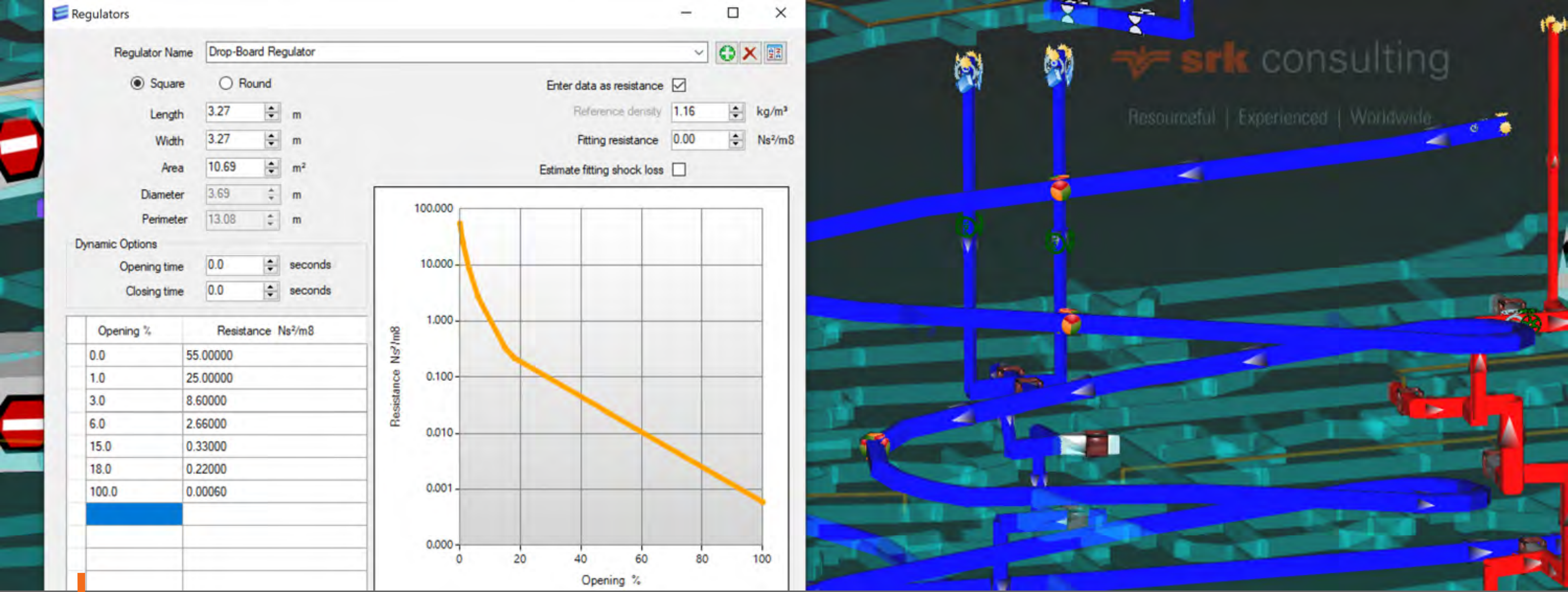


Establishing Site-Specific Preset Values in Ventsim

John Bowling, Principal Consultant (Mine Ventilation)

Ventsim User Conference, Montreal, 26 Sep 2023

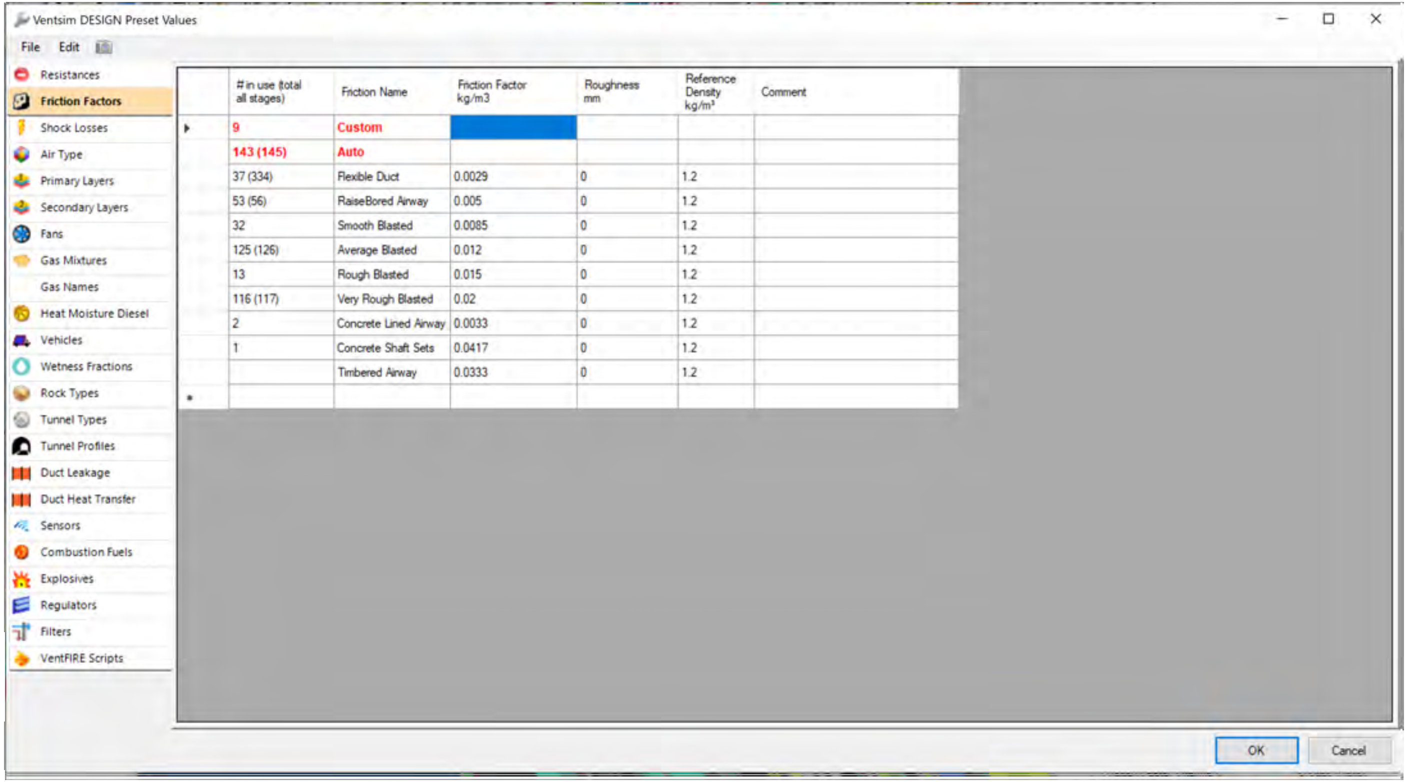
srk consulting

Presets and Other Assumptions

Ventsim is an excellent tool. A complex, purpose-built calculator.

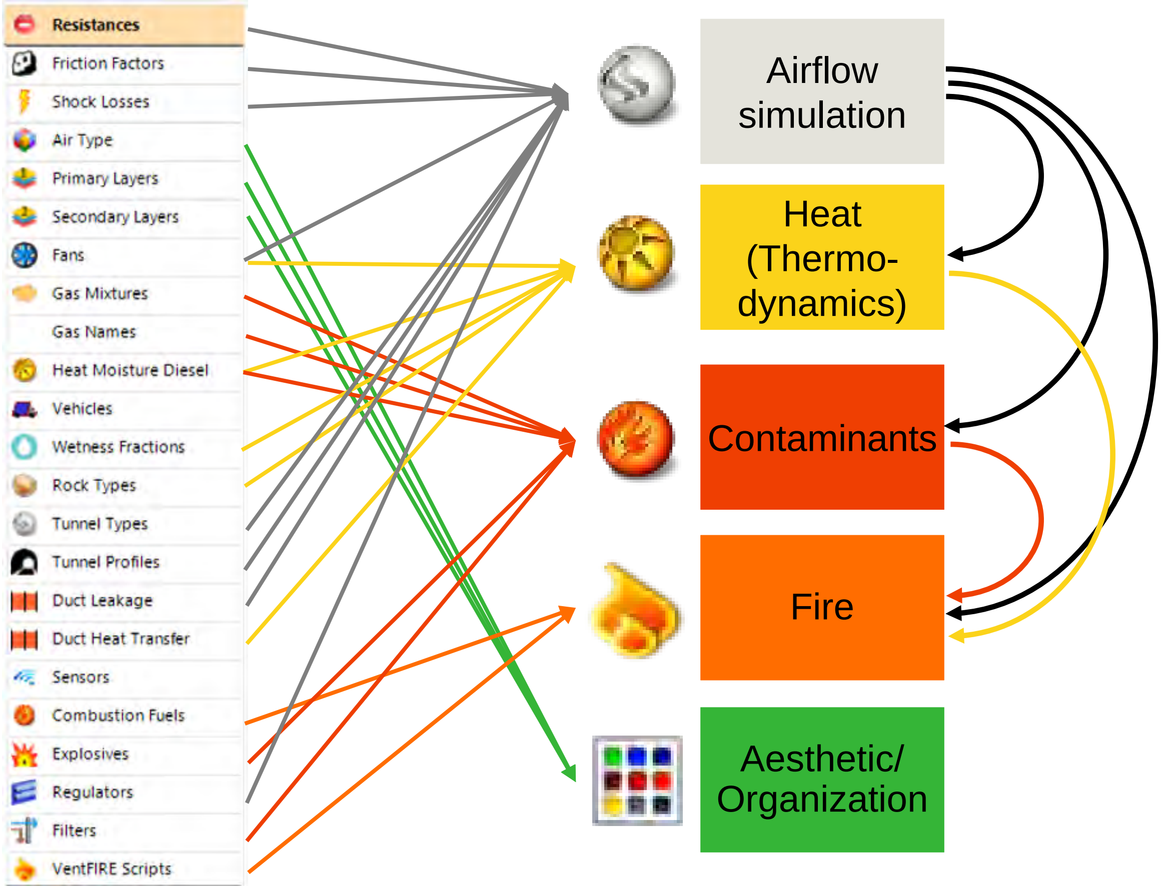
With a lot of underlying assumptions.

And Presets.



# in use (total all stages)	Friction Name	Friction Factor kg/m3	Roughness mm	Reference Density kg/m³	Comment
9	Custom				
143 (145)	Auto				
37 (334)	Flexible Duct	0.0029	0	1.2	
53 (56)	RaiseBored Airway	0.005	0	1.2	
32	Smooth Blasted	0.0085	0	1.2	
125 (126)	Average Blasted	0.012	0	1.2	
13	Rough Blasted	0.015	0	1.2	
116 (117)	Very Rough Blasted	0.02	0	1.2	
2	Concrete Lined Airway	0.0033	0	1.2	
1	Concrete Shaft Sets	0.0417	0	1.2	
	Timbered Airway	0.0333	0	1.2	

Presets – Which Matter and Why?



- The airflow simulation (resistance network) is the most basic component of Ventsim
- Airflow simulation forms the basis of other simulations
- For many mines the airflow simulation is sufficient

Model Review: Presets

- Resistances
- Friction Factors
- Shock Losses
- Air Type
- Primary Layers
- Secondary Layers
- Fans
- Gas Mixtures
- Gas Names
- Heat Moisture Diesel
- Vehicles
- Wetness Fractions
- Rock Types
- **Tunnel Types**
- Tunnel Profiles
- Duct Leakage

# in use (total all stages)	Airway	Diameter m	Width m	Height m	Perimeter m	Area m²	Profile	Friction Factor Type	Min Velocity m/s	Max Velocity m/s
1194 (14032)	Custom						Square	Auto		
191 (2321)	Main Ramp	5.5	5.5	6.05			Arched	Ramp	0	6.5
212 (2311)	Main Ramp	6.05	6.05	6.05			Arched	Ramp	0	6.5
1302 (14264)	Cross-cut	5.5	5.5	4.85			Arched	Rough Blast...	0	
1399 (15416)	Footwall Drift	5.5	5.5	5.5			Arched	Rough Blast...	0	
	Production Shaft	6	6	6			Round	Concrete Li...	0	
	575/760	0	0	0			Square	Auto	0	
24 (284)	Waste pass 785	3	3	3			Square	Very Rough ...	0	
	Hurley Intake	2.41	2.41	2.41			Round	RaiseBored ...	0	
2 (22)	Exhaust Raise	5	5	5			Round	RaiseBored ...	0	
23 (265)	Man way	3	3	3			Square	Rough Blast...	0	0
11 (122)	Adit Raises	5	5	5			Square	Rough Blast...	0	0
1 (11)	South Portal	6	6	6			Arched	Ramp	0	6
1 (9)	220 Raise	6.7	6.7	6.7			Round	RaiseBored ...	0	0
57 (611)	95L Ramp	5.5	5.5	5.5			Arched	Rough Blast...	0	0
229 (2511)	95L Access	5	5	5			Arched	Rough Blast...	0	0

Airways have appropriate dimensions, friction ✓

Velocity limits in ramps

- Resistances
- **Friction Factors**
- Shock Losses
- Air Type
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- Secondary Layers
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- Gas Mixtures
- Gas Names
- Heat Moisture Diesel
- Vehicles
- Wetness Fractions
- Rock Types
- Tunnel Types
- Tunnel Profiles
- Duct Leakage

# in use (total all stages)	Friction Name	Friction Factor kg/m3
716 (9323)	Custom	
408 (3918)	Auto	
	Smooth Blasted	0.0085
	Average Blasted	0.012
3057 (33538)	Rough Blasted	0.015
41 (472)	Very Rough Blasted	0.02
4 (45)	Concrete Lined Airway	0.0033
	Concrete Shaft Sets	0.0417
	Timbered Airway	0.0333
12 (113)	RaiseBored Airway	0.005
0 (2)	Flexible Duct - New	0.0037
0 (67)	Flex Duct - Used	0.0046
	Rigid Duct	0.0019
404 (4646)	Ramp	0.0221
4 (55)	Shaft	0.0075

OK

- Resistances
- Friction Factors
- Shock Losses
- **Air Type**
- Primary Layers
- Secondary Layers
- Fans

# in use	Air Type Name	Set	Colour
4013 (43...	Not Set	☑	
333 (2439)	Fresh	☑	
262 (5795)	Exhaust	☑	
27 (126)	Leakage	☑	
11 (80)	Pit Leakage	☑	
	Manway Leakages	☑	

✓

- Resistances
- Friction Factors
- Shock Losses
- Air Type
- Primary Layers
- Secondary Layers
- Fans
- Gas Mixtures
- Gas Names
- **Heat Moisture Diesel**
- Vehicles
- Wetness Fractions
- Rock Types
- Tunnel Types
- Tunnel Profiles
- Duct Leakage
- Duct Heat Transfer
- Sensors
- Combustion Fuels
- Explosives

Name	Icon	# in use (total all stages)	Utilisation Factor	DPM g/kW hr	NOx Yield Rate g/kW hr	CO Yield Rate g/kW hr	Point Diesel Power hp	Electric Vehicle Power kW	Point Sensible kW	Point Latent kW
Conveyor Linear 350 w/m										
Crusher Station 500kW Electric										
Diesel Truck 350kW @ 50%										
Pump Station 300kW Electric 90% effi...										
Refrigeration Plant 500kWR										
45T [113.2 l/hr]		6*								3.5
40T Truck [98.6 l/hr]			1	0.1	9.2	3.5	0	0	602	313.2
60T Truck [64% Utilisation]		3*	1	0.1	9.2	3.5	0	0	670.1	348.6
8 yd Scoop [70.3 l/hr]		1*	1	0.1	9.2	3.5	0	0	436.9	227.3
Light Vehicle Toyota [25% Utilisation]			1	0.1	9.2	3.5	0	0	59.7	31
11 yd Scoop [75% Utilisation]		5*	1	0.1	9.2	3.5	0	0	452.5	235.4
Cubex - Orion [30% Utilisation]			1		9.2	3.5	0	0	11.7	0
Cubex - Aries [30% Utilisation]			1	0.1		3.5	0	0	29.1	0
40T Truck [Idling, 15% Utilisation]		7 (77)	1		9.2	3.5	0	0	114.2	59.4
8 yd Toro Scoop [70% Utilisation]			1	0.1	9.2	3.5	0	0	239.4	124.6
4 yd MTI Scoop [70% Utilisation]			1	0.1	9.2	3.5	0	0	248.7	129.3
New scoop			1	0.1	9.2	3.5	0	0	136.9	227.3
60T Idling [15% Utilization]		3 (28)	1	0.1	9.2	3.5	0	0	157.8	83.1

Heat presets – hard to trace (better: use power and utilization)

OK

- **Resistances**
- Friction Factors
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- Secondary Layers
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- Gas Names
- Heat Moisture Diesel
- Vehicles
- Wetness Fractions
- Rock Types
- Tunnel Types

# in use (total all stages)	Resistance Name	Resistance Ns²/m8	Reference Density kg/m³
128 (755)	Blocked	∞	1.2
5 (144)	Brattice	2.5	1.2
84 (546)	Concrete Wall	1000	1.2
32 (417)	Good Door	20	1.2
7 (96)	Good Seal	250	1.2
1 (16)	Leaky Door	5	1.2
2 (12)	Poor Seal	50	1.2
0 (10)	Stockpile	1	1.2
0 (1)	Raise 7 to 5	0.19288	1.2
60 (529)	Muck High	1.5	1.2
3 (33)	Muck Low	0.5	1.2
5 (50)	Muck Med	1	1.2

OK

Preset: Resistances

- ✔ Preset values are good for greenfield planning
- ? How well do the preset resistances match your installed controls?
- ✗ Majority of controls aren't just a "Steel Door" or "Concrete Wall"

Ventsim DESIGN Preset Values

File Edit

Resistances

# in use (total all stages)	Resistance Name	Resistance Ns²/m8	Reference Density kg/m³	Strength Rating kPa	Reversing Resistance (leave zero for default) Ns²/m8	Linear/100	No Thoroughfare	Icon	Comment
3	**Blocked**	∞	**1.2**		∞	☐	☑		
6	Blocked Drawpoint	25	1.2		0	☐	☐		
	FabricSeal	2.5	1.2		0	☐	☐		
1	HangFlaps	1.5	1.2		0	☐	☐		
13	MeshBrattice	4	1.2		0	☐	☐		
2	Full Pass	1000	1.2		0	☐	☐		
5	LoStockpile	0.05	1.2		0	☐	☐		
	Stockpile	0.15	1.2		0	☐	☐		
2	HiStockpile	0.8	1.2		0	☐	☐		
2	WoodDoor	5	1.2		0	☐	☐		
1	SteelDoor	20	1.2		0	☐	☐		
	Brattice	2.5	1.2		0	☐	☐		
	Concrete Wall	1000	1.2		0	☐	☐		
	Good Door	20	1.2		0	☐	☐		
	Good Seal	250	1.2		0	☐	☐		
	Leaky Door	5	1.2		0	☐	☐		
	Poor Seal	50	1.2		0	☐	☐		

Typical Resistance Values for Ventilation Controls

- Doors: 5-50 Ns^2/m^8 or P.U. (Typical 20)
- Seals: 1000-10,000 Ns^2/m^8 or P.U. (Typical 2,500)
- Curtains or Brattices: 1-5 Ns^2/m^8 or P.U. (Typical 2.5)
- Bulkheads or Stoppings: 50-5,000 Ns^2/m^8 or P.U. (Typical 1,500)

Note: 1 P.U. = 1.11 Ns^2/m^8

- Ventsim's Presets align well with observed average values

Preset Resistances: Ventilation Controls

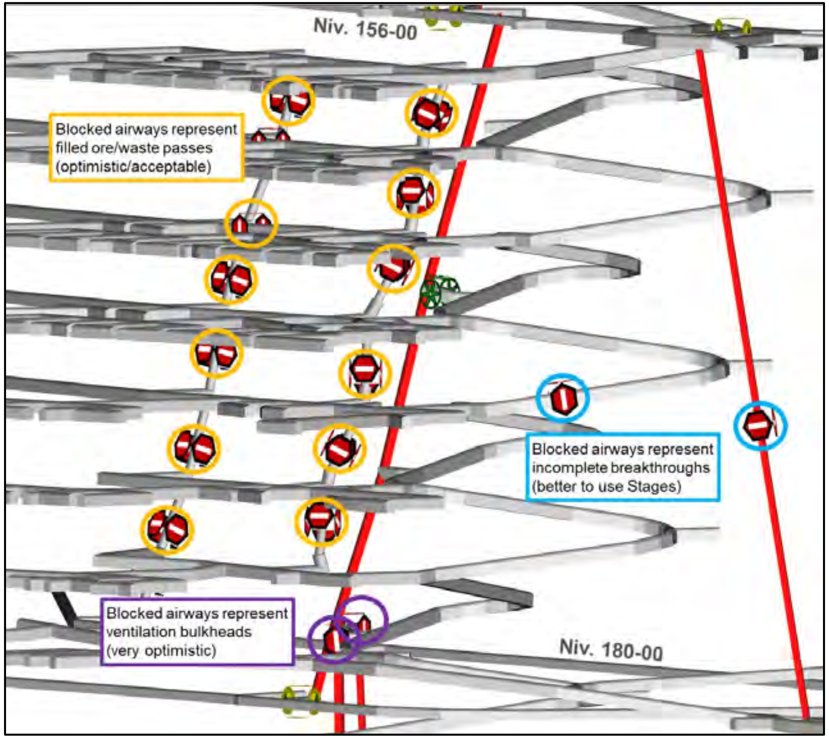
- How well do the preset resistances match your installed controls?

None of these controls easily fits into a Preset

Blocked airways: infinite resistance

“Blocked” infinite resistances uses:

- ✓ Filled ore passes: even if leakage is negligible, better to include in model for orientation and modeling open OP effects
- ✗ As bulkheads: some good bulkheads may start as very high resistance, but often deteriorate and leak as they age
- ✗ To represent planned breakthroughs: effective but confusing; prefer either:
  - Exclude + Hide Excluded (F8 toggles)
  - Stages
- ✓ Brainstorming while in a live meeting, to make temporary/what-if changes. Go back and exclude or stage airways appropriately after the meeting



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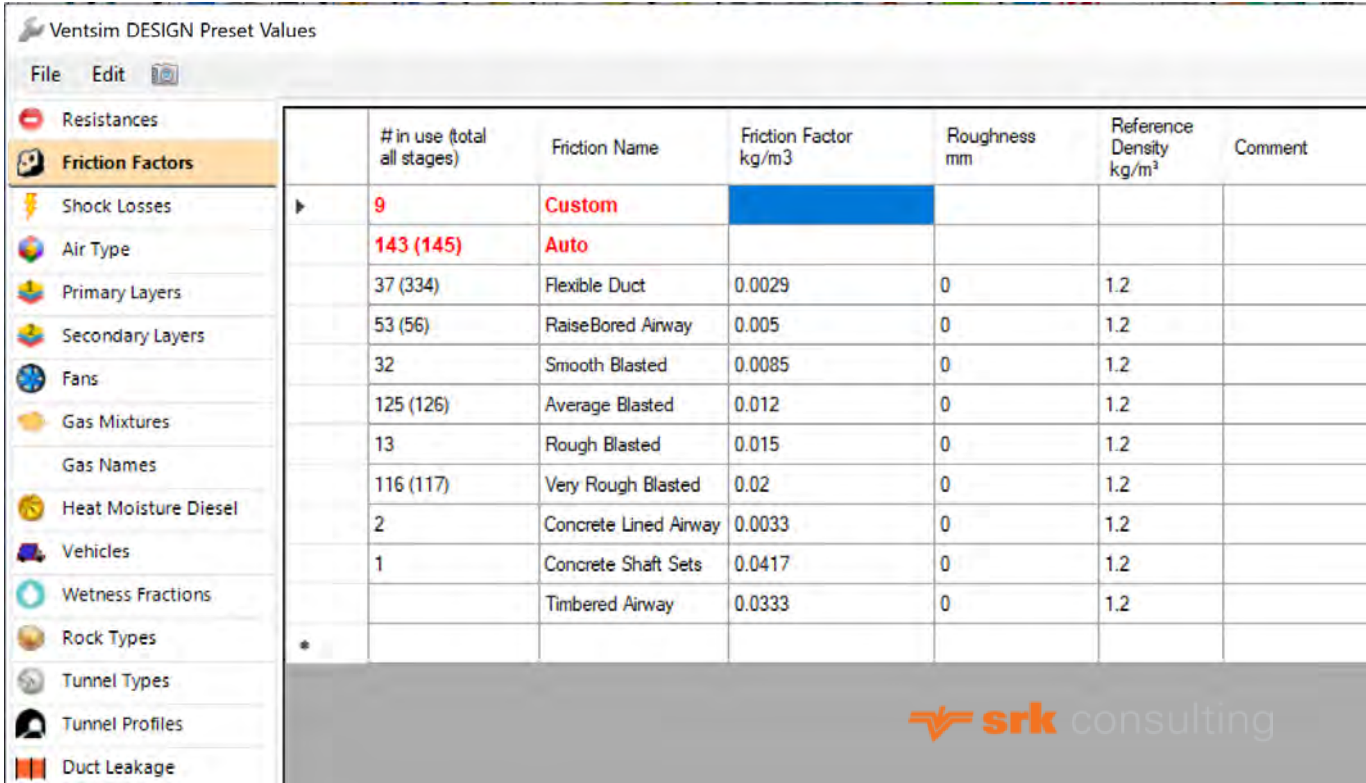
Preset: Friction Factors

- Ventsim's Preset friction factors are from reliable references
- Excellent for desktop studies
- Often more variable in practice: function of ground support



# in use (total all stages)	Friction Name	Friction Factor kg/m3	Roughness mm	Reference Density kg/m³	Comment
9	Custom				
143 (145)	Auto				
37 (334)	Flexible Duct	0.0029	0	1.2	
53 (56)	RaiseBored Airway	0.005	0	1.2	
32	Smooth Blasted	0.0085	0	1.2	
125 (126)	Average Blasted	0.012	0	1.2	
13	Rough Blasted	0.015	0	1.2	
116 (117)	Very Rough Blasted	0.02	0	1.2	
2	Concrete Lined Airway	0.0033	0	1.2	
1	Concrete Shaft Sets	0.0417	0	1.2	
	Timbered Airway	0.0333	0	1.2	

Raises and Escapeways

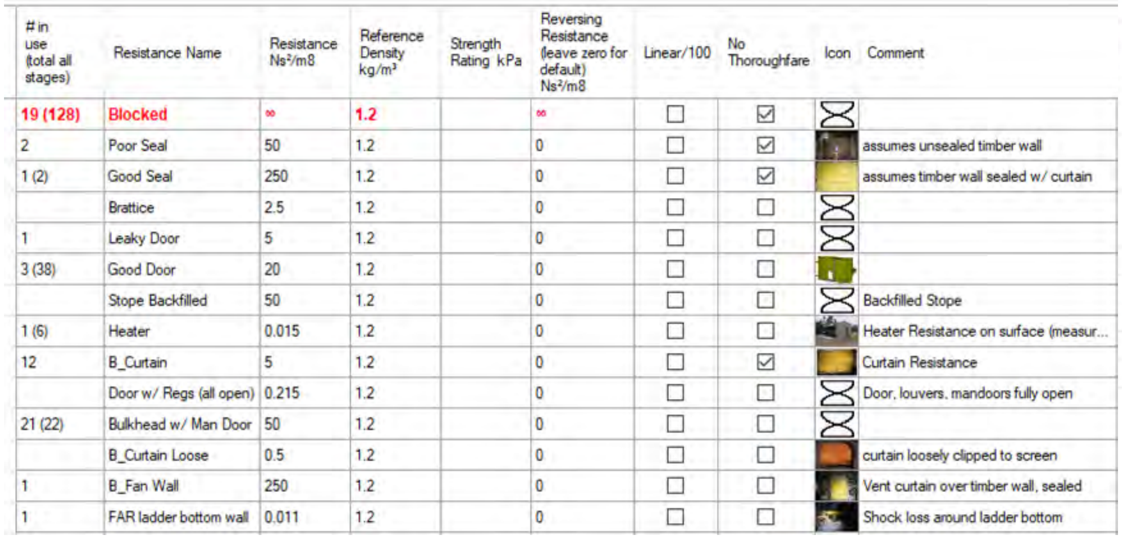
"Smooth Lined"

Full Landings

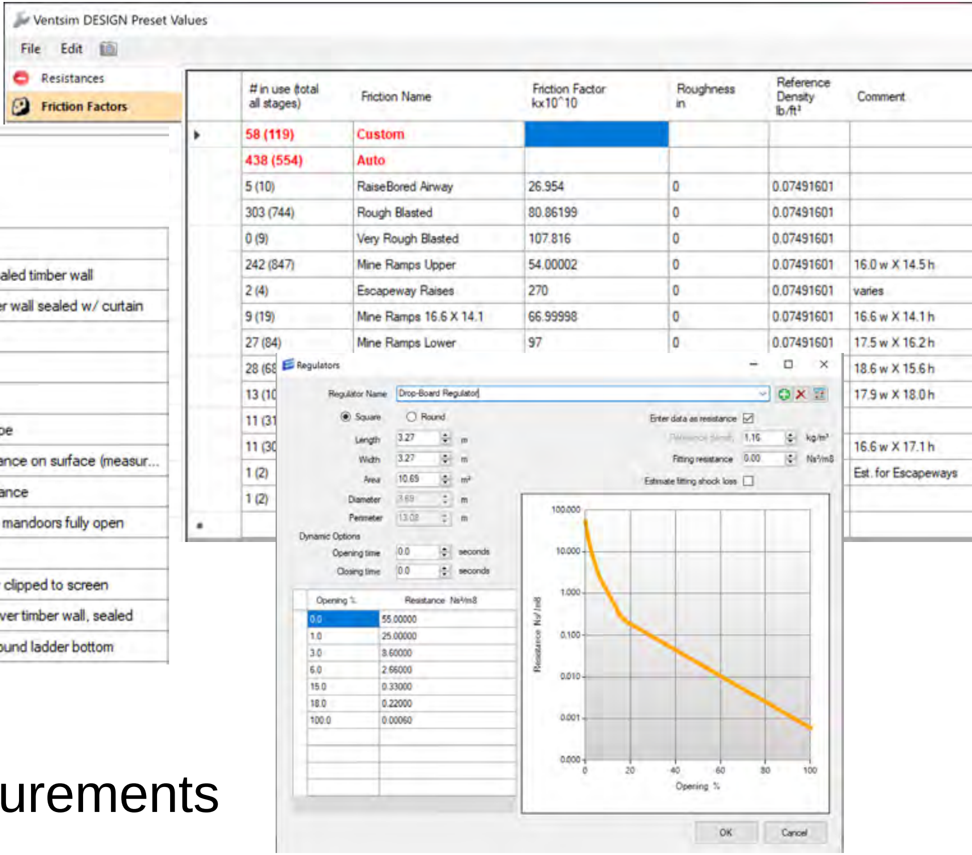
Timbered manway ~2.5m × 3m w/ full landings

Open/ divided manway >1/2 open, ~3.5m × 3.5m w/ open landings

Once It's Built: Custom Presets



# in use (total all stages)	Resistance Name	Resistance Ns²/m8	Reference Density kg/m³	Strength Rating kPa	Reversing Resistance (leave zero for default) Ns²/m8	Linear/100	No Thoroughfare	Icon	Comment
19 (128)	Blocked	∞	1.2		∞	☐	☑		
2	Poor Seal	50	1.2		0	☐	☑		assumes unsealed timber wall
1 (2)	Good Seal	250	1.2		0	☐	☑		assumes timber wall sealed w/ curtain
	Brattice	2.5	1.2		0	☐	☐		
1	Leaky Door	5	1.2		0	☐	☐		
3 (38)	Good Door	20	1.2		0	☐	☐		
	Stope Backfilled	50	1.2		0	☐	☐		Backfilled Stope
1 (6)	Heater	0.015	1.2		0	☐	☐		Heater Resistance on surface (measur...
12	B_Curtain	5	1.2		0	☐	☑		Curtain Resistance
	Door w/ Regs (all open)	0.215	1.2		0	☐	☐		Door, louvers, mandoors fully open
21 (22)	Bulkhead w/ Man Door	50	1.2		0	☐	☐		
	B_Curtain Loose	0.5	1.2		0	☐	☐		curtain loosely clipped to screen
1	B_Fan Wall	250	1.2		0	☐	☐		Vent curtain over timber wall, sealed
1	FAR ladder bottom wall	0.011	1.2		0	☐	☐		Shock loss around ladder bottom



# in use (total all stages)	Friction Name	Friction Factor kx10^10	Roughness in	Reference Density lb/ft³	Comment
58 (119)	Custom				
438 (554)	Auto				
5 (10)	RaiseBored Airway	26.954	0	0.07491601	
303 (744)	Rough Blasted	80.86199	0	0.07491601	
0 (9)	Very Rough Blasted	107.816	0	0.07491601	
242 (847)	Mine Ramps Upper	54.00002	0	0.07491601	16.0 w X 14.5 h
2 (4)	Escapeway Raises	270	0	0.07491601	varies
9 (19)	Mine Ramps 16.6 X 14.1	66.99998	0	0.07491601	16.6 w X 14.1 h
27 (84)	Mine Ramps Lower	97	0	0.07491601	17.5 w X 16.2 h
28 (6					18.6 w X 15.6 h
13 (1					17.9 w X 18.0 h
11 (3					
11 (3					16.6 w X 17.1 h
1 (2)					Est. for Escapeways
1 (2)					

Opening %	Resistance Ns²/m8
0.0	55.00000
1.0	25.00000
3.0	8.60000
6.0	2.66000
15.0	0.33000
18.0	0.22000
100.0	0.00060

But *how*?

With a few simple measurements

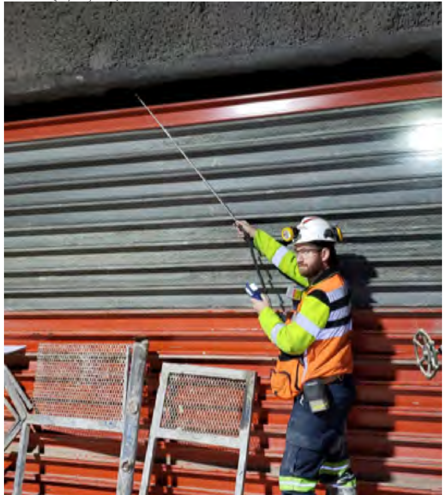
Ventilation PQ Survey: Q = Airflow

Measure velocity (full section)

- Full section traverse w/ anemometer, time scales with area (typic. 1 min)
- Grid method: divide into points by geometry (rectangular or circular)
- Select instrument appropriate for velocity (smoke tube, vane or hotwire anemometer, pitot tube)

Measure cross-sectional area

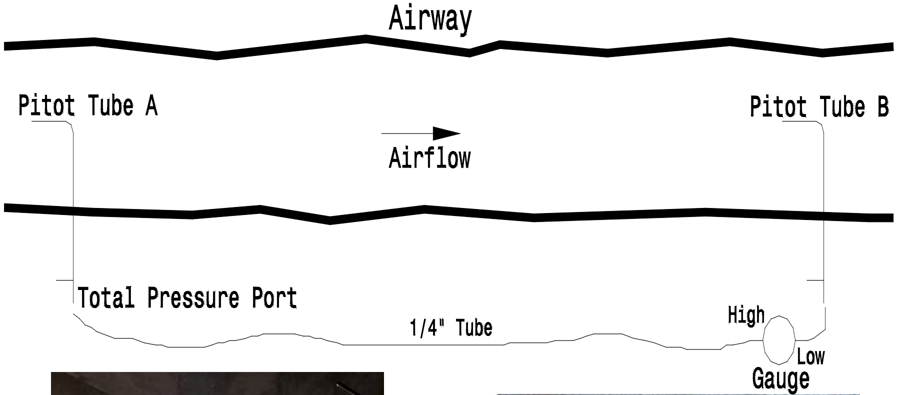
- Drift: average 2 widths and 3 heights
- Duct: note diameter (and annulus)

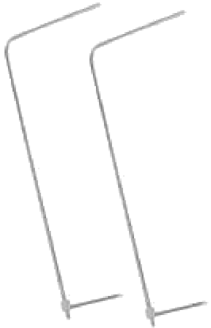


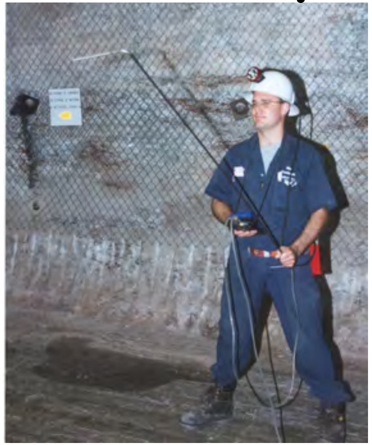
Ventilation PQ Survey: P = Pressure
Pressure loss in airways or controls

Gauge-and-tube method

- Micromanometer, Pitot tubes, nylon tubing (up to 1000 ft/ 330 m)
- Measure static pressure drop across controls: doors, bulkheads
- Measure <u>total</u> pressure drop along main airways







Ventilation PQ Survey: P = Pressure Pressure loss in raises/shafts

Gauge-and-Tube method

- Direct measurement possible when accessible, practical (<~ 600m or 2000ft)

Barometer/altimeter method

- Leap Frog or Roving method
- Record time, barometric pressure, dry bulb temp, wet bulb or RH, air velocity, and elevation at each station
- Preferable to conduct while weather (atmospheric pressure) stable
- Requires additional data and calculation


Gauge-and-tube

For barometer method:
≥ 2 precision barometers (base station + roving)
Anemometer
RH/temp meter

Square Law and Atkinson's Equation

"Square Law" $$p = RQ^2 \text{ or } R = \frac{p}{Q^2}$$

Where: R = resistance (Ns^2/m^8 or Practical Unit [P.U.])

p = frictional pressure drop (Pa or 10^{-3} in.w.g.)

Q = airflow (m^3/s or kcfm)

Note: P.U. = 10^{-3} in.w.g./kcfm^2 = 1.117 Ns^2/m^8

Atkinson's Equation $$R = \frac{kLO}{cA^3}$$

Where: k = (Atkinson) friction factor, *function of air density* (kg/m^3 or $lb_f \cdot min^2/ft^4 \times 10^{-10}$)

L = length of airway (m or ft)

O = airway perimeter (m or ft)

A = airway cross-sectional area (m^2 or ft^2)

c = 1 in S.I. or 52 in Imperial Units

- Combine both the Square Law and Atkinson's Equation and solve, e.g.

$$R = \frac{p}{Q^2} = \frac{kLO}{cA^3} \Rightarrow k = \frac{p(cA^3)}{Q^2 LO}$$

R and *k* at measured air density

Correct to standard density by multiplying by $\frac{\rho_{std}}{\rho_{actual}}$

Ventilation Control Resistances: Calculating from Field Measurements

- Use PQ data from vent controls
- Group and average similar controls, e.g., doors, walls
- Goal: representative values for future planning

Resistances

# in use (total all stages)	Resistance Name	Resistance Ns²/m8	Reference Density kg/m³	Strength Rating kPa	Reversing Resistance (leave zero for default) Ns²/m8	Linear/100	No Thoroughfare	Icon	Comment
19 (128)	Blocked	∞	1.2		∞	☐	☑		
2	Poor Seal	50	1.2		0	☐	☑		assumes unsealed timber wall
1 (2)	Good Seal	250	1.2		0	☐	☑		assumes timber wall sealed w/ curtain
	Brattice	2.5	1.2		0	☐	☐		
1	Leaky Door	5	1.2		0	☐	☐		
3 (38)	Good Door	20	1.2		0	☐	☐		
	Stope Backfilled	50	1.2		0	☐	☐		Backfilled Stope
1 (6)	Heater	0.015	1.2		0	☐	☐		Heater Resistance on surface (measur...
12	B_Curtain	5	1.2		0	☐	☑		Curtain Resistance
	Door w/ Regs (all open)	0.215	1.2		0	☐	☐		Door, louvers, mandoors fully open
21 (22)	Bulkhead w/ Man Door	50	1.2		0	☐	☐		
	B_Curtain Loose	0.5	1.2		0	☐	☐		curtain loosely clipped to screen
1	B_Fan Wall	250	1.2		0	☐	☐		Vent curtain over timber wall, sealed
1	FAR ladder bottom wall	0.011	1.2		0	☐	☐		Shock loss around ladder bottom

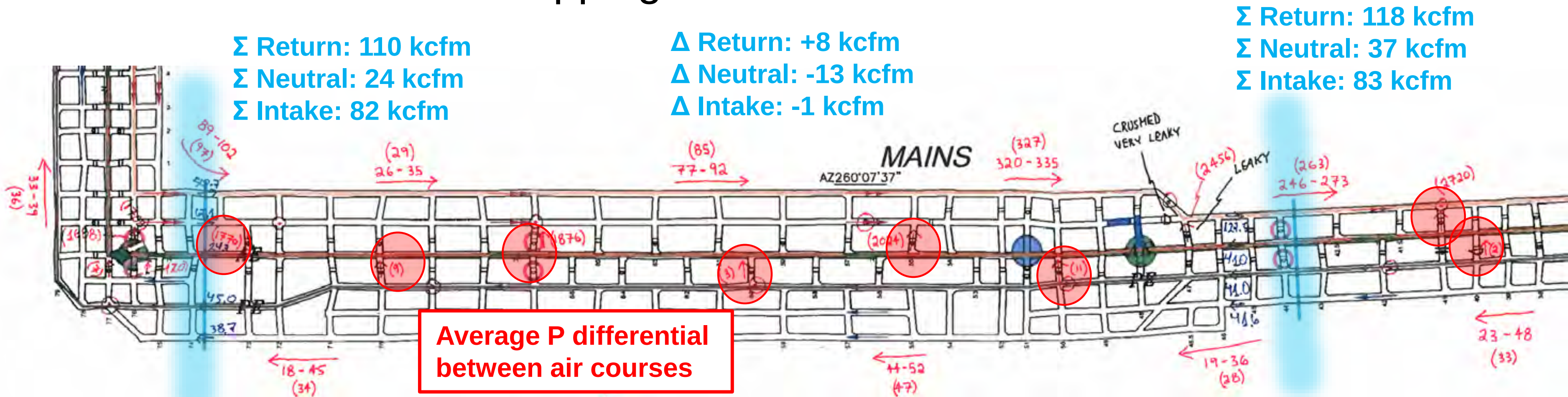
Location	Description	Density* (kg/m³)	Airflow (m³/s)	Pressure (Pa)	R (Ns²/m⁸)	R (std) (Ns²/m⁸)
FAR collar	Heater house	1.17	169.0	93	0.01075	0.01102
405L ramp	Door w/ reg (open door, regs, mandoor)	1.25	99.4	5	0.20000	0.19139
405L ramp	Door w/ reg (open door, regs, mandoor)	1.25	99.4	4	0.25000	0.23924
255L FA transfer	Shock loss around bottom of ladderway	1.24	178.0	89	0.01124	0.01086

Ventilation Control Resistances: Parallel Stoppings or Curtains

Use PQ data from schematic:

- Estimate Q leakage and count controls (e.g., 8 kcfm over 22 stoppings)
- Measure P across stoppings

- Group and average stoppings of similar condition and construction
- Goal: representative values for future planning



Friction Factors: Calculating from Field Measurements

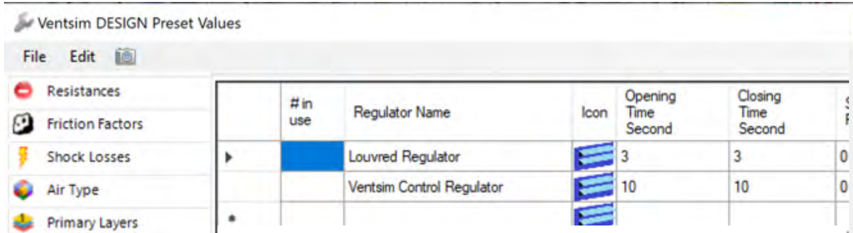
Resistances
Friction Factors

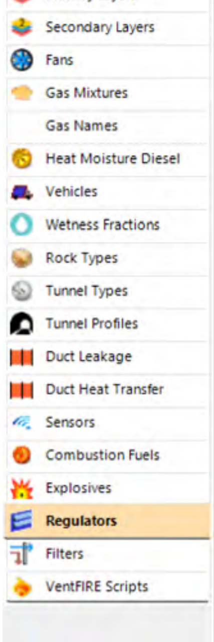
# in use (total all stages)	Friction Name	Friction Factor kx10^10	Roughness in	Reference Density lb/ft³	Comment
58 (119)	Custom				
438 (554)	Auto				
11 (30)	1350 Level (Slashed)	46	0	0.07491601	16.6 w X 17.1 h
13 (105)	29 Ramp	51	0	0.07491601	17.9 w X 18.0 h
1 (2)	3.5ft diam. Plastic Escape Tube	8.000001	0	0.07491601	
1 (2)	4ft diam. Raises	54.00002	0	0.07491601	Est. for Escapeways
11 (31)	8ft diam. Raises	27	0	0.07491601	
28 (68)	920 Level	52	0	0.07491601	18.6 w X 15.6 h
2 (4)	Escapeway Raises	270	0	0.07491601	varies
9 (19)	Mine Ramps 16.6 X 14.1	66.99998	0	0.07491601	16.6 w X 14.1 h
27 (84)	Mine Ramps Lower	97	0	0.07491601	17.5 w X 16.2 h

- Goal: average, representative friction factor for future ventilation planning
- Group by development type/ ground support/ rock type, etc.

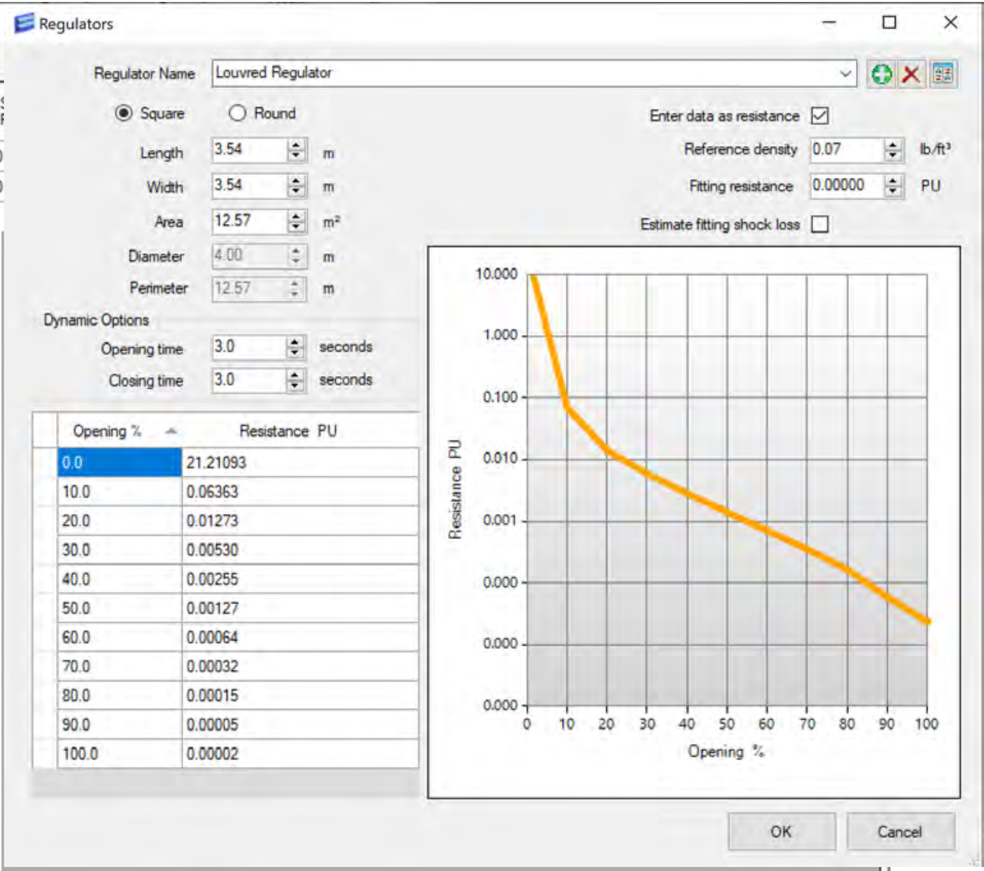
Location	Pressure (milli in. w.g.)	Aiflow (kcfm)	Length (ft)	Area (ft^2)	Perimeter (ft)	Density (lbs/ft^3)	Resistance (P.U.)	R/L (P.U./ 1000 ft)	k (lbf $min^2/ft^4 x10^{-10}$)	Standard k (lbf $min^2/ft^4 x10^{-10}$)
480 Ramp	253	156.8	4787.0	282.1	65.7	0.0740	0.01029	0.0021	38	38
29 Ramp	186	113.5	4955.0	306.5	70.0	0.0700	0.01443	0.0029	62	58
2853 Ramp	294	87.0	4312.0	217.5	61.0	0.0710	0.03884	0.0090	79	75
2950 Ramp	1268	193.8	3184.0	217.5	64.3	0.0730	0.03376	0.0106	88	86
48 Ramp	308	127.5	2636.0	205.6	57.4	0.0740	0.01895	0.0072	57	56
45 Ramp	119	125.8	2766.0	238.2	61.9	0.0740	0.00752	0.0027	31	30
31 Ramp	62	75.1	3025.0	225.0	61.0	0.0730	0.01099	0.0036	35	34
920 Level	190	280.0	2333.0	253.1	61.9	0.0730	0.00242	0.0010	14	14
1350 Level (Slashed)	378	195.5	2628.0	274.0	63.4	0.0730	0.00989	0.0038	63	62
Escapeway Safescape Tube	273	1.8	238.5	8.0	10.1	0.0730	84.25926	353.2883	950	925
8 foot raise	535	72.8	727.0	50.3	25.1	0.0730	0.10095	0.1389	37	36

Presets: Regulators



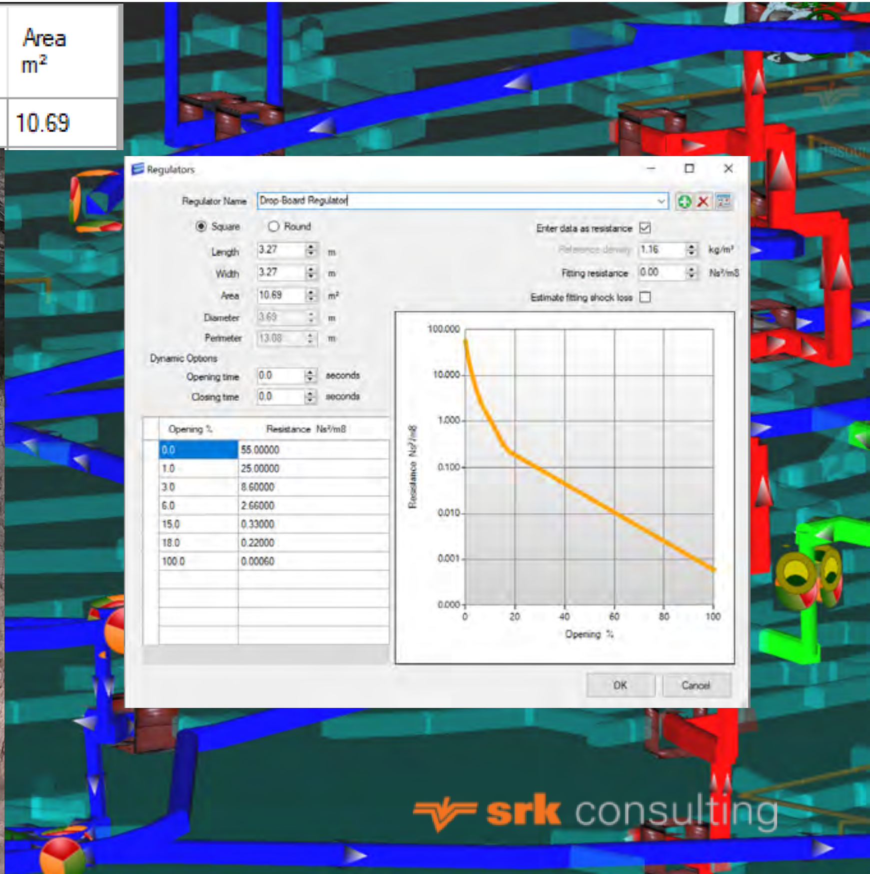


- Regulators are variable resistances controls
- Regulator curves based on actual measurements
- Not all regulators are rectangular louvers



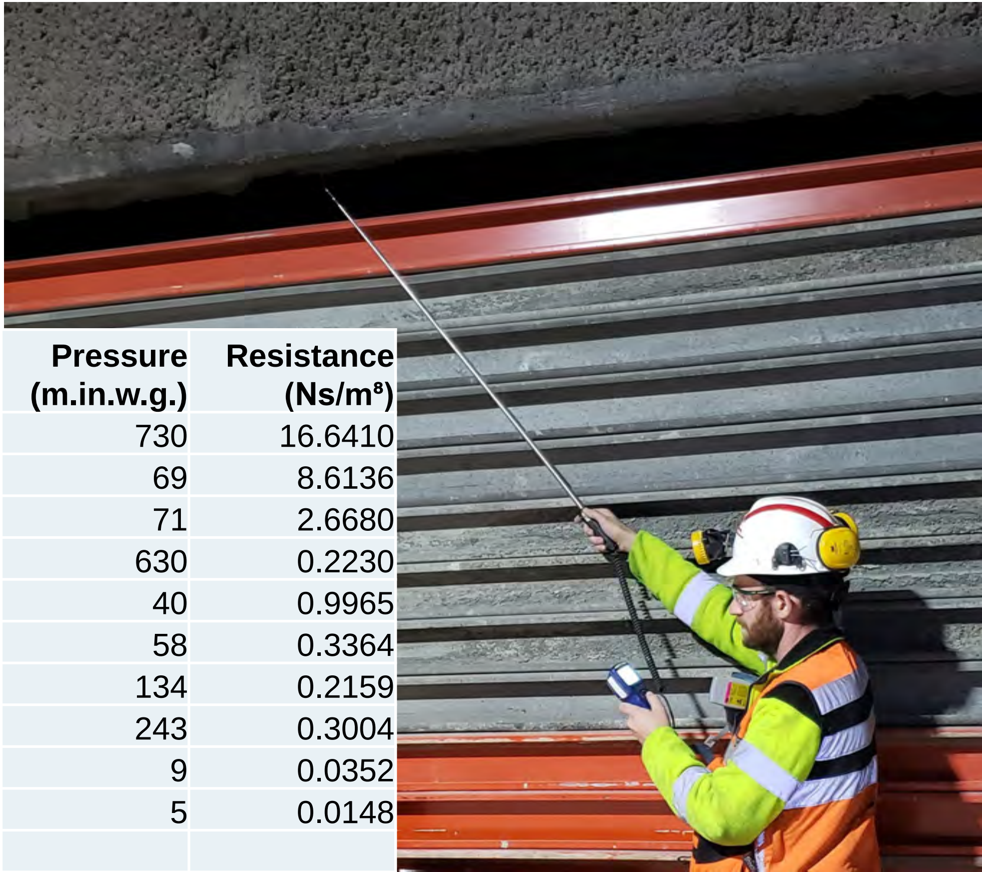
Custom Regulators Example: Drop-Board Regulator

# in use	Regulator Name	Icon	Opening Time segundos	Closing Time segundos	Shock Factor	Area m²
42 (76)	Drop-Board Regulator		3000	3000	0	10.69



Measuring Regulator Resistances: Example: Drop-Board Regulator

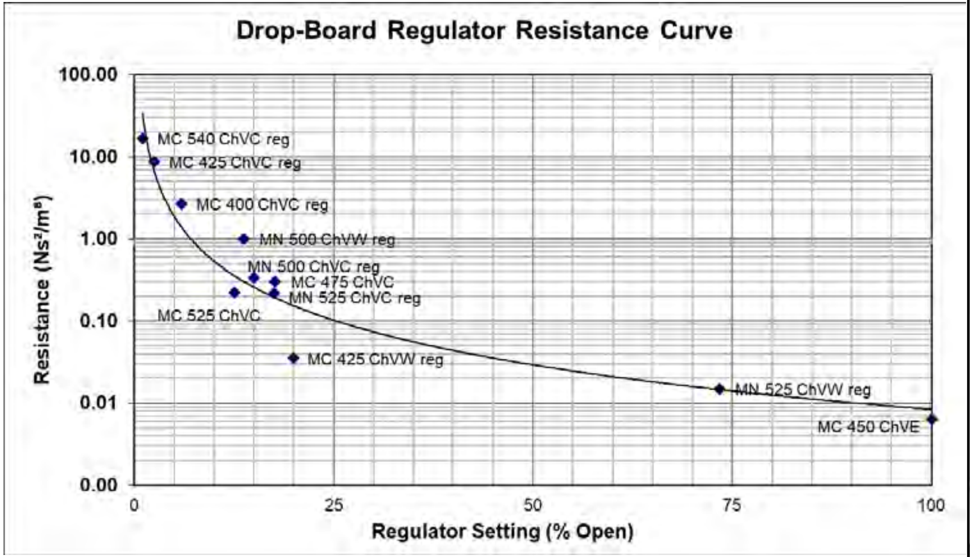
- Curve: Resistance vs. % Open
- R: need P and Q for each setting
- % Open from PLC, area, number of logs, etc.

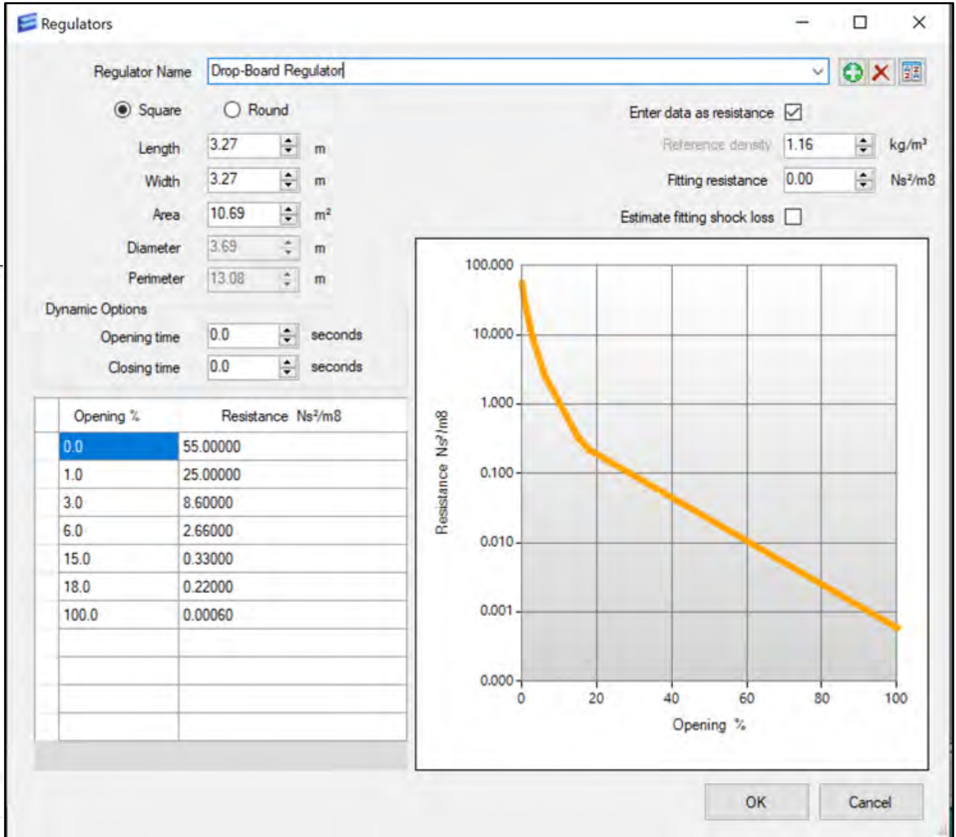


Location	Bars open	Percent open	Percent open	Airflow (kcfm)	Pressure (m.in.w.g.)	Resistance (Ns/m^8)
MC 540 ChVC reg	0.2	1%	1.0	7.0	730	16.6410
MC 425 ChVC reg	0.5	3%	2.5	3.0	69	8.6136
MC 400 ChVC reg	1	6%	5.9	5.5	71	2.6680
MC 525 ChVC	2.5	13%	12.5	56.2	630	0.2230
MN 500 ChVW reg	2	14%	13.7	6.7	40	0.9965
MN 500 ChVC reg	3	15%	15.0	13.9	58	0.3364
MN 525 ChVC reg	3.5	18%	17.5	26.3	134	0.2159
MC 475 ChVC	3	18%	17.6	30.1	243	0.3004
MC 425 ChVW reg	4	20%	20.0	16.9	9	0.0352
MN 525 ChVW reg	(area)	73%	73.4	19.4	5	0.0148
Total bars in frame	**20**					

Measuring Regulator Resistances: Example: Drop-Board Regulator

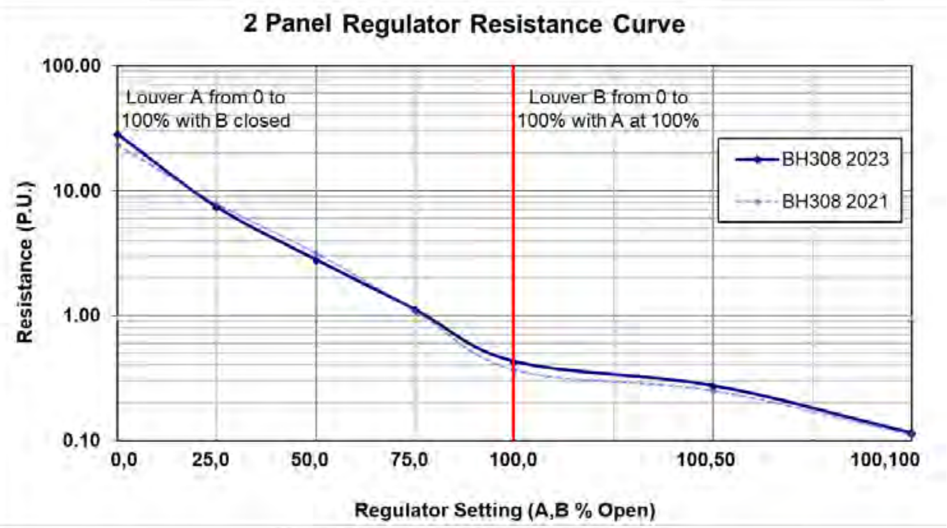
- Enter as Resistance vs. % Open
- % Open is any meaningful value: actuator control value, number of handle turns, area, etc.

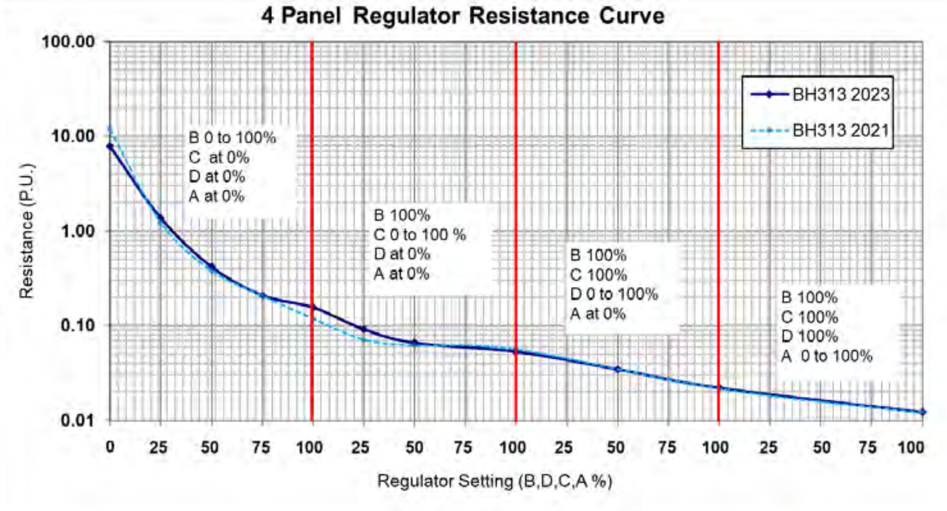




Multiple-Louver Regulators

- Sometimes regulators consist of multiple louvers in banks
- Can be combined into single curve

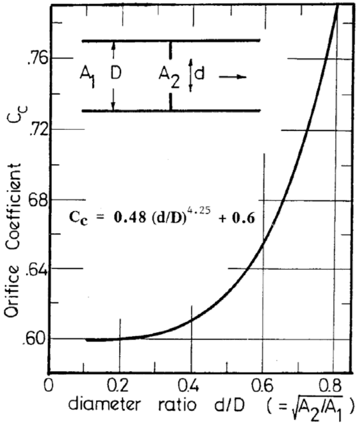


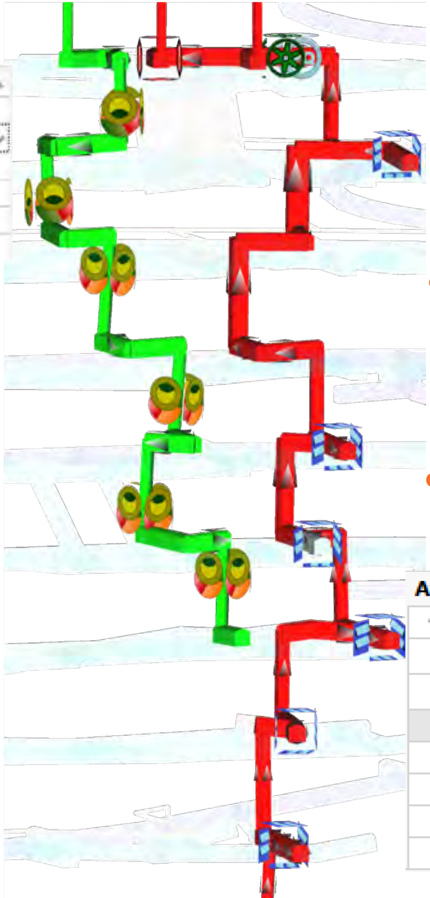


Why a Regulator? Why not use Orifice?

Attributes	
Resistance (Ns²/m8)	40.26999 (Orifice)
Resistance Type	Orifice
Orifice Area (m²)	0.2
Adjusted to local density	☐
Friction Factor (kg/m³)	0.0122 (Ramp (avg))
Shock X	0.00 (Nil)

- **Orifice** area calculator does not match the regulator geometry





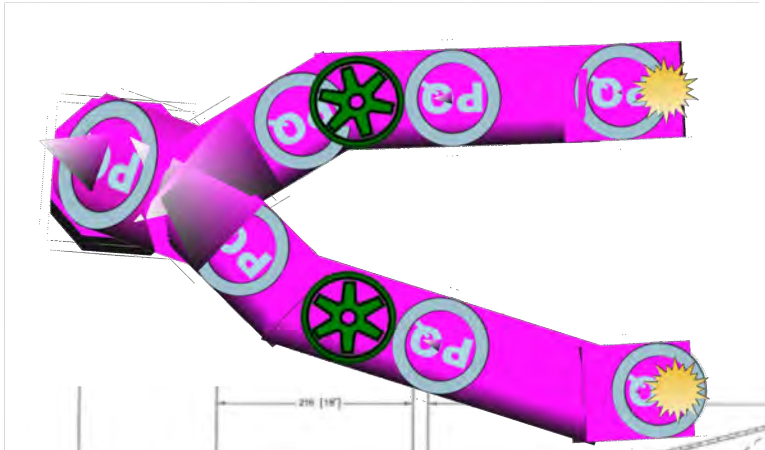
Attributes	
Resistance (Ns²/m8)	4.64000 (Regulator)
Resistance Type	Regulator
Regulator	Drop-Board Regulator
Opening (%)	5.0
Adjusted to local density	☐
Friction Factor (kg/m³)	0.0122 (Ramp (avg))
Shock X	0.00 (Nil)

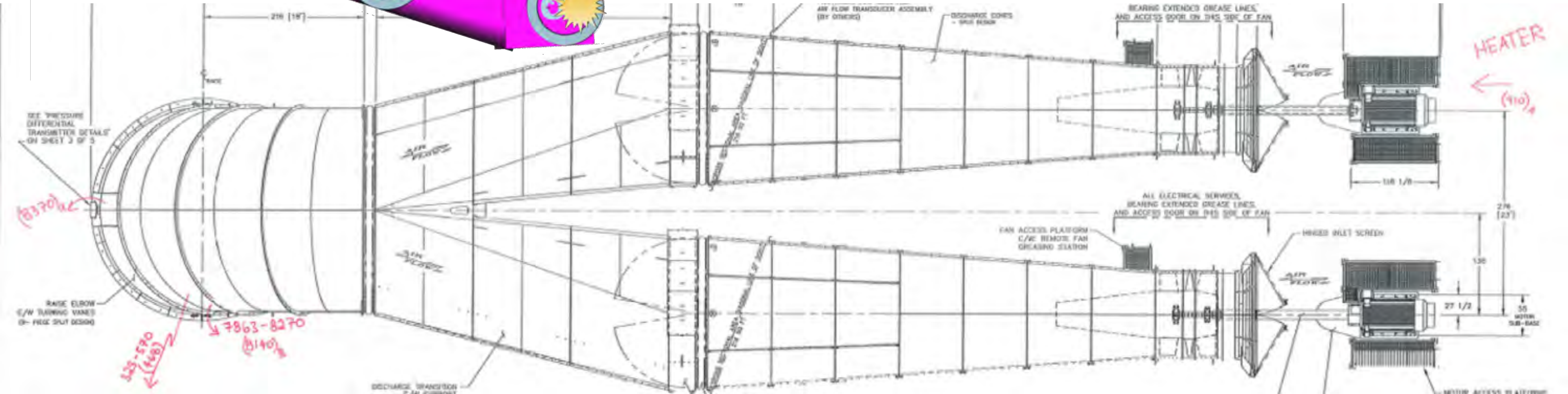
- **Regulator** uses a curve based on actual PQ data for each open setting
- **Auto-Regulator** (target airflow) needs Regulator curves

Attributes	
Resistance (Ns²/m8)	0.10644 (Auto-Regulator)
Resistance Type	Auto-Regulator
Auto-Regulator Type	Drop-Board Regulator
Target Flow (kcfm)	20.0
Opening (%)	60.4
Adjusted to local density	☐
Friction Factor (kg/m³)	0.0122 (Ramp (avg))
Shock X	0.00 (Nil)

When Presets Don’t Fit
PQ Survey input

- PQ survey: any vent control
- Useful for unique permanent controls:
  - Headframes
  - Ducts
  - Transitions
- Remember: measured at local density

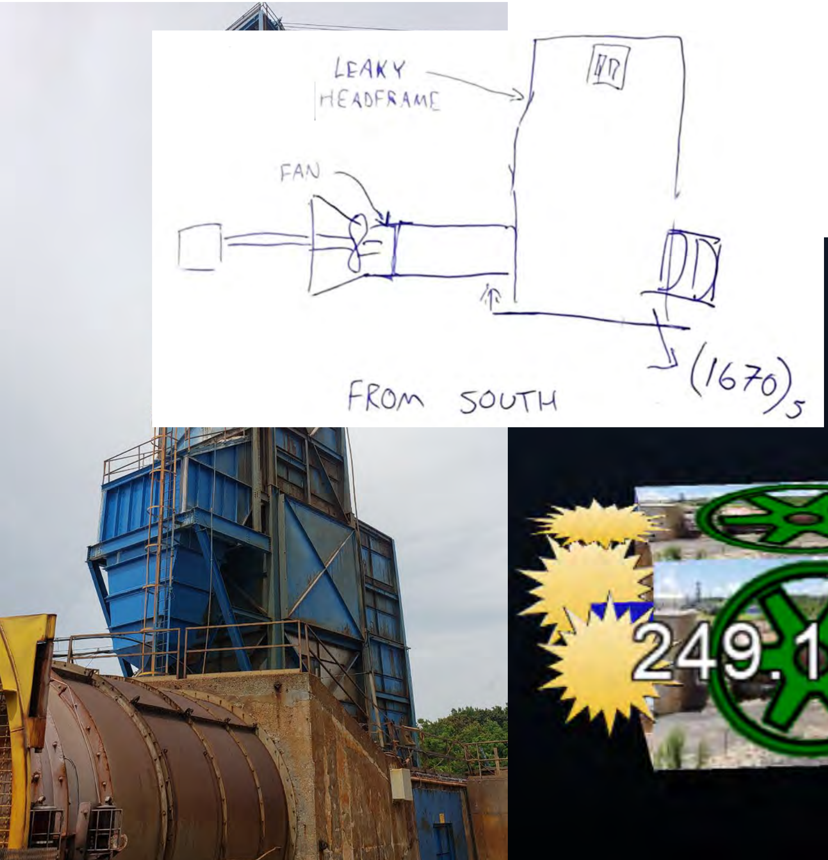


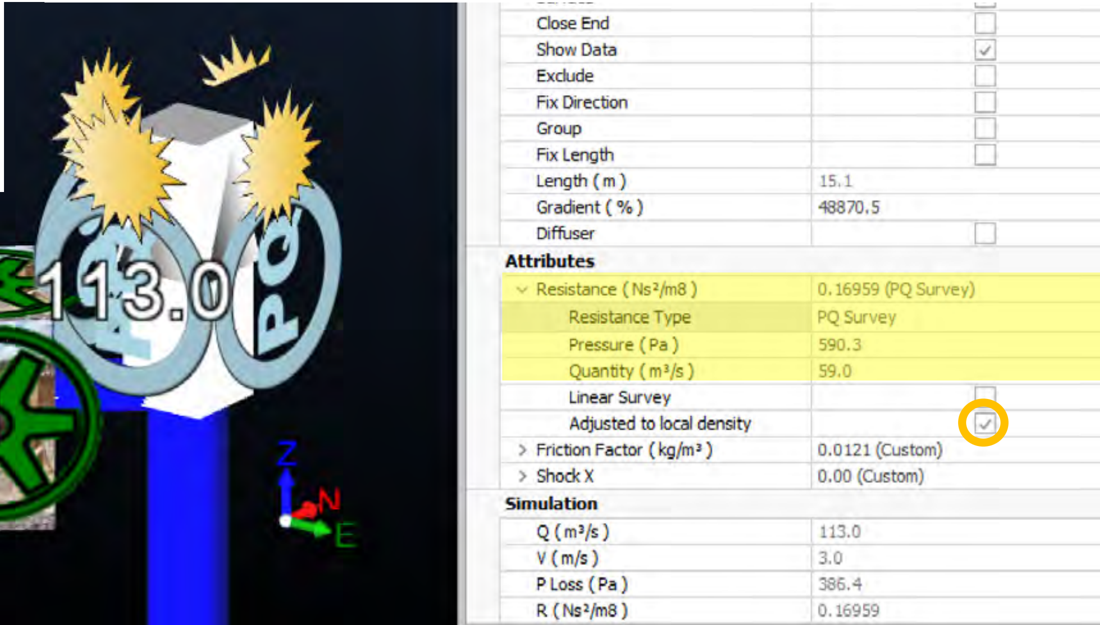


PQ Survey input

Example: PQ survey for a headframe:

- **P** from differential across headframe – this depends on fans, open doors, etc.!
- **Q** measured UG, at shaft collar, or leakage between fan (pitot) and UG





Conclusions

- Ventsim's Presets are assumptions (check yours!)
  - Based on literature, great for desktop studies
  - May NOT match your installed controls, but YOU can measure your own

- Where to measure?
  - *Representative* controls (think future planning: will you build 2 more? 200 more?)
  - Regulators: variety of setpoints (include or estimate "0% open")
  - Important unique controls: prioritize by high *Air Power Loss* (~airflow × pressure drop)

Tips for Using Custom Presets

- Measure P and Q at the same time
- Convert measured values to standard air density
- Regulators: measure a variety of setpoints (include “0% open”)
- Take photos! Use them for Preset Resistances and unique controls
- Be creative! Many values can be measured indirectly
- Estimate leakages by parallel combination if possible
- Headframes: note season (open in summer, closed in winter?)
- Drop raises or multi-stage raises: do they include shock losses? (if so, don’t double-count)
- Use *File > Inherit* to copy Presets between models

Thank you for your attention

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