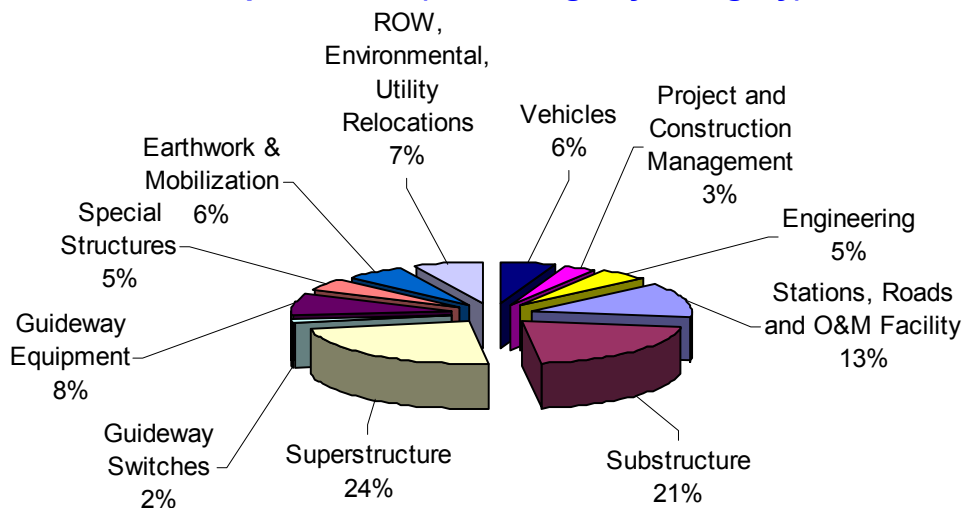


**PENNSYLVANIA PROJECT - Capital Costs**

The **PENNSYLVANIA PROJECT** cost estimates were developed by the Project Team utilizing the contractor Michael Baker Engineering for infrastructure, stations, super and substructure, special structures and bridges, side roads, crash and retaining walls, utilities, earthwork and excavation. These estimates were refined based on the work and findings of various other contracting firms including: Transrapid International for maglev equipment supply, Dick Corporation for construction and construction management, Mammoet, Barnhart Crane and Rigging and Transrapid International for beam installation and logistics, Figg Engineering Group for pre-cast structures and pre-cast post tension hollow core structures, McKinney Drilling Company and Case Construction for caissons and drilling feasibility, Nicholson Construction Company for pin pile and driven pile usage, Bombardier for vehicle, communication and control systems, Duquesne Light and Power Engineers for substation and power distribution, Robicon for propulsion converter design, D'Appolonia, GAI, CDM, Nicholson and Baker for local geotechnical information, CDM for substructures and foundations, US Steel for steel and materials, the University of Michigan for AASHTO-LRFD, University of Virginia for system safety and regulatory rules, and IGM, Giddings and Lewis, Fahrion Engineering, Dillinger Staubau GmbH (DSD), Grossert Engineering, Marx and Transrapid International for guideway engineering and fabrication requirements and methods. This is but a part of a group of regional, national and international firms and organizations that have been utilized in developing the cost estimates as well as identifying a number of opportunities for potential cost reduction.

Capital costs for the project were prepared based on engineering plans, profiles, and other engineering details and the use of the PENNDOT Bulletin 50-Construction Cost Catalog and other information for unit construction cost estimates. Cost information supplied by Transrapid International was used in the development of the maglev system cost elements.

**Capital Costs (Percentage by Category)**



## Capital Costs

Cost estimates were developed in 2003 dollars for comparison of the various U.S. projects.

<b>Cost Estimate Category</b>	<b>Cost (000,000)</b>	<b>% Of Total</b>
Stations, Roads and O&M Facility	\$482	13%
Substructure	\$792	21%
Superstructure (Guideway, etc.)	\$890	24%
Guideway Switches	\$65	2%
Guideway Equipment	\$311	8%
Special Structures	\$181	5%
Earthwork & Mobilization	\$225	6%
ROW, Environmental, Utility Relocations	\$263	7%
Vehicles	\$209	6%
Project and Construction Management	\$123	3%
Engineering	\$184	5%
<b>Total Construction Costs (2003\$)</b>	<b>\$3,725</b>	<b>100%</b>

A description of what is included in the various categories of the estimate follows:

**Station, Roads, and Operating and Maintenance (O&M) Facility** – Includes construction of five maglev stations, parking facilities, roadway improvements, and the O&M facility.

**Substructure** – Includes foundations, piers, crash walls, geotechnical, mine subsidence/stabilization.

**Superstructure** – Consists of Type I and Type II guideway, secondary structures, and the cost of the precision fabrication plant.

**Guideway Switches** - Guideway switching equipment.

**Guideway Equipment** – Consists of the control/communications, energy supply, and propulsion.

**Special Structures** – This category includes side road improvements, earth retention systems, the structure crossing the Monongahela River, and box culverts.

**Earthwork and Mobilization** – Consists of clearing and grubbing, excavation, off-site hauling and disposal, and site restoration. A 4 percent mobilization cost was applied to guideway, substructures, and local roadway improvements.

**ROW, Environmental, and Utility Relocation** – ROW is estimated at 15.2 meters (50 feet), or 7.6 meters (25 feet) from each side of the alignment centerline, or the top of cut slope plus 6.1 meters (20 feet). Environmental costs include mitigation for noise, wetlands, and other environmental impacts. Utility includes aerial and underground utility relocation costs.

**Vehicles** – Includes vehicles from Transrapid International and commissioning costs.

Project Management (PM) and Construction Management (CM) - costs is based on a specific staffing organization/manpower estimate to support both pre-construction (design) and construction.

**Engineering** – Engineering costs is based on a specific staffing organization/manpower estimate to support both pre-construction (design) and construction phases of the project.