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VARIABLE-DENSITY WIND TUNNEL

Uses: Variable-Density Wind Tunnel - to conduct aerodynamic investigations over a wide-scale range extending to high Reynolds numbers.
Smoke-Flow Tunnels - for visualization of the nature of air flow around objects.
High-Speed Jets - for investigation of aerodynamic characteristics of propeller blades or other bodies moving at speeds approaching the velocity of sound.

Authority: 66th Congress, Public No. 389; approved March 4, 1921.

Location: Plot 16, Langley Field, Virginia; approved by Secretary of War July 15, 1921.

History: Preliminary work started July 1921.
First tests in variable-density tunnel made in April 1923.

Construction:

Variable-Density Wind Tunnel

Dimensions of building	82' × 40' × 27' (average height)
Ground area	3,300 sq ft
Second-floor area	925 sq ft
Cubic contents	88,500 cu ft
Character	Steel structure
Type and thickness of walls	Lower part - brick - 9 in. thick Upper part - stucco on corrugated galvanized sheets - 1½ in. thick
Type of ground floor	Concrete - 5 in. thick
Type of second floor	Wood - 1 3/4 in. thick
Type of roof	Composition on wood deck
Approximate weight of tunnel	80 tons

24-inch High-Speed Tunnel

Dimensions of building	31' diameter × 18' high (+ 43½' to top of stack)

Construction (cont'd)

Ground area	750 sq ft
Second-floor area	130 sq ft
Cubic contents	8,630 cu ft
Character	Reinforced concrete
Type and thickness of walls	Reinforced concrete - 6 in. and 12 in. thick
Type of ground floor	Reinforced concrete - 25 in. thick
Type of second floor	Reinforced concrete - 16 in. thick
Type of roof	Reinforced concrete - 18 in. thick and 16-mesh bronze-wire cloth

Cost Summary

Cost of variable-density tunnel building	$ 15,736.14
Cost per cu ft of structure (including heating, plumbing, and electrical systems)	0.177
Cost of variable-density tunnel equipment	105,479.15

Detailed Costs

Structure (construction of housing, including heating, plumbing, and electrical systems)	$15,736.14	
Variable-density tunnel, including electric drive equipment	88,620.73	
Cleaning out and rebuilding variable-density tunnel after fire which occurred August 1, 1927 (this cost is included in total cost of variable-density tunnel shown herein)	39,020.17	
4-inch smoke-flow tunnel	486.83	
11-inch high-speed jet	21,394.48	
24-inch high-speed jet	31,907.98	$197,166.33
Technical and Engineering services (10 o/o of structural costs)		19,716.63
Complete costs of tunnel building and tunnels housed therein		$216,882.96

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The Variable-Density Tunnel has ceased operation as a tunnel and is now used in connection with the still active 24-inch High-Speed Tunnel as a compressed air chamber. The 4-inch Smoke-Flow Tunnel and the 11-inch High-Speed Jet are no longer operating or are out of existence. Equipment in the Variable-Density Tunnel Building is considered salvage for use in other sections.