international linear collider

Underground Unit Cost Analysis

Fermilab

PARSONS

U/G Unit Cost Analysis

- Objective:

  Prepare unit construction cost estimates for the underground structures and their supporting construction facilities for the conventional facilities associated with the proposed International Linear Collider (ILC) sited in a northeastern Illinois region near Fermilab.

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- Methodology
  - Development of the Geotechnical Basis
    - Review and analyze the available geotechnical data from underground construction projects executed within the same general vicinity and in similar subsurface conditions.
    - Based on the above review, establish the geotechnical basis for preparing unit cost estimates, such as:
      - Production Rates
        - Tunnel Boring Machine (TBM)
        - Drill & Blast
      - Groundwater Inflow Rates
      - Temporary & Permanent Support Requirements

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- Methodology (Contd)
  - Development of the Unit Costs Analyses
    - Subdivide the ILC U/G facilities into generic construction groupings and then further subdivide the groupings into similar elements for analysis.
    - Bound each element so that a representative cost can be ascertained.
    - Analyze the defined construction elements as to their construction costs and then convert those costs into a unit cost.

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► Methodology (Contd)

- Develop the Summary of Costs Report, providing unit cost estimates for the following generic construction groupings:
  - Tunnels
  - Shafts
  - Caverns and/or Halls

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- Results
  - Tunnels
    - The representative segments selected for analysis was based on the length of tunnel that could be bored in one work week (275 to 380 m). Tunnel diameters shown are nominal internal or finished diameters.
    - Cost estimates were crew based and included an allowance for shotcrete lining, waterproofing, tunnel boring machine (TBM) setup, mine rescue, and various other required support elements.

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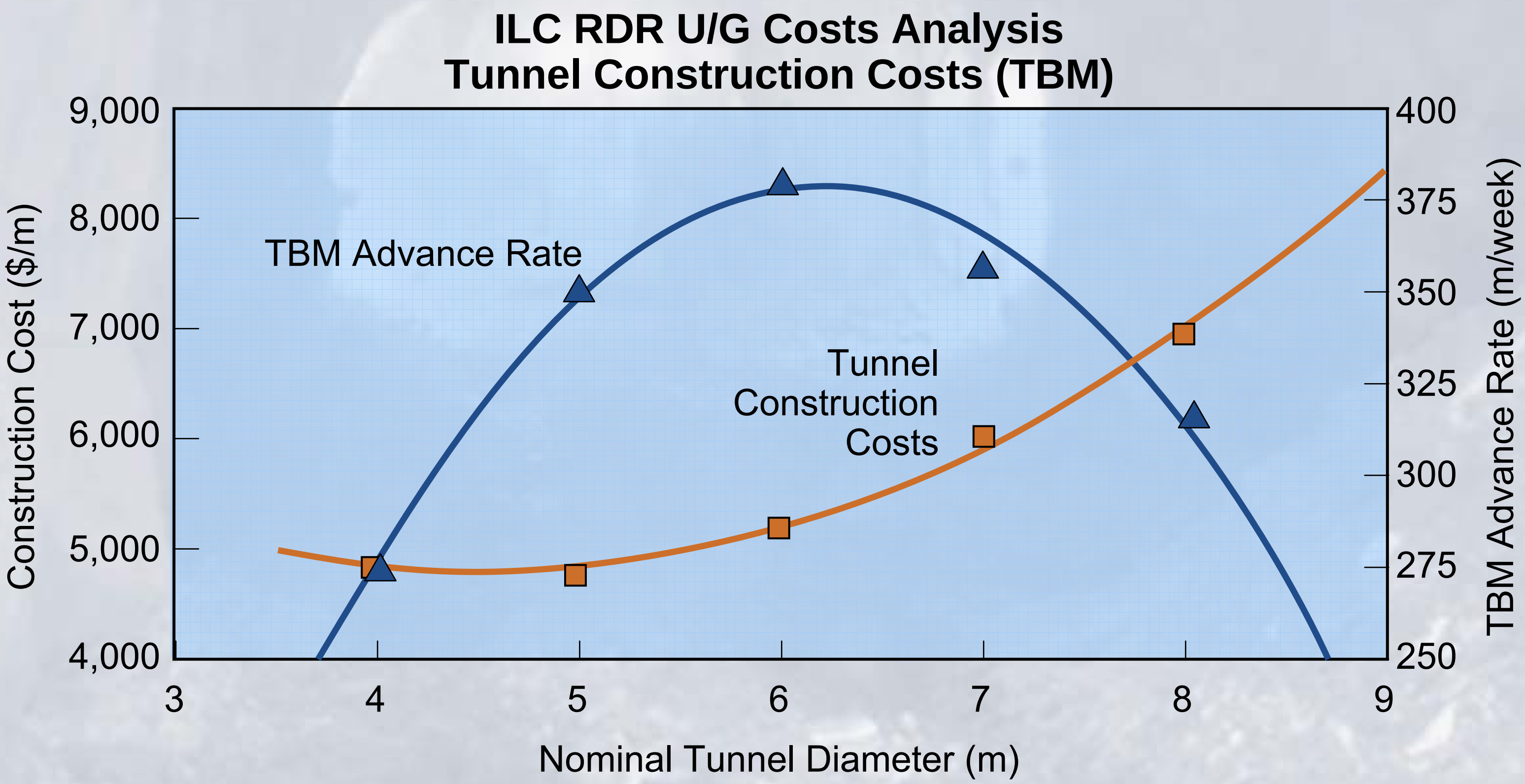
- Results
  - Tunnels



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- Results
  - Shafts
    - A representative shaft segment could not be defined as subsurface conditions vary as the shaft progresses down. Therefore each shaft was analyzed for its full depth, which ranged from 90 to 140 m.
    - Diameters shown are nominal internal or finished diameters.
    - Overburden varied from 31 to 40 m based on the site being analyzed.
    - Estimates were crew based and included an allowance for reinforced concrete lining in access shafts and various other required support elements.

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- Results
  - Shafts

Description	Diameter (m)	Unit	Unit Cost ($K)
Access Shaft	15.0	Each	5,700 – 7,780
Access Shaft	14.0	Each	7,740
Access Shaft	9.0	Each	4,380 – 5,870
Vent Shaft	1.07	Each	530
Survey Boring	0.80	Each	250

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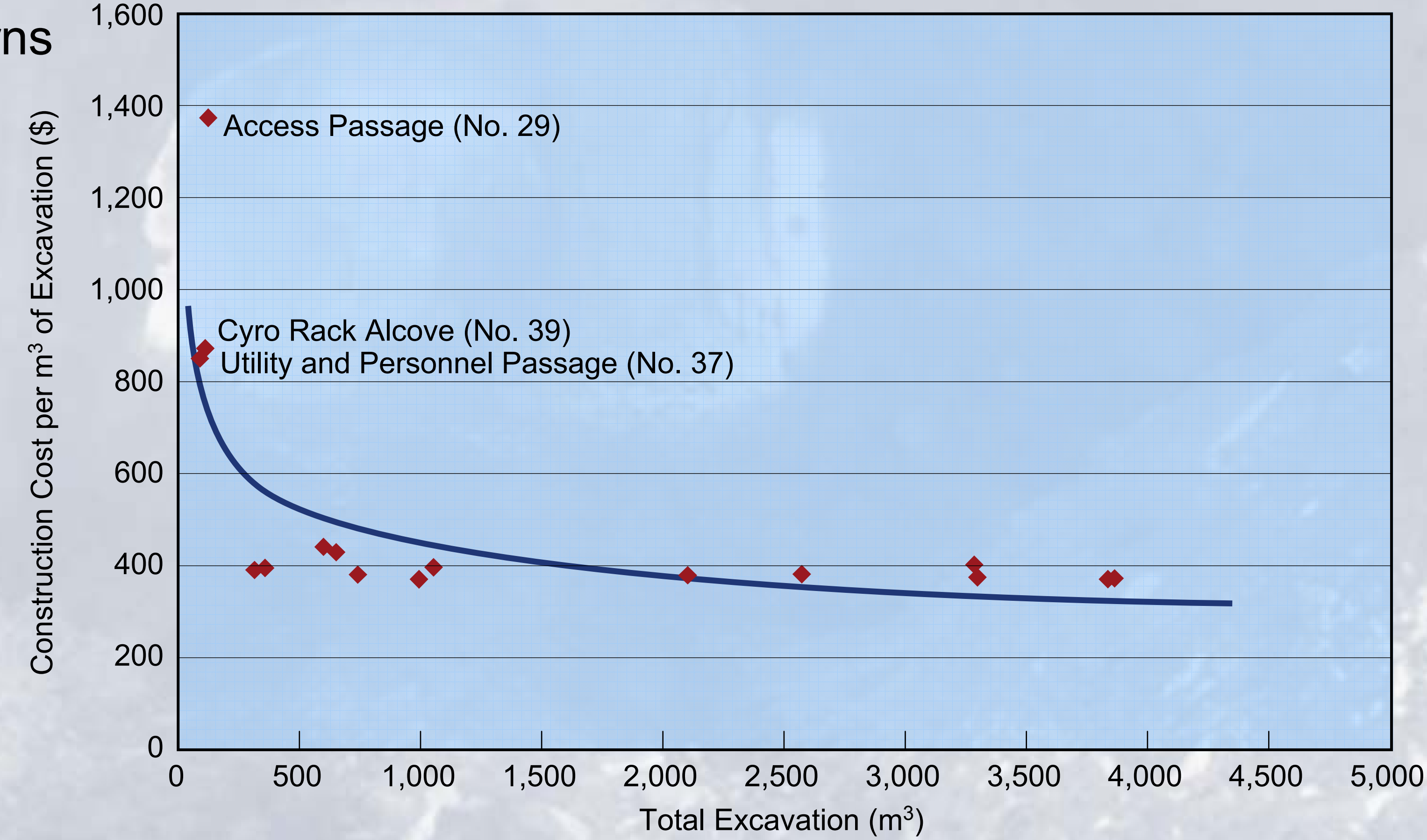
- Results
  - Caverns and Halls
    - In most cases, a representative portion of a cavern/hall could not be defined because of large variances in their sizes. Therefore each cavern was analyzed in total. (The exception to this was the passageways where only a single unit was analyzed.)
    - Caverns were excavated using drill and blast techniques.
    - Estimates were crew based and included an allowance for rock bolts and fiber-reinforced shotcrete on top half of cavern and included various other required support elements.

U/G Unit Cost Analysis

- Results
  - Caverns and Halls



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Questions