

## Mini Design Warm-Up Exercise

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### Instructions:

- Students get into groups of 6 (usually a 50:50 split, McGill:Polytechnique students)
- The instructor distributes a problem sheet to each group:
  - The problem involves calculating the flow rate of air through a vent with specific parameters (diameter, excavation depth, etc.)
  - Each group gets a vent with different parametric values, but groups do not know this, nor does the instructor tell them
- Groups spend time solving the problem and coming up with a fan power value. They are not allowed to consult other groups.
- Once all groups have completed the exercise, the instructor asks each group for their fan power value, which the instructor writes on the board:
  - Because each group started with different parametric values, their end fan powers are different, too
  - This causes some concern among students as they see the numbers going up on the board; they don't understand why everyone has a different fan power value
- The instructor then reveals that each group began with different parametric values.
- The instructor then proceeds to highlight the connections between the different parameters and their calculations
  - This is an important lessons for students because they learn to connect concepts (e.g., excavation depth, shaft diameter, shaft liner, air flow rate) with calculation (e.g., how shaft diameter impacts the fan power requirement and cost of ventilation, etc.)