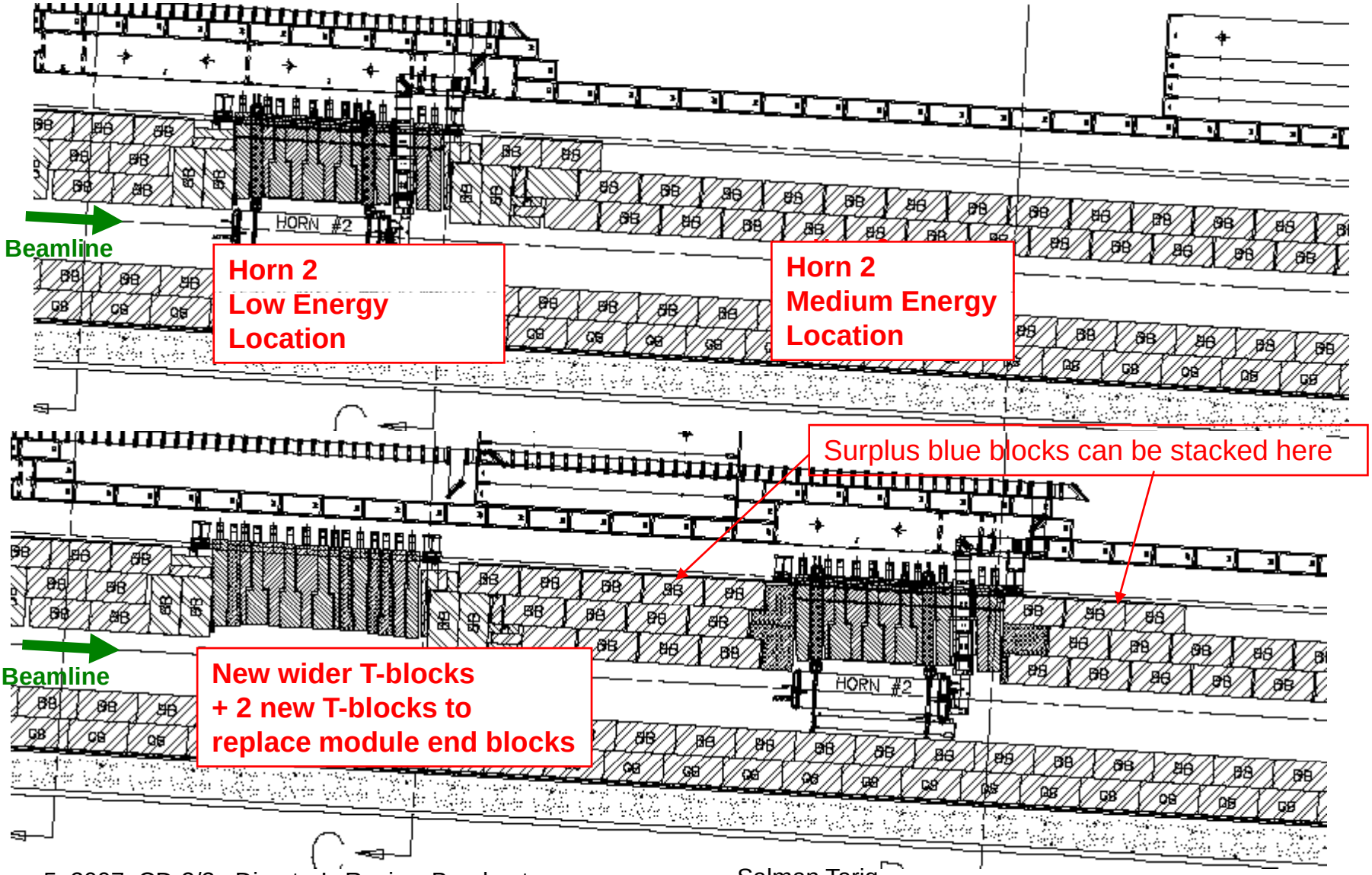
Horn 2 Relocation steps without Dummy Module:

- Accelerator Upgrades Shutdown: Reconfigure Shielding & Prep ME Location
  1. Re-locate T-block staging area, remove R-blocks over ME
  2. Remove and reconfigure 8-10 blue blocks (some surplus blocks could be taken up-shaft for storage), install custom blocks
  3. Install new Carriage, T-block Support Tube weldment, and T-blocks
  4. Install new air barrier in ME position, install R-blocks
- NuMI Upgrades Shutdown: Move Horn 2 to ME
  1. Remove R-blocks over LE and ME position (we will probably need to move several blocks upshaft since not enough space in Target Hall)
  2. Remove and stage LE T-blocks, remove Horn 2 and place in work-cell
  3. Remove ME T-blocks and place directly in LE position
  4. Move air barrier from ME and install in LE position, install R-blocks
  5. Install Horn 2 in ME position, install T-blocks, install R-blocks

Pros: no dummy module--cost saving, no blue block remote stacking in high radiation areas, single T-block staging area, work can be split over 2 shutdowns, easy to move Horn 2 back to LE position in future or store a defective module

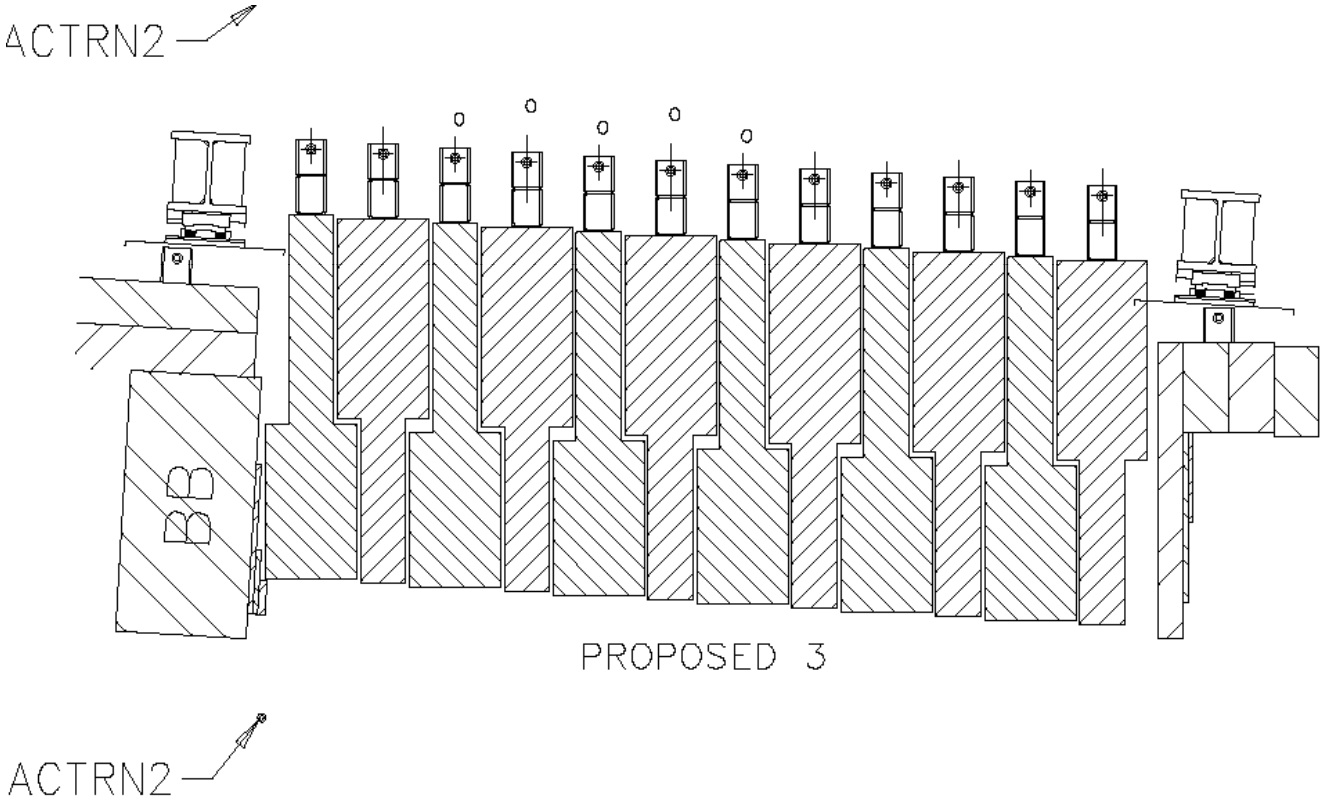
Cons: still requires new set of T-blocks (heavier) plus custom end blocks

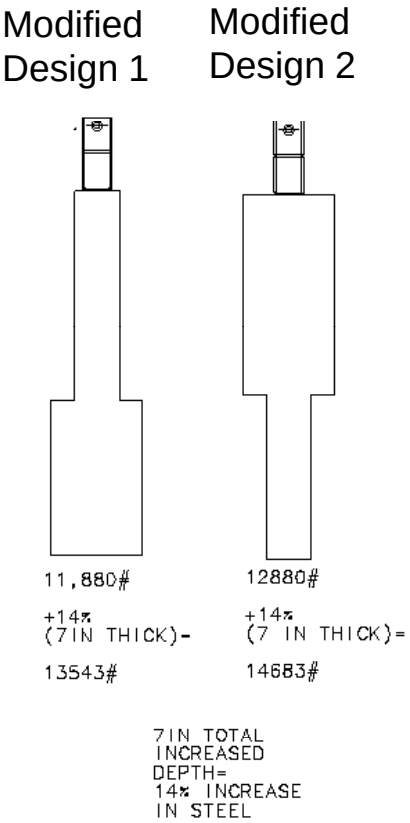
Horn 2 Relocation w/o Dummy Module



Recent work in progress…

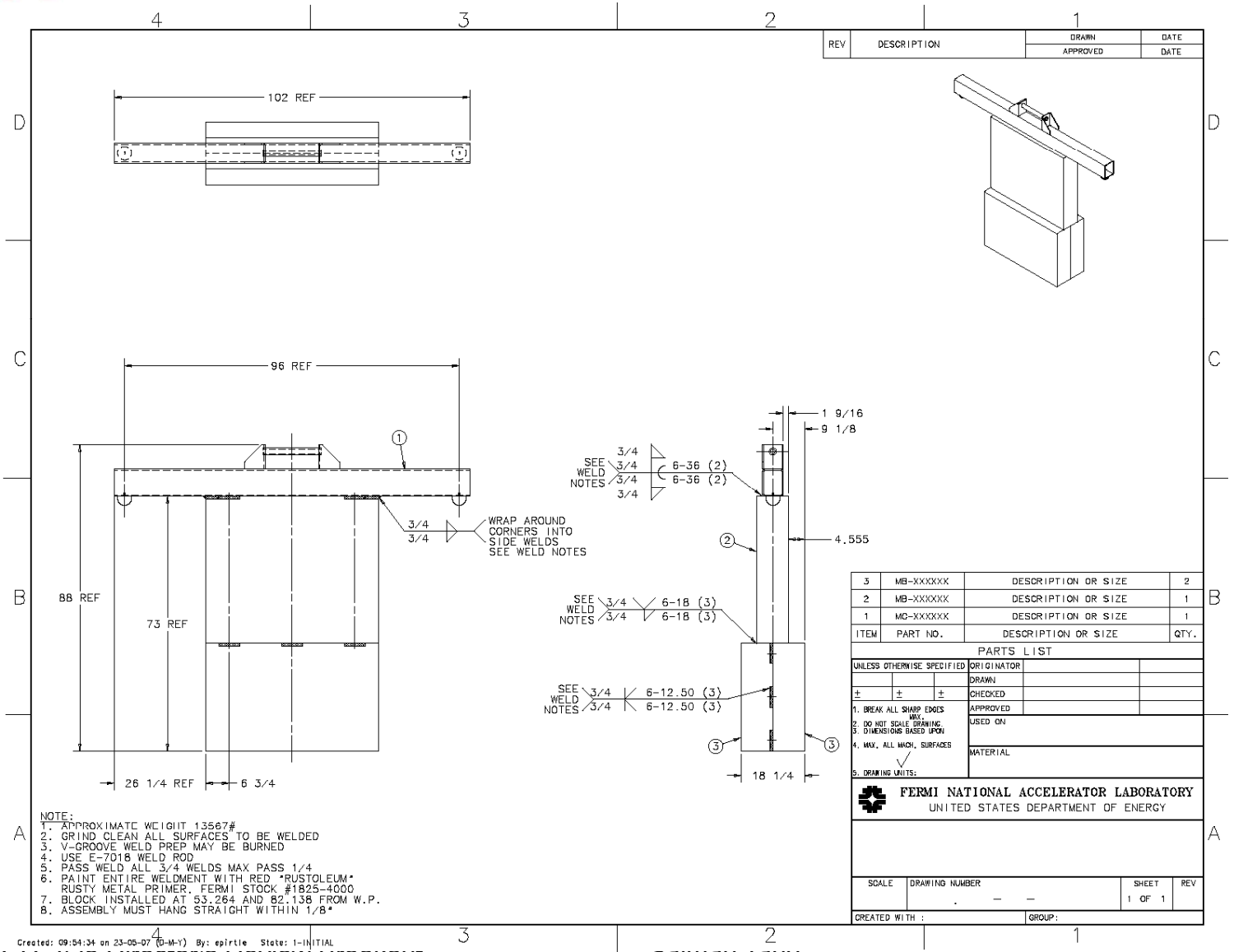
LE location 2 T-block design (new)





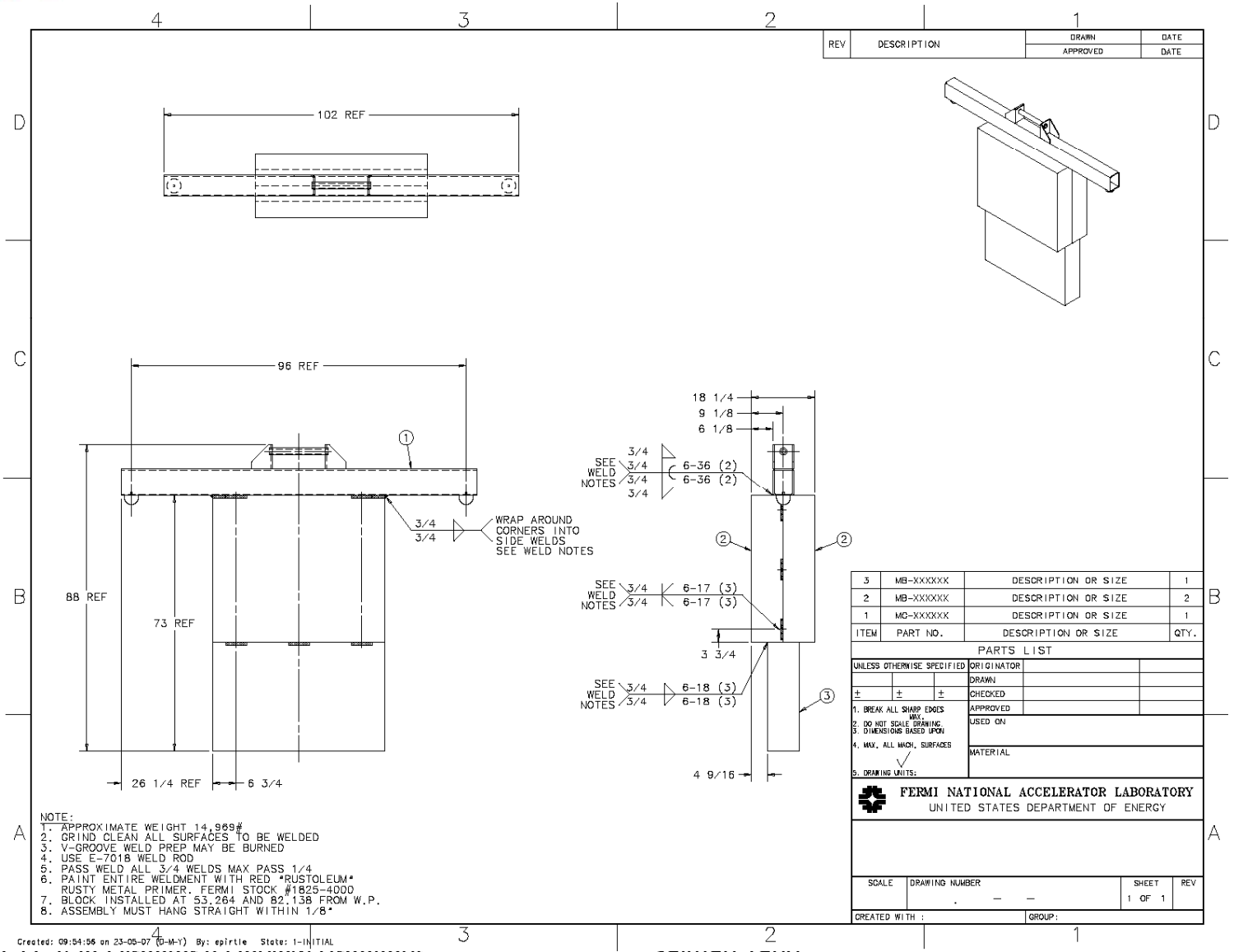
work in progress…

Modified T-Block Design 1



work in progress…

Modified T-Block Design 2



Target Hall Space Concerns

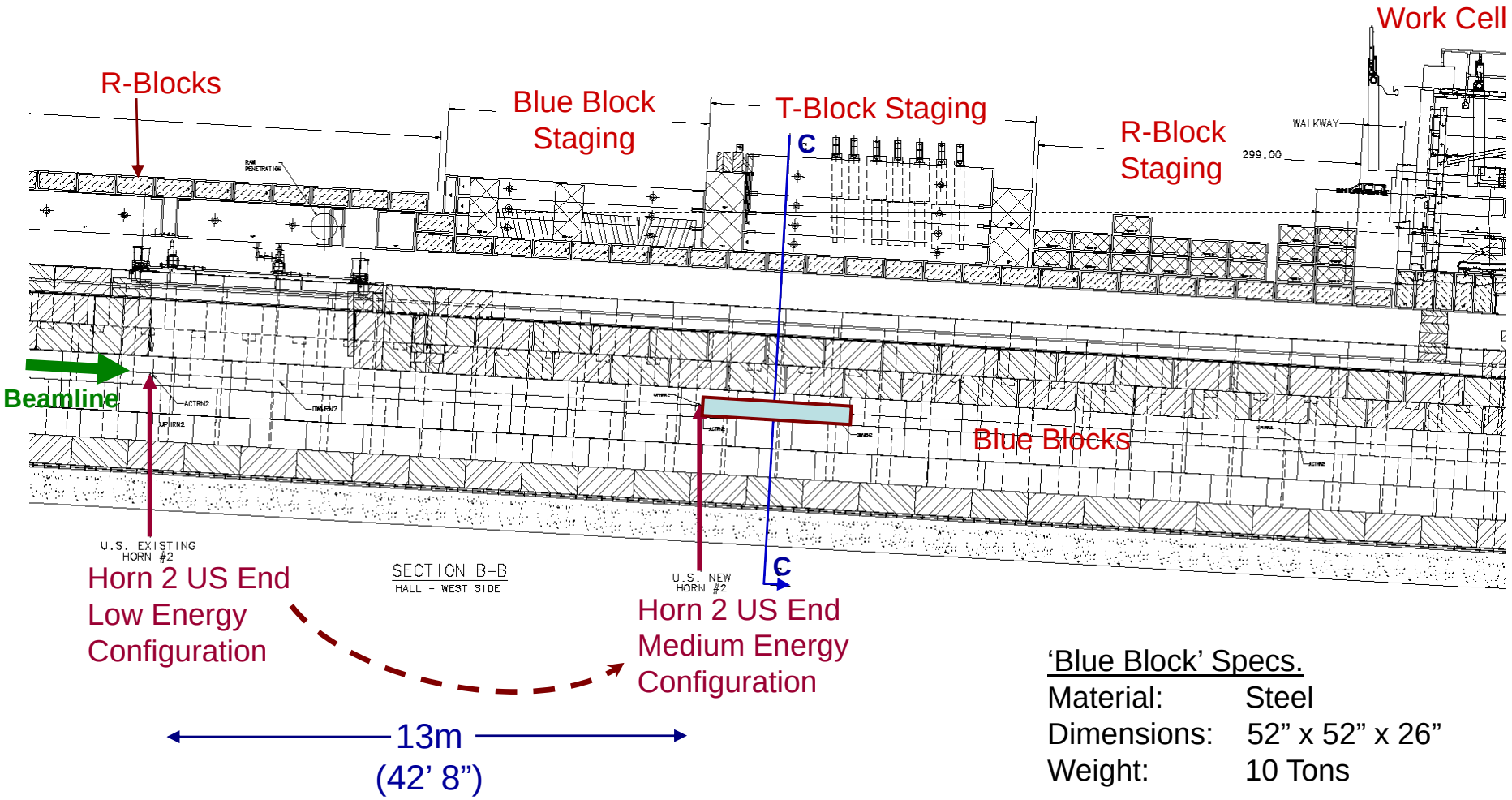
- Limited space available for Target Hall activities
- Medium Energy Horn 2 location falls beneath existing T-Block & Blue Block storage space
  - Staging of R-blocks is main concern
  - Completely new storage scheme will have to be developed

Therefore,

- Task added in RLS to conduct a detailed study of the available space aimed at developing a comprehensive new layout plan for the various target hall activities, which will include:
  - Horn 2 move to the medium energy position
    - includes evaluating R-block, T-Block, & Blue Block staging options, stripline extension, etc.
  - Target & Horn change outs, upgrades, & repairs (off-project)
  - Radioactive component repair/removal (work cell activities, remote manipulator setup, additional shielding, etc.) (off-project)

Target Hall Space Concerns

Section View Through Target Pile Shielding



'Blue Block' Specs.

Material:	Steel
Dimensions:	52" x 52" x 26"
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Target Hall Space Concerns

NuMI Target Hall looking DS during a recent target repair job

Blue Block Removal & Remote Handling

- Approximately 12 Blue Blocks will be removed from the Medium Energy location
  - Need to determine residual dose rates and whether remote handling is necessary
- Remote Handling of Blue Blocks
  - Existing remote handling fixture and camera system are not adequate to do this task effectively
  - An assessment of the remote lifting system will be made requiring possible upgrades to the fixture and camera system
  - Actual dry runs will need to be carried out
  - Try to minimize remote handling & stacking of radioactive blue blocks

Surplus Blue Block Management

- Possible to re-use some of the blue blocks (up to 6) at the LE position in place of the Dummy Module & T-Blocks – but this is not the most viable option due to challenges with remote stacking in tight spots
- Some blue blocks could possibly be stacked on top of the existing two layers of blue blocks at vacant spots, assuming there is no interference with equipment, etc.
- Temporary storage in the morgue (limited space available)
- Up-shaft removal for long term storage (e.g. TSB)
  - Included in 'Radioactive Component Repair/Removal Plan' (off-project)
  - Might require customized steel shielding coffins for transportation (weight & size of coffin will be the limiting factor) (off-project)

Summary of Basic Tasks Involved in the Shielding Reconfiguration & H2 Relocation

- **Accelerator Upgrades (1st) Shutdown**
  - Re-locate T-Block, Blue Block, & R-Block staging areas
    - Based on available space study & considering other parallel activities taking place during shutdown
  - Remove ~12 Blue Blocks from medium energy location
    - Possibly involves remote handling
  - Install 'Dummy' module with associated shielding (T-Blocks and/or Blue Blocks, End Blocks) '*Shielding Plug*'
    - Includes new carriage and rail plus T-Block support tube; air seal
    - Alignment of carriage and T-Block support tube
- **NuMI Upgrades (2nd) Shutdown**
  - Move Horn 2 to medium energy position by swapping the 2 module & shielding assemblies

critical item