ASSIGNMENT 2 - HEAT DISTRIBUTION

ARC 314 ENVIRONMENT SYSTEMS

GROUP 3

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CALCULATIONS

A Main Plenum

Total heat loss: 1,500,000 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

=1500000/0.018 x 60X35=39683 cfm

Desired fpm in Shaft: 2500 Design RC(N): 35

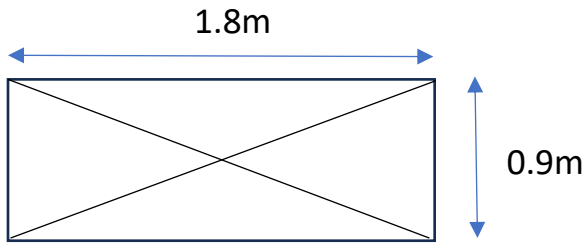
Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part A)

=39683X144/2500=2286 inches² =1.48 m²

Building Shaft Dimension: 1.5m x 2.64 m

Main Air Supply Duct Size in Shaft:

1.8 m x 0.9m =1.62 m²



B Secondary Plenum

1 first floor

heat loss: 400,000 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

=400000/0.018 x 60X35=10582 cfm

Desired fpm Under Suspended Celling: 1750 Design RC(N): 35

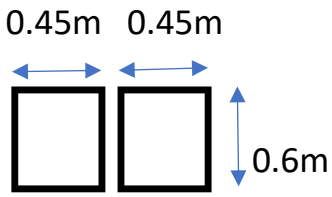
Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part A)

=39683X144/1750=871 inches² =0.56 m²

Suspended Celling Height: 0.68m

Air Supply Duct Size Under Raised Floor:

0.6 m x 0.9 m = 0.6 x (2X0.45) = 0.54 m²



2 2nd to 4 floor

heat loss: 220,000 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

=220000/0.018 x 60X35=5820 cfm

Desired fpm Under Raised Floor: 1750 ***Design RC(N): 35***

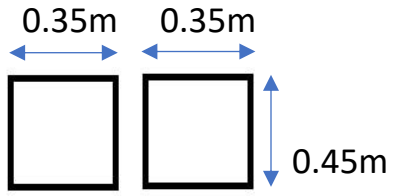
Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part A)

=5820X144/1750=479 inches² =0.31 m²

Raised floor Space Height: 0.45m

Air Supply Duct Size Under Raised Floor:

0.45 m x 0.69 m = 0.45 x (2X0.35) = 0.31 m²



3 5th floor

heat loss: 440,000 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

=440000/0.018 x 60X35=11640 cfm

Desired fpm Under Raised Floor: 1750 ***Design RC(N): 35***

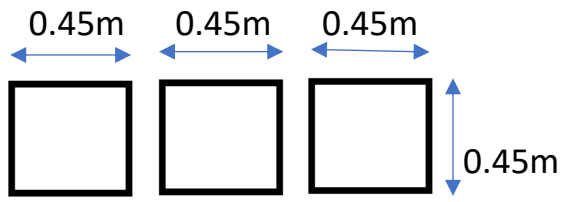
Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part A)

=11640X144/1750=958 inches² =0.62 m²

Raised floor Space Height: 0.45m

Air Supply Duct Size Under Raised Floor:

0.45 m x 1.38 m = 0.45 x (3X0.45) = 0.62 m²



C Branch Lines

1 1st Floor

Total Floor Area: 14996 sqft ***Floor heat loss: 400,000 btuh***

Heat loss per sqft= Floor heat loss/ Total Floor Area = 400000/14996 = 27 btuh

Heat loss per unit room (600 sqft) = 27*600 =16200 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

=16200/0.018 x 60X35= 429 cfm

Desired fpm Under Raised Floor: 430 ***Design RC(N): 30***

Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part B)

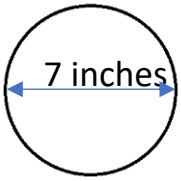
=429X144/430=144 inches²

Raised floor Space Height: 0.45m

Air Supply Duct Size Under Raised Floor:

$\prod R^2$= 144 inches^2 R= 6.8 inches

7 inches or 178 mm flex duct will be used



2 2nd to 4th Floor

Total Floor Area: 16850 sqft Floor heat loss: 220,000 btuh

Heat loss per sqft= Floor heat loss/ Total Floor Area = 220000/16850 = 13 btuh

Heat loss per unit room (600 sqft) = 13*600 =7800 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

=7800/0.018 x 60X35= 206 cfm

Desired fpm Under Raised Floor: 430 Design RC(N): 30

Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part B)

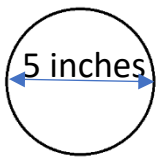
=206X144/430=69 inches^2

Raised floor Space Height: 0.45m

Air Supply Duct Size Under Raised Floor:

$\prod R^2$= 69 inches^2 R= 4.7 inches

5 inches or 127 mm flex duct will be used



3 5th Floor

Total Floor Area: 16850 sqft Floor heat loss: 440,000 btuh

Heat loss per sqft= Floor heat loss/ Total Floor Area = 440000/16850 = 26 btuh

Heat loss per unit room (600 sqft) = 26*600 =15600 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

=15600/0.018 x 60X35= 413 cfm

Desired fpm Under Raised Floor: 430 Design RC(N): 30

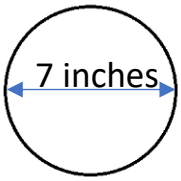
Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part B)

=413X144/430=138 inches²

Raised floor Space Height: 0.45m

Air Supply Duct Size Under Raised Floor:

∏R²= 138 inches² R= 6.63 inches 7 inches or 178 mm flex duct will be used



D Return Air Plenum

Total heat loss: 1,500,000 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

=1500000/0.018 x 60X35=39683 cfm

Desired fpm in Shaft for Return Air : 2500 ***Design RC(N): 35***

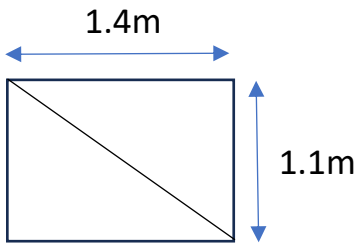
Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part A)

=39683X144/2500=2286 inches² =1.48 m²

Building Shaft Dimension: 1.5m x 2.64 m

Main Air Supply Duct Size in Shaft:

1.4 m x 1.1m =1.54 m²



Branch Lines

1 first floor

heat loss: 400,000 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

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Desired fpm Under Suspended Celling: 1750 ***Design RC(N): 35***

Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part A)

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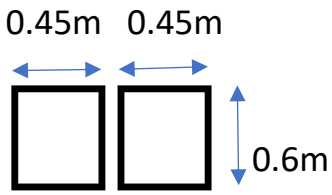
Suspended Celling Height: 0.68m

Return Air Duct Size Under Raised Floor:

0.6 m x 0.9m = 0.6 x (2X0.45) = 0.54 m²



2 2nd to 4 floor

heat loss: 220,000 btuh

Temperature drop: 35 F°

CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

=220000/0.018 x 60X35=5820 cfm

Desired fpm Under Raised Floor for Return Air: 1750 ***Design RC(N): 35***

Area = CFM x 144 (in sq./ft/sq/**)/**Desired fpm (table 7.4 part A)

=5820X144/1750=479 inches² =0.31 m²

Raised floor Space Height: 0.45m

Air Supply Duct Size Under Raised Floor:

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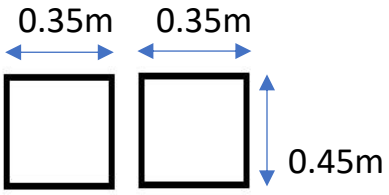

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CFM= Heat loss/0.018 x 60 (min) x temp rise/drop

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Desired fpm Under Raised Floor: 1750 ***Design RC(N): 35***

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Raised floor Space Height: 0.45m

Air Supply Duct Size Under Raised Floor:

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