

1305-11 Duarte

## DUARTE RESIDENCE HVAC LOAD ANALYSIS

for

ADAM'S CONSTRUCTION AND FRAMING



Prepared By:

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5/6/13

1305-11



### Miscellaneous Project Data

Project File Name: ADAM, DUARTE

### System Input Data

| ---System 1--- | Outdoor<br>Dry Bulb | Outdoor<br>Wet Bulb | Indoor<br>Rel.Hum. | Indoor<br>Dry Bulb | Grains<br>Difference |
|----------------|---------------------|---------------------|--------------------|--------------------|----------------------|
| Winter:        | 27                  | N/A                 | N/A                | 72                 | N/A                  |
| Summer:        | 98                  | 78                  | 50%                | 75                 | 48                   |
| ---System 2--- |                     |                     |                    |                    |                      |
| Winter:        | 27                  | N/A                 | N/A                | 72                 | N/A                  |
| Summer:        | 98                  | 78                  | 50%                | 75                 | 48                   |

### External Overhangs

| No. | Projection | Offset | No. | Projection | Offset |
|-----|------------|--------|-----|------------|--------|
| 1   | 3          | 1      | 6   | 0          | 0      |
| 2   | 5          | 0      | 7   | 0          | 0      |
| 3   | 4          | 0.5    | 8   | 0          | 0      |
| 4   | 0          | 0      | 9   | 0          | 0      |
| 5   | 0          | 0      | 10  | 0          | 0      |

### Duct Sizing Inputs

|                   | Runouts              |  | Main Trunk           |
|-------------------|----------------------|--|----------------------|
| Duct Material:    | Flexible Duct        |  | Galvanized Steel     |
| Roughness Factor: | 0.010000             |  | 0.000300             |
| Pressure Drop:    | 0.1000 In.wg/100 Ft. |  | 0.1000 In.wg/100 Ft. |
| Minimum Velocity: | 450.0 Ft./Minute     |  | 650.0 Ft./Minute     |
| Maximum Velocity: | 750.0 Ft./Minute     |  | 900.0 Ft./Minute     |
| Minimum Height:   | 0 Inches             |  | 0 Inches             |
| Maximum Height:   | 0 Inches             |  | 0 Inches             |

### Outside Air Data

|                                                      | Winter           |                                          | Summer           |
|------------------------------------------------------|------------------|------------------------------------------|------------------|
| Infiltration:                                        | 0.900 AC/Hr      |                                          | 0.400 AC/Hr      |
| Volume of Conditioned Space:                         | X 62546 Cu.Ft.   |                                          | X 62546 Cu.Ft.   |
|                                                      | 56,291 Cu.Ft./Hr |                                          | 25,018 Cu.Ft./Hr |
|                                                      | X 0.0167         |                                          | X 0.0167         |
| Total Building Infiltration:                         | 938.19 CFM       |                                          | 416.9733 CFM     |
| Total Building Ventilation:                          | 0 CFM            |                                          | 0 CFM            |
| ---System 1---                                       |                  |                                          |                  |
| Infiltration & Ventilation Sensible Gain Multiplier: | 25.30            | = (1.10 X 23.00 Summer Temp. Difference) |                  |
| Infiltration & Ventilation Latent Gain Multiplier:   | 32.64            | = (0.68 X 48.00 Grains Difference)       |                  |
| Infiltration & Ventilation Sensible Loss Multiplier: | 49.50            | = (1.10 X 45.00 Winter Temp. Difference) |                  |
| ---System 2---                                       |                  |                                          |                  |
| Infiltration & Ventilation Sensible Gain Multiplier: | 25.30            | = (1.10 X 23.00 Summer Temp. Difference) |                  |
| Infiltration & Ventilation Latent Gain Multiplier:   | 32.64            | = (0.68 X 48.00 Grains Difference)       |                  |
| Infiltration & Ventilation Sensible Loss Multiplier: | 49.50            | = (1.10 X 45.00 Winter Temp. Difference) |                  |



### Total Building Summary Loads

| Component Description                              | Area Quan | Sen. Loss | Lat. Gain | Sen. Gain | Total Gain |
|----------------------------------------------------|-----------|-----------|-----------|-----------|------------|
| 3C Window Double Pane Clear Glass Metal Frame      | 490       | 15,991    | 0         | 22,197    | 22,197     |
| 8O Glass Door Double Clear Glass Metal Frame       | 196       | 6,394     | 0         | 8,116     | 8,116      |
| 10D Door Wood Solid Core                           | 42        | 869       | 0         | 514       | 514        |
| 11A Door Metal Fiberglass Core                     | 42        | 1,116     | 0         | 660       | 660        |
| 12G Wall R-13 + 3/4" ExtPoly Board(R-3.8)          | 2,183     | 6,388     | 0         | 3,774     | 3,774      |
| 12H Wall R-19 + 1/2" Gypsum Board(R-0.5)           | 2,221     | 5,999     | 0         | 3,542     | 3,542      |
| 16G Ceiling R-30 Insulation                        | 6,543     | 9,717     | 0         | 10,146    | 10,146     |
| 19D Floor Over Basement/Encl Crawl Hardwood + R-19 | 2,875     | 3,363     | 0         | 0         | 0          |
| 22A Slab on Grade No Edge Insulation               | 273       | 9,950     | 0         | 0         | 0          |
| Subtotals for structure:                           | 14,865    | 59,787    | 0         | 48,949    | 48,949     |
| Active People:                                     | 12        | 0         | 2,760     | 3,600     | 6,360      |
| Inactive People:                                   | 0         | 0         | 0         | 0         | 0          |
| Appliances:                                        | 0         | 0         | 3,200     | 3,200     | 6,400      |
| Lighting:                                          | 0         | 0         |           | 23,188    |            |
| Ductwork:                                          | 0         | 5,314     | 0         | 8,948     | 8,948      |
| Infiltration: Winter CFM: 938.2, Summer CFM: 417.0 | 770       | 46,438    | 13,611    | 10,549    | 24,160     |
| Ventilation: Winter CFM: 0.0, Summer CFM: 0.0      | 0         | 0         | 0         | 0         | 0          |
| Sensible Gain Total:                               |           |           |           | 98,434    |            |
| Temperature Swing Multiplier:                      |           |           |           | X1.00     |            |
| Building Load Totals:                              |           | 111,539   | 19,571    | 98,434    | 118,005    |

### Check Figures

|                            |       |                      |         |
|----------------------------|-------|----------------------|---------|
| Total Building Supply CFM: | 4474  | CFM per square foot: | 0.684   |
| Square feet of room area:  | 6,543 | Square feet per ton: | 614.191 |

### Building Loads

|                                          |              |                                              |
|------------------------------------------|--------------|----------------------------------------------|
| Total heating required with outside air: | 111,539 Btuh | 111.539 MBH                                  |
| Total sensible gain:                     | 98,434 Btuh  | 83 %                                         |
| Total latent gain:                       | 19,571 Btuh  | 17 %                                         |
| Total cooling required with outside air: | 118,005 Btuh | 9.834 Tons (based on sensible + latent)      |
|                                          |              | 10.653 Tons (based on 77% sensible capacity) |

### Notes

Calculations are based on 7th edition of ACCA Manual J.  
All computed results are estimates as building use and weather may vary.  
Be sure to select a unit that meets both sensible and latent loads.



5/6/13

### System #1 Summary Loads

| Component Description                              | Area Quan | Sen. Loss | Lat. Gain | Sen. Gain | Total Gain |
|----------------------------------------------------|-----------|-----------|-----------|-----------|------------|
| 3C Window Double Pane Clear Glass Metal Frame      | 235       | 7,667     | 0         | 10,683    | 10,683     |
| 8O Glass Door Double Clear Glass Metal Frame       | 196       | 6,394     | 0         | 8,116     | 8,116      |
| 10D Door Wood Solid Core                           | 42        | 869       | 0         | 514       | 514        |
| 11A Door Metal Fiberglass Core                     | 42        | 1,116     | 0         | 660       | 660        |
| 12G Wall R-13 + 3/4" ExtPoly Board(R-3.8)          | 2,183     | 6,388     | 0         | 3,774     | 3,774      |
| 16G Ceiling R-30 Insulation                        | 3,668     | 5,446     | 0         | 5,688     | 5,688      |
| 22A Slab on Grade No Edge Insulation               | 273       | 9,950     | 0         | 0         | 0          |
| Subtotals for structure:                           | 6,639     | 37,830    | 0         | 29,435    | 29,435     |
| Active People:                                     | 5         | 0         | 1,150     | 1,500     | 2,650      |
| Inactive People:                                   | 0         | 0         | 0         | 0         | 0          |
| Appliances:                                        | 0         | 0         | 2,200     | 2,200     | 4,400      |
| Lighting:                                          | 0         | 0         |           | 13,640    |            |
| Ductwork:                                          | 0         | 3,254     | 0         | 5,296     | 5,296      |
| Infiltration: Winter CFM: 550.1, Summer CFM: 244.5 | 515       | 27,229    | 7,981     | 6,184     | 14,165     |
| Ventilation: Winter CFM: 0.0, Summer CFM: 0.0      | 0         | 0         | 0         | 0         | 0          |
| Sensible Gain Total:                               |           |           |           | 58,255    |            |
| Temperature Swing Multiplier:                      |           |           |           | X1.00     |            |
| System Load Totals:                                |           | 68,313    | 11,331    | 58,255    | 69,586     |

### Check Figures

|                           |       |                      |         |
|---------------------------|-------|----------------------|---------|
| Supply CFM:               | 2,648 | CFM per square foot: | 0.722   |
| Square feet of room area: | 3,668 | Square feet per ton: | 581.792 |

### System Loads

|                                          |             |                                             |
|------------------------------------------|-------------|---------------------------------------------|
| Total heating required with outside air: | 68,313 Btuh | 68.313 MBH                                  |
| Total sensible gain:                     | 58,255 Btuh | 84 %                                        |
| Total latent gain:                       | 11,331 Btuh | 16 %                                        |
| Total cooling required with outside air: | 69,586 Btuh | 5.799 Tons (based on sensible + latent)     |
|                                          |             | 6.305 Tons (based on 77% sensible capacity) |

### Notes

Calculations are based on 7th edition of ACCA Manual J.  
All computed results are estimates as building use and weather may vary.  
Be sure to select a unit that meets both sensible and latent loads.

1305-11



5/6/13

### System #2 Summary Loads

| Component Description                              | Area Quan | Sen. Loss | Lat. Gain | Sen. Gain | Total Gain |
|----------------------------------------------------|-----------|-----------|-----------|-----------|------------|
| 3C Window Double Pane Clear Glass Metal Frame      | 255       | 8,324     | 0         | 11,514    | 11,514     |
| 12H Wall R-19 + 1/2" Gypsum Board(R-0.5)           | 2,221     | 5,999     | 0         | 3,542     | 3,542      |
| 16G Ceiling R-30 Insulation                        | 2,875     | 4,271     | 0         | 4,458     | 4,458      |
| 19D Floor Over Basement/Encl Crawl Hardwood + R-19 | 2,875     | 3,363     | 0         | 0         | 0          |
| Subtotals for structure:                           | 8,226     | 21,957    | 0         | 19,514    | 19,514     |
| Active People:                                     | 7         | 0         | 1,610     | 2,100     | 3,710      |
| Inactive People:                                   | 0         | 0         | 0         | 0         | 0          |
| Appliances:                                        | 0         | 0         | 1,000     | 1,000     | 2,000      |
| Lighting:                                          | 0         | 0         |           | 9,548     |            |
| Ductwork:                                          | 0         | 2,060     | 0         | 3,652     | 3,652      |
| Infiltration: Winter CFM: 388.0, Summer CFM: 172.5 | 255       | 19,209    | 5,630     | 4,365     | 9,995      |
| Ventilation: Winter CFM: 0.0, Summer CFM: 0.0      | 0         | 0         | 0         | 0         | 0          |
| Sensible Gain Total:                               |           |           |           | 40,179    |            |
| Temperature Swing Multiplier:                      |           |           |           | X1.00     |            |
| System Load Totals:                                |           | 43,226    | 8,240     | 40,179    | 48,419     |

### Check Figures

|                           |       |                      |         |
|---------------------------|-------|----------------------|---------|
| Supply CFM:               | 1,826 | CFM per square foot: | 0.635   |
| Square feet of room area: | 2,875 | Square feet per ton: | 661.166 |

### System Loads

|                                          |             |                                             |
|------------------------------------------|-------------|---------------------------------------------|
| Total heating required with outside air: | 43,226 Btuh | 43.226 MBH                                  |
| Total sensible gain:                     | 40,179 Btuh | 83 %                                        |
| Total latent gain:                       | 8,240 Btuh  | 17 %                                        |
| Total cooling required with outside air: | 48,419 Btuh | 4.035 Tons (based on sensible + latent)     |
|                                          |             | 4.348 Tons (based on 77% sensible capacity) |

### Notes

Calculations are based on 7th edition of ACCA Manual J.  
All computed results are estimates as building use and weather may vary.  
Be sure to select a unit that meets both sensible and latent loads.

1305-11



## Room Load Summary Reports

### System #1 Room Load Summary

| No              | Room Name      | Area SF | Htg Sens Btuh | Htg Nom CFM | Run Duct Size | Run Duct Vel | Clg Sens Btuh | Clg Lat Btuh | Clg Nom CFM | Zone Adj Fact | Clg Adj CFM | Air Sys CFM |
|-----------------|----------------|---------|---------------|-------------|---------------|--------------|---------------|--------------|-------------|---------------|-------------|-------------|
| ---Zone 1---    |                |         |               |             |               |              |               |              |             |               |             |             |
| 1               | Laundry Room   | 92      | 1,047         | 14          | 1-4           | 603          | 1,158         | 0            | 53          | 1.00          | 53          | 53          |
| 2               | Garage Entry   | 46      | 2,229         | 29          | 1-4           | 614          | 1,179         | 325          | 54          | 1.00          | 54          | 54          |
| 3               | Bath #1        | 42      | 1,483         | 19          | 1-5           | 518          | 1,244         | 93           | 57          | 1.25          | 71          | 57          |
| 4               | Kitchen        | 311     | 523           | 7           | 1-7           | 562          | 3,306         | 1,430        | 150         | 1.00          | 150         | 150         |
| 5               | Great Room     | 556     | 14,041        | 182         | 2-9           | 566          | 11,002        | 1,966        | 500         | 1.00          | 500         | 500         |
| 6               | Dining Room    | 234     | 5,907         | 77          | 1-9           | 497          | 4,830         | 744          | 220         | 1.00          | 220         | 220         |
| 7               | Living Room    | 541     | 4,478         | 58          | 1-9           | 513          | 4,989         | 1,695        | 227         | 1.00          | 227         | 227         |
| 8               | Bath #2        | 94      | 2,316         | 30          | 1-5           | 548          | 1,645         | 325          | 75          | 1.00          | 75          | 75          |
| 9               | Guest Suite    | 278     | 8,567         | 111         | 1-11          | 586          | 6,306         | 1,315        | 287         | 1.35          | 387         | 287         |
| 10              | Guest Bath     | 66      | 141           | 2           | 1-4           | 449          | 862           | 0            | 39          | 1.00          | 39          | 39          |
| 11              | Hall           | 95      | 186           | 2           | 1-2           | 338          | 162           | 0            | 7           | 1.00          | 7           | 7           |
| 12              | Guest Closet   | 54      | 291           | 4           | 1-4           | 469          | 900           | 0            | 41          | 1.00          | 41          | 41          |
| 13              | Piano Lounge   | 178     | 3,705         | 48          | 1-8           | 557          | 3,290         | 465          | 150         | 1.30          | 194         | 150         |
| 14              | Foyer          | 104     | 3,760         | 49          | 1-6           | 486          | 2,100         | 651          | 95          | 1.00          | 95          | 95          |
| 15              | Study          | 192     | 3,798         | 49          | 1-8           | 512          | 3,333         | 465          | 152         | 1.18          | 179         | 152         |
| 16              | Master Bedroom | 392     | 10,387        | 135         | 2-7           | 547          | 6,438         | 1,485        | 293         | 1.00          | 293         | 293         |
| 17              | Master Bath    | 393     | 5,454         | 71          | 4-5           | 459          | 5,511         | 372          | 251         | 1.00          | 251         | 251         |
| System 1 Totals |                | 3668    | 68,313        | 887         |               |              | 58,255        | 11,331       | 2,648       |               | 2,835       | 2,648       |

\*Main Trunk Size: 20x16 in.

\*Main Trunk velocity constraints were not met due to duct schedule limitations.

Main Trunk Air Velocity = 1274 Feet/Minute

### System #1 Cooling System Summary

|               | Cooling Tons | Sensible/Latent Split | Sensible Btuh | Latent Btuh | Total Btuh |
|---------------|--------------|-----------------------|---------------|-------------|------------|
| Net Required: | 5.799        | 84%/16%               | 58,255        | 11,331      | 69,586     |
| Recommended:  | 6.305        | 77%/23%               | 58,255        | 17,401      | 75,656     |
| Actual:       | 0.000        |                       |               |             | 5          |

## Room Load Summary Reports

### System #2 Room Load Summary

| No                         | Room Name            | Area SF | Htg Sens Btuh | Htg Nom CFM | Run Duct Size | Run Duct Vel | Clg Sens Btuh | Clg Lat Btuh | Clg Nom CFM | Zone Adj Fact | Clg Adj CFM | Air Sys CFM |
|----------------------------|----------------------|---------|---------------|-------------|---------------|--------------|---------------|--------------|-------------|---------------|-------------|-------------|
| ---Zone 1---               |                      |         |               |             |               |              |               |              |             |               |             |             |
| 18                         | Game Room            | 548     | 13,934        | 181         | 3-9           | 470          | 13,713        | 3,809        | 623         | 1.00          | 623         | 623         |
| 19                         | Bath                 | 162     | 683           | 9           | 2-3           | 714          | 1,543         | 0            | 70          | 1.00          | 70          | 70          |
| 20                         | Guest Suite #2       | 240     | 2,531         | 33          | 1-8           | 501          | 3,080         | 561          | 140         | 1.25          | 175         | 140         |
| 21                         | Guest Suite#2 Closet | 88      | 2,494         | 32          | 1-6           | 599          | 2,160         | 353          | 98          | 1.20          | 118         | 98          |
| 22                         | Guest Suite #3       | 289     | 3,841         | 50          | 1-8           | 499          | 3,255         | 760          | 148         | 1.18          | 174         | 148         |
| 23                         | Guest Suite#3 Bath   | 59      | 1,202         | 16          | 1-5           | 570          | 1,428         | 177          | 65          | 1.20          | 78          | 65          |
| 24                         | Lounge               | 685     | 9,175         | 119         | 3-6           | 489          | 6,339         | 1,785        | 288         | 1.00          | 288         | 288         |
| 25                         | Guest Suite #4       | 255     | 4,180         | 54          | 1-8           | 472          | 3,136         | 530          | 143         | 1.16          | 165         | 143         |
| 26                         | Suite #4 Closet      | 49      | 415           | 5           | 1-4           | 523          | 1,005         | 0            | 46          | 1.00          | 46          | 46          |
| 27                         | Suite #4 Bath        | 100     | 2,125         | 28          | 1-5           | 589          | 1,766         | 265          | 80          | 1.00          | 80          | 80          |
| 28                         | Storage Room         | 400     | 2,646         | 34          | 2-5           | 459          | 2,754         | 0            | 125         | 1.00          | 125         | 125         |
| System 2 Totals            |                      | 2875    | 43,226        | 561         |               |              | 40,179        | 8,240        | 1,826       |               | 1,942       | 1,826       |
| Main Trunk Size: 20x16 in. |                      |         |               |             |               |              |               |              |             |               |             |             |

### System #2 Cooling System Summary

|               | Cooling Tons | Sensible/Latent Split | Sensible Btuh | Latent Btuh | Total Btuh |
|---------------|--------------|-----------------------|---------------|-------------|------------|
| Net Required: | 4.035        | 83%/17%               | 40,179        | 8,240       | 48,419     |
| Recommended:  | 4.348        | 77%/23%               | 40,179        | 12,002      | 52,181     |
| Actual:       | 0.000        |                       |               |             | 5          |

130 S-11



### Project Information

|          |                                 |                 |                    |
|----------|---------------------------------|-----------------|--------------------|
| Project: | DUARTE RESIDENCE                | Company:        | DAVID HALL'S INC.  |
| Client:  | ADAM'S CONSTRUCTION AND FRAMING | Representative: | DAVID HALL         |
| Address: |                                 | Address:        | PO BOX 244         |
| City:    |                                 | City:           | LAKE CITY FL 32056 |
| Phone:   |                                 | Phone:          | 386-755-9792       |
| Fax:     |                                 | Fax:            | 386-755-9100       |
|          |                                 | Comment:        |                    |

### Equipment and Labor Data

|              | Cooling System       | Heating System       |
|--------------|----------------------|----------------------|
| Description  | CONDENSER            | AIR HANDLER          |
| Model Number | 4TWB3060             | 4TEC3F60             |
| Model Type   | Air Source Heat Pump | Air Source Heat Pump |
| Capacity     | 5 TONS               | 5 TONS               |
| Efficiency   | 13 SEER              | 8.5 HSPF             |

#### Notes:

- (1) New condensing unit to be re-connected to existing electrical power.
- (2) Furnace will have electronic ignition. Deduct \$100 from furnace cost for standing pilot.

We propose hereby to furnish material and labor-complete in accordance with above specifications, for the sum of: \$0,000.00

### Terms and Conditions

Payment to be made as follows: Upon completion

#### ACCEPTANCE OF PROPOSAL:

The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as outlined above.

Date: \_\_\_\_\_ Signature: \_\_\_\_\_