



Karges-Faulconbridge, Inc.
Engineers

March 21, 2008, Revised July 14, 2008

Mr. Dan Stevens
Director of Regulatory Affairs
CDC Enterprises, Inc.
13355 George Weber Drive, Suite M
Rogers, MN 55374

Ref: Energy Analysis Comparison Report
(AKDUCT™ vs. PVC Duct)

Dear Mr. Stevens,

Attached is a summary of our conclusions with regard to the comparable heat loss thru 20 foot or 10" round AKDUCT™ vs. 20 foot or 10" round P.V.C. duct.

We have to qualify our conclusions with the following:

1. We did not witness the test; therefore, we may not be aware of all the variables.
2. The original test was not designed to determine heat transfer through the duct system. However, the test does give us information regarding the heat loss which occurred during the test.
3. The variation of the quantity of air moving through the two duct systems will have some impact on the results.

| | | | | | |
|---------|------------|-----|---------|-----|-----|
| AK Duct | 340 to 345 | CFM | Average | 343 | CFM |
| PVC | 225 to 230 | CFM | Average | 228 | CFM |

The fact that there was more air moving through the AKDUCT™ suggest higher velocity because of a smaller duct, and the heat loss was about the same as the PVC is a plus for the AKDUCT™.

4. The diameters of the two duct systems are different.

| | | |
|---------|------|----------|
| AK Duct | 9.0" | Diameter |
| PVC | 9.8" | Diameter |

Both increased CFM and decreased diameter (higher velocity) would normally result in greater heat loss thru the AKDUCT™. However, the heat loss was essentially the same for the AKDUCT™; this would lead us to believe that the thermal characteristics are comparable for the AKDUCT™ as the PVC duct, with the R-10 insulation configuration, which is currently the in industrial standard method of insulation.

Please let us know if we can be of additional help.

Sincerely,

Cc: Jon Jungers – CDC Enterprises
Jeff Prickel – CDC Enterprises

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ENERGY ANALYSIS COMPARISON REPORT (AKDUCT vs. PVC Duct)

EXECUTIVE SUMMARY

Karges-Faulconbridge, Inc received the request to do an independent analysis of the data from the Stork/Twin City Testing Corporation Report dated June 28, 2007, titled "Temperature Performance Test of AKDUCT™ Plastic vs. PVC Ducting"

The objective of our analysis was to determine the heat loss at a point during the test through 20 feet of 10" round AKDUCT™ as compared to the heat loss through 20 feet of 10" round PVC ducting (expressed in terms of BTUs/ HR). The data collected from the June 28, 2007 report by Stork/Twin City Testing is the basis for our conclusions.

Formula used for Heat Loss (Sensible):

$BTUH = 1.1 \times cfm \times \text{change in air temperature}$

1.1 is a constant based on specific heat and density of air at 114 degrees F

$0.24 \text{ Bt/lb} \times F \text{ times density at } 114 \text{ F } 0.077 \text{ lb/cubic ft times } 60 \text{ minutes in } 1 \text{ hour} = 1.1$

AKDUCT: $1.1 \times 343 \text{ cfm} \times 5.8 \text{ degrees F} = 2188 \text{ BTUH}$

PVC Duct: $1.1 \times 228 \text{ cfm} \times 8.5 \text{ degrees F} = 2132 \text{ BTUH}$

The Thermal Distribution Efficiency (TDE)

AKDUCT: $1.1 \times 343 \text{ cfm} \times 114 \text{ degrees F input} = 43,012$

BTUH AKDUCT; $1.1 \times 343 \text{ cfm} \times 108 \text{ degrees} = 40,748 \text{ BTUH}$

AKDUCT TDE = 95 %

PVC Duct: $1.1 \times 228 \text{ cfm} \times 114 \text{ degrees F} = 28,591 \text{ BTUH input}$

PVC Duct: $1.1 \times 228 \text{ cfm} \times 106 \text{ degrees F} = 26,585 \text{ BTUH output}$

PVC TDE= 93 %

The rate of heat loss was about the same for both of the test ducts. Although the Stork/Twin City Testing was not designed to determine heat transfer comparison, we do conclude that the AK Duct™ has essentially the same thermal characteristics as the PVC installed with exterior R-10 thermal insulation configuration. The Thermal Distribution Efficiency of the AKDUCT™ is essentially the same PVC Duct System

BASIS FOR OUR CONCLUSIONS (Both Duct Runs 20 feet in length)

1. PVC Duct: 10" outside diameter, 9.8" inside diameter, 228 average cfm
2. AKDUCT™: 10" outside diameter, 9.0" inside diameter, 343 average cfm
3. Elapsed time for temperature measurements 1:30 hours
4. Inlet temperature for both duct runs: 114.1 degrees F.
5. Outlet temperature for AKDUCT™: 108.3 degrees F.
6. Outlet temperature for PVC Duct: 105.6 degrees F.
7. Temperature loss for AKDUCT™: 5.8 degrees F
8. Temperature loss for PVC Duct: 8.5 degrees F.

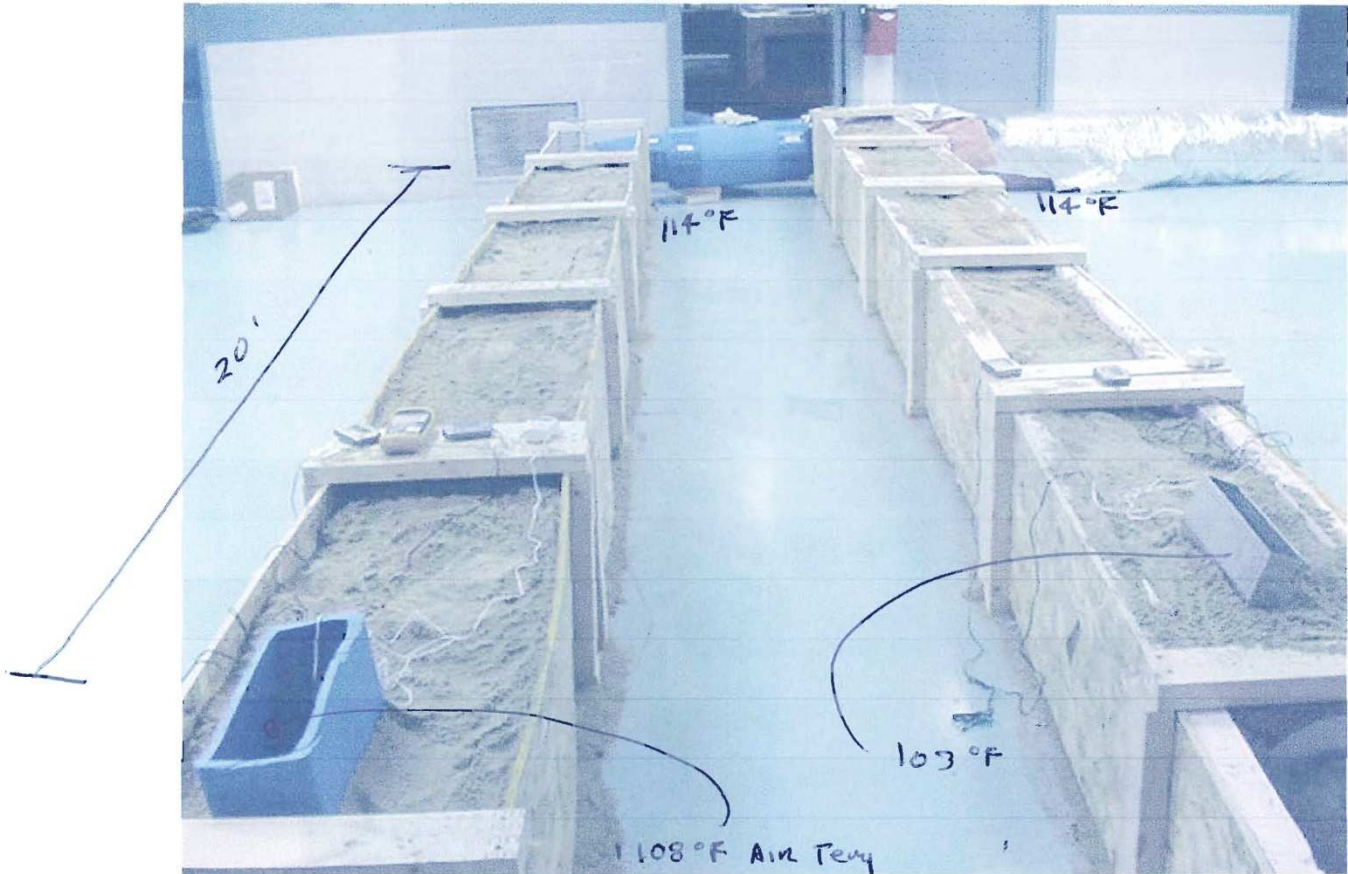
Prepared by John A. Clark, PE

July 14, 2008

Photographs of Test Set-up

AKDUCT System

PVC / R10 System



AK DUCT
8.5" DIA.

PVC DUCT
9.8" DIA

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Stork Twin City Testing is an operating unit of Stork Materials Technology B.V., Amsterdam, The Netherlands, which is a member of the Stork group

PROJECT NUMBER: 30160 07-86256

PAGE: 6 of 12

DATE: June 28, 2007

TEST DATA (cont')

HEATING TEST

| Elapse Time, min. | AKDUCT | | PVC/R10 | | |
|----------------------|-----------------------|------------------------|-----------------------|------------------------|--------------------|
| | Inlet air temp, °F | Outlet air temp, °F | Inlet air temp, °F | Outlet air temp, °F | |
| 0 | 59.4 | 59.3 | 59.5 | 57.7 | room stat set 75°F |
| :10 Hours | 97.9 | 93.0 | 97.0 | 84.9 | |
| :20 | 107.6 | 102.0 | 107.2 | 94.8 | |
| :25 | 110.1 | 102.7 | 109.9 | 98.4 | |
| :30 | 111.0 | 105.6 | 110.8 | 100.2 | |
| :35 | 111.7 | 105.8 | 111.6 | 102.0 | |
| :45 | 112.5 | 106.3 | 112.3 | 102.2 | |
| :50 | 112.8 | 107.0 | 112.8 | 102.0 | |
| :55 | 113.4 | 108.1 | 113.2 | 102.5 | |
| 1:00 | 114.4 | 108.6 | 114.3 | 103.1 | |
| 1:05 | 107.6 | 103.8 | 107.1 | 100.2 | Fan Off 1:06 |
| 1:10 | 91.4 | 81.1 | 86.5 | 77.3 | |
| 1:15 | 104.2 | 96.6 | 102.9 | 94.8 | Fan On 1:13 |
| 1:17 | 111.2 | 102.9 | 110.8 | 102.0 | |
| 1:20 | 113.4 | 106.5 | 113.2 | 102.9 | |
| 1:25 | 113.5 | 107.6 | 113.5 | 105.6 | |
| 1:30 | 114.1 | 108.3 | 114.1 | 105.6 | |
| 1:32 | 99.5 | 98.4 | 100.4 | 91.5 | Fan Off 1:31 |
| 1:35 | 94.3 | 84.0 | 91.0 | 84.0 | |
| 1:43 | 109.4 | 102.2 | 109.2 | 100.2 | Fan On 1:40 |
| 1:47 | 112.1 | 105.6 | 112.1 | 102.3 | |
| 1:50 | 103.4 | 107.4 | 113.4 | 102.9 | |
| 1:54 | 99.3 | 98.4 | 100.6 | 91.9 | Fan Off 1:53 |
| 2:00 | 90.1 | 79.5 | 89.1 | 79.5 | |

Calculation based on this point in time

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