



Advanced Parabolic Trough Design Wind Tunnel Testing

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Wind Tunnel Tests

Primary Objectives

- Obtain force and pressure distribution data on trough collectors for use in structural analysis
- Conduct flow visualization tests for additional insight into flow patterns around the collectors
- Make data available to trough industry

Previous Trough Wind Tunnel Tests

- Sandia-sponsored tests (late '70s, early '80s)
 - Only mean loads reported (not peaks)
 - No pressure distributions obtained
- EuroTrough wind tunnel tests (~'99)
 - Reported to be significantly different
 - Includes pressure distributions
 - Data not publicly available

Boundary Layer Wind Tunnel at CPP, Inc.

10 x 7.5 x 70 ft Wind Tunnel



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What will these tests produce?

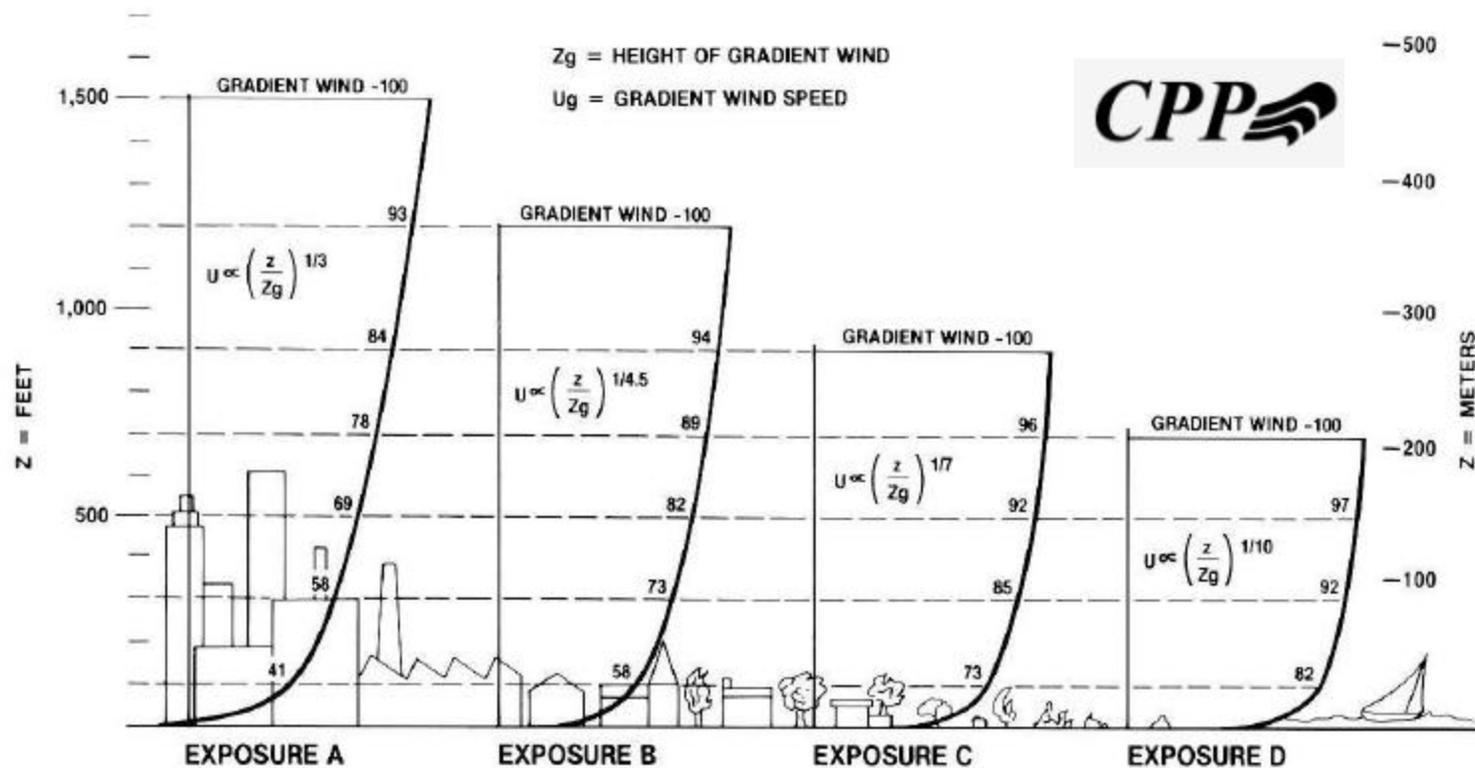
- Drag, lift, and pitching moments
- Pressure distributions on windward & leeward surfaces
- Cross-check of results by comparing the two test methods
- Wind direction and collector orientation for maximum forces and pitch moments
- Better understanding of flow patterns via smoke visualization
- Time histories of data on CD-ROM

Testing Issues

- Model size and configuration
 - with or without torque tube
- Reynolds Number scaling
- Turbulence intensity and scale of turbulence
- Limited number of pressure taps

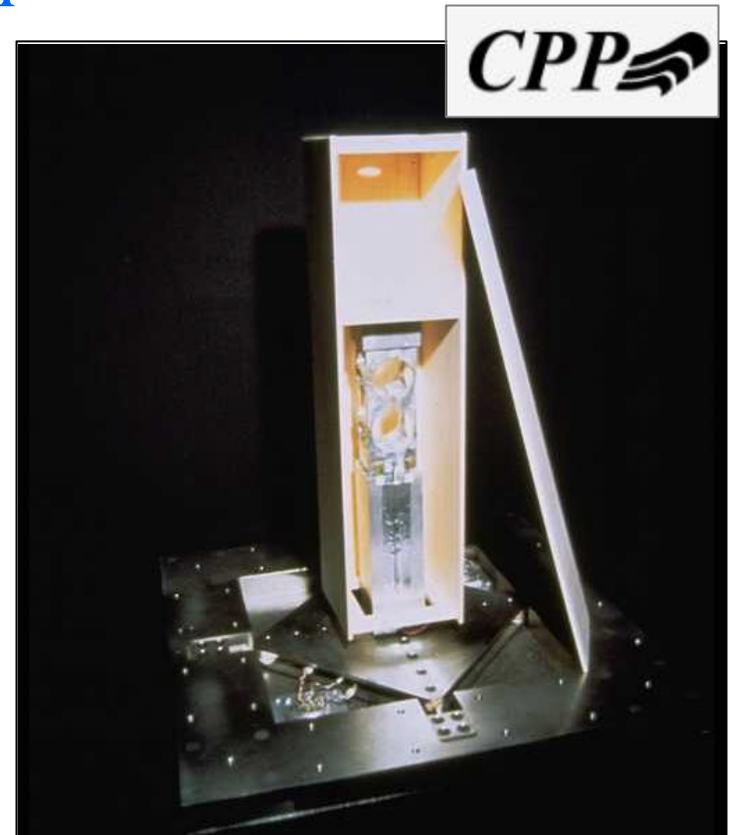
Boundary Layer Profiles

Turbulence Intensity and Scale of Turbulence Vary with Height Too



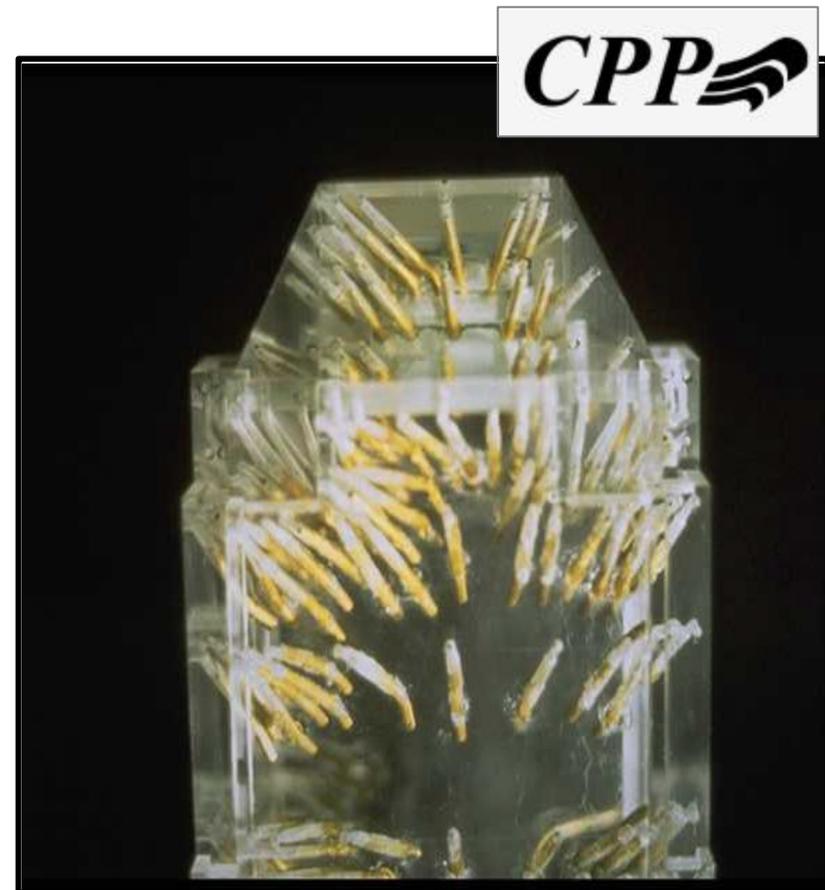
Force Balance Tests

- Isolated collector
 - Re No., turbulence, and torque tube studies
 - Baseline tests
(vary pitch angle and yaw angle)
- Collector field
 - Exterior row locations
 - Interior row locations
 - With & without wind fence



Pressure Distribution Tests

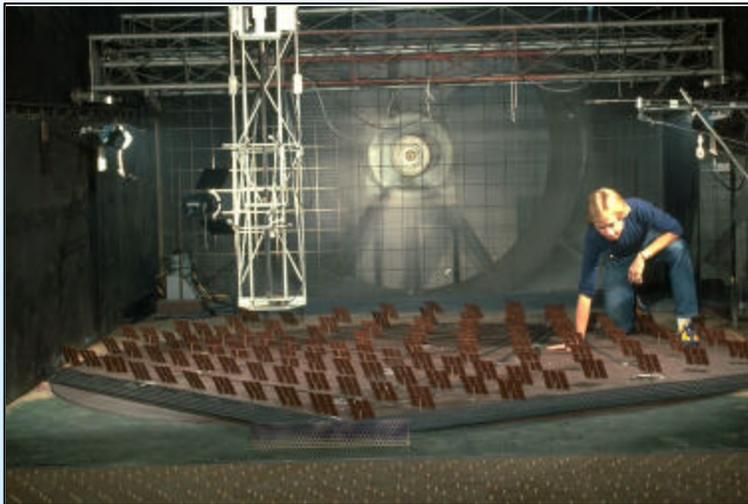
- Isolated collector
- Selected exterior & interior locations
- Some with wind fence, some without



Flow Visualization



Still Photos and Analog Video for :
Isolated Collector Cases
Collector Field Cases



Colorado State University wind tunnel, courtesy of CPP

