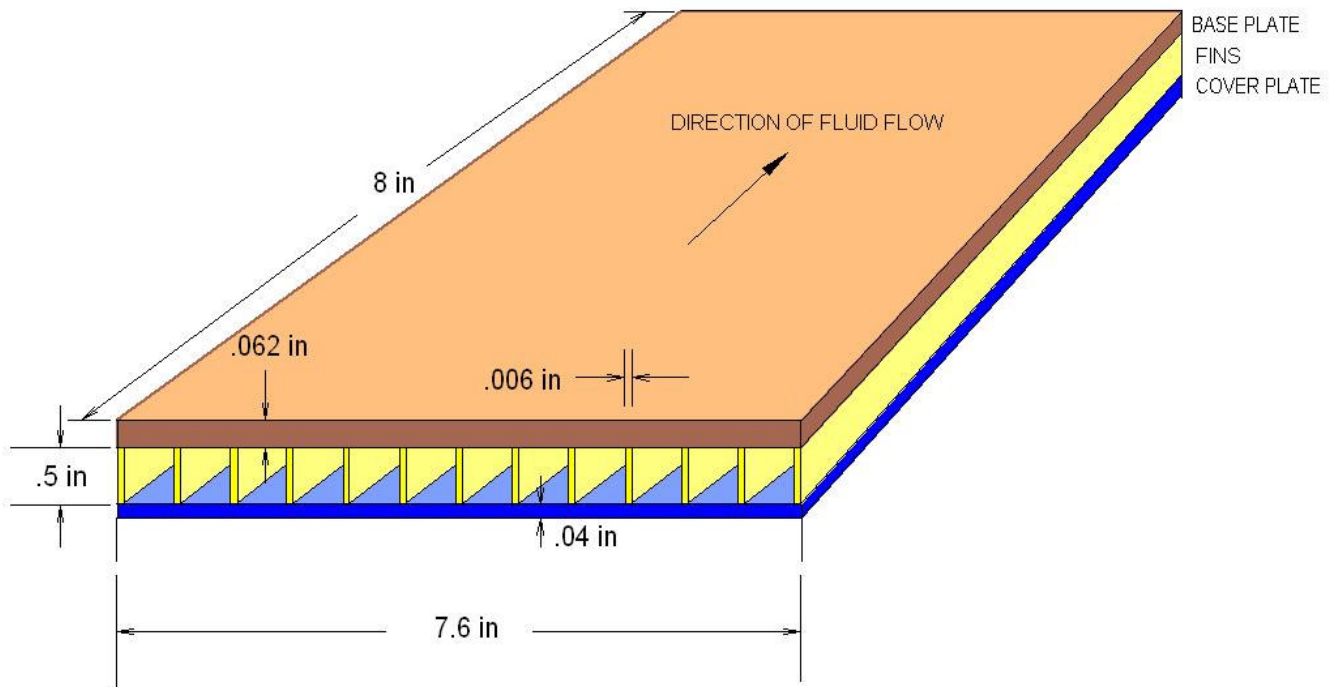


Simple Example Model

Assume that it is desired to determine the thermal characteristics of a cold plate with the following input parameters. The model will be built using the Wizard capability of COLDPLATE.

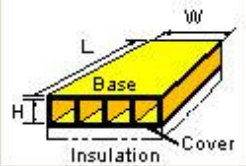
- Length L is 8 inches
- Width W is 7.6 inches
- Fin height H is .5 inches
- Fins are to be .006 inches thick
- Fin type is rectangular
- The fin density is 8 fins/inch
- Cover plate is .04 inches
- Base plate is .062 inches thick
- The inlet fluid temperature is 55C
- The inlet fluid pressure is 14.7 PSI
- Cooling fluid is air
- Volume flow rate is 50 CFM
- 250 Watts is uniformly distributed across the cold plate
- Base, fins and cover are made of aluminum



Input the geometry on this step

Flow Thru Wizard - Geometry - Step 1 of 4 [?] [X]

Geometry



Length (in.)

Width (in.)

Fin Height (in.)

Base Thickness (in.)


Cover Thickness (in.)

Fin Type

- PF9
- PLANE FIN 11.1
- RECTANGULAR
- TEST
- TRI FIN 12.00T

Plate or Pin Fins

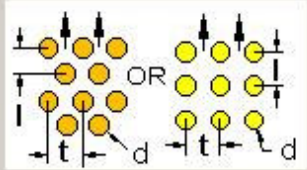
Plate Fins



Fin Thickness (in.)

Fin Density (fins/in.)

Pin Fins

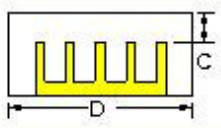


Pin Diameter (in.)

Transverse Spacing (in.)

Lateral Spacing (in.)

For Bypass Flow Only

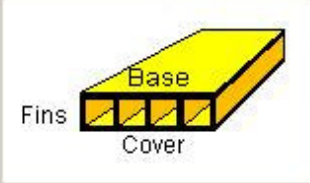


Duct Width (in.)

Cover Clearance (in.)

Select Default Aluminum Properties on this step.

Flow Thru Wizard - Material Properties - Step 2 of 4



The diagram shows a 3D perspective view of a coldplate assembly. It consists of a top rectangular block labeled 'Base', a middle section with four vertical rectangular protrusions labeled 'Fins', and a bottom rectangular block labeled 'Cover'.

Base

Select type of material: Default Aluminum Properties

Thermal Conductivity (W/in.-C): 3.92

Specific Heat (W-min./lb-C): 7.07

Density (lb/in.^3): 0.098

Fins

Select type of material: Default Aluminum Properties

Thermal Conductivity (W/in.-C): 3.92

Specific Heat (W-min./lb-C): 7.07

Density (lb/in.^3): 0.098

Cover

Select type of material: Default Aluminum Properties

Thermal Conductivity (W/in.-C): 3.92

Specific Heat (W-min./lb-C): 7.07

Density (lb/in.^3): 0.098

<Back Next> X Cancel ? Help

Input temperature, pressure, flow rate and air as the fluid on this step.

Flow Thru Wizard - Fluid Properties - Step 3 of 4 [?] [X]

Inlet Fluid Temperature and Inlet Pressure Pair

Inlet Fluid Temperature (C)

Inlet Fluid Pressure (lb/in²)

Type of Cooling Fluid

- AIR
- COOLANOL20
- COOLANOL25
- EG_H2O_30/70
- EG_H2O_40/60
- EG_H2O_50/50
- EG_H2O_60/40

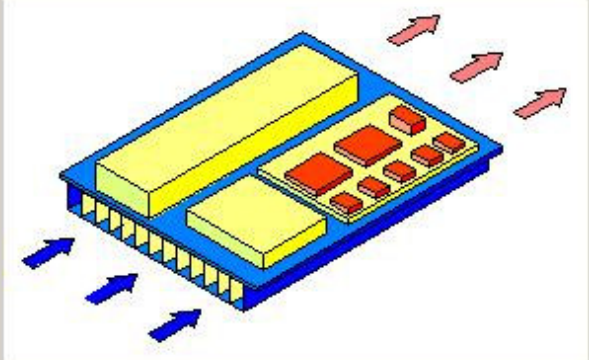
Fluid Flow Rate

Mass Flow Rate (lb/min)

Volume Flow Rate (ft³/min)

Predict Flow Rate That Results In

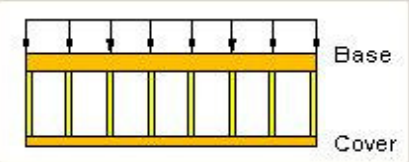
Fluid Exit Temperature (C)



<Back
Next>
X Cancel
? Help

Input the power dissipation on this step.

Flow Thru Wizard - Power - Step 4 of 4



Base Plate Power (Watts)

Base
Cover

After filling in the power value a complete model will be built and ready to run. Click on "Finish" and the Flow Thru Cooling form will appear. The model can be saved and run or edited to add more model information.

<Back Finished X Cancel ? Help

The model is then saved and run, the results are shown below:

```
#####
HEATING ON ONE SIDE ONLY

***** VARIABLE INPUTS *****
THE TYPE OF FINS SPECIFIED ARE:                RECTANGULAR
FIN HEIGHT, INCHES                             0.500
BASE THICKNESS, INCHES                         0.062
FIN THICKNESS, INCHES                          0.0060
FIN DENSITY, FINS PER INCH                     8.0
STATIC INLET FLUID TEMPERATURE, DEG C          55.0
INLET PRESSURE, LBS/IN2                        14.70
VOLUME FLOWRATE, FT3/MIN                       50.00
THE POWER APPLIED TO ONE SIDE ONLY, WATTS      250.00
THE COOLING FLUID IS:                          AIR

***** INTERMEDIATE CALCULATED PARAMETERS *****
FREE FLOW CROSS SECTIONAL AREA, IN2            3.62
HYDRAULIC DIAMETER, INCHES                    0.192
COLDPLATE WEIGHT, LBS                          0.75
TOTAL MASS FLOWRATE, LBS/MIN                  3.31
COLD PLATE MASS FLOWRATE, LBS/MIN              3.31
COLDPLATE VOL FLOWRATE, [GAL/MIN] FT3/MIN [ 374.0] 50.00
COLDPLATE VELOCITY, FT/SEC                    33.17
REYNOLDS NUMBER                               2644.
EQUIVALENT FRICTION LOSS COEFFICIENT, KFRICITION 1.67
INLET LOSS COEFFICIENT, KINLET                 0.82
EXIT LOSS COEFFICIENT, KEXIT                  -0.73
FILM COEFFICIENT, [BTU/(HR-FT2-F)] W/(IN2-C) [ 8.22] 0.0301
THE FIN EFFICIENCY WITH HEAT ON ONE SIDE ONLY IS 0.796

***** PRESSURE *****
INLET PRESSURE, [LB/IN2] INCHES-H2O          [ 14.700] 407.077
INLET PRESSURE DROP, INCHES-H2O              0.196
ACCELERATION PRESSURE DROP, INCHES-H2O       0.013
FRICTIONAL PRESSURE DROP, INCHES-H2O         0.363
EXIT PRESSURE DROP, INCHES-H2O                -0.182
TOTAL PRESSURE DROP, INCHES-H2O               0.390
EXIT PRESSURE, [LB/IN2] INCHES-H2O           [ 14.686] 406.687
DENSITY RATIO TIME PRESSURE DROP, INCHES-H2O 0.3375

***** THERMAL RESISTANCE *****
THERMAL RESISTANCE FROM INLET FLUID TO COLDPLATE, C/W 0.090
THERMAL RESISTANCE FROM LOCAL FLUID TO COLDPLATE, C/W 0.068

***** TEMPERATURES *****
STATIC INLET FLUID TEMPERATURE, DEG C        55.0
STAGNATION FLUID TEMP RISE ALONG COLDPLATE, DEG C 9.9
TOTAL STAGNATION FLUID TEMP RISE, DEG C      9.9
STATIC EXIT FLUID TEMPERATURE, DEG C         64.9
ISOTHERMAL COLDPLATE TEMPERATURE, DEG C      77.4
MAXIMUM COLDPLATE TEMPERATURE, DEG C         81.9
```