HW → 2001.04.12 Heat exchanger mod file

New York State Department of Environmental Conservation
Division of Environmental Permits, Region 4
1150 North Westcott Road, Schenectady, New York 12306-2014
Phone: (518) 357-2069 • **FAX:** (518) 357-2460
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

April 12, 2001

Mr. Timothy Lachell
Norlite Corporation
628 South Saratoga Street
P. O. Box 694
Cohoes, New York, 12047

RE: DEC # 4-0103-16/16
373 HW/APC
Norlite Corp, Lt. Wt. Aggregate/HW Fuel
Modification of Heat Exchanger on Kiln #2.
Cohoes(C), Albany County

Dear Mr. Lachell,

The Department hereby approves your January 22, 2001 request to modify the heat exchanger on Kiln #2 in a manner similar to the modification for Kiln #1 and as described in the "Summary of Heat Exchanger Modification for control of flue gas Dioxin/Furan concentration" (including diagrams) dated April, 2000. Completion of the installation and commencement of operation and notification of such to the Department needs to occur no later than 5/1/01.

If you have any question, please contact Parag B. Amin at 457-7264.

Sincerely Yours,

William J. Clarke

William J. Clarke
Regional Permit Administrator
Region 4

CC: C. Van Guilder/H. Brezner, Region 4
R. Leone, Region 4
S. Chetty/P. Amin
R. Ostrov
W. Morris, Norlite

Norlite Corporation

628 SO. SARATOGA ST.
P.O. BOX 694
COHOES, N.Y. 12047
TEL: (518) 235-0401
FAX: (518) 235-0233

January 22, 2001

Mr. William Clarke
Regional Permit Administrator
New York Department of Environmental Conservation
Region 4
1150 North Wescott Road
Schenectady, NY 12306-2014

Dear Mr. Clarke:

This is in response to your Notice of Intent to Modify Permit dated November 16, 2000 and all subsequent correspondence. I have enclosed the previously submitted package for the Kiln 1 Heat Exchanger Modification that was completed prior to the May 2000 Risk Burn. This package was sent to Mr. Rick Leone on April 27, 2000. The modification to Kiln 2's Heat Exchanger is the same as for Kiln 1. We have ordered the equipment and structural steel for Kiln 2's modification. Equipment deliveries are lengthy from the manufacturers with the longest lead item being the variable speed drives at 8 to 10 weeks. This puts delivery by early to mid-March 2001. We would need 2 weeks after receipt of equipment to complete the installation.

If you need more information from me, please feel free to contact me.

Sincerely,

Timothy F. Lachell

Timothy F. Lachell
Plant Manager

cc: Bill Morris

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Norlite Corporation

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April 27, 2000

Mr. Ricky M. Leone
Acting Regional Air Pollution Control Engineer
Region 4
1150 North Westcott Road
Schenectady, NY 12306-2014

Re: Heat Exchanger Modification.

Dear Mr. Leone:

This letter is to confirm our conversation on April 26, 2000 regarding Norlite's heat exchanger. It was at this time that Norlite along with the Department agreed that this was not a true permit modification. However, Norlite is submitting this document for information purposes only. Norlite is proceeding with the modification to our heat exchanger as explained in the attached summary. This work will be completed during the first week of May 2000 in preparation of our upcoming Supplemental Risk Burn which is scheduled for the third week of May 2000. It is Norlite's belief that this modification will aid in the control of dioxin/furan formation within this portion of the air pollution control system.

If you have any questions or additional information is required, please feel free to contact me at (518) 235-0401 Ext. 4049.

Sincerely,

NORLITE CORPORATION

Stan C. Milos
Environmental Manager

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Summary of Heat Exchanger Modification for control of flue gas Dioxin/Furan concentration

Norlite has two parallel process systems to make lightweight aggregate (LWA) from shale and to burn liquid wastes. LWA is produced by heating shale nodules to the point that the surface melts and seals the gasses in the nodule until the internal gas pressure expands the shale reducing its bulk density. Each process contains a large rotary kiln, approximately 10' ID x 180' long. Liquid waste is the primary fuel that is air atomized into the kiln. A variable drive blower provides primary air for the burner. Secondary air is pulled through the system by an ID fan. Waste liquids are fed at approximately 35 to 40 psi. Atomization air pressure is 65 to 75 psi. Natural gas is used as a back up fuel, but generally natural gas is used to supply a burner pilot only.

Crushed and sized shale is fed countercurrent to the flue gases in the kiln. The temperature profile of the kiln is set manually based on the physical characteristics of the LWA. Product LWA exits the kiln under the faceplate of the kiln and is cooled with an ambient air blowers, so that the product can be conveyed and classified. The flue gas passes out of the kiln and is cooled and subsequently passes through a bag house to remove fines and is discharged via a stack. The flame temperature of the liquid waste burner is approximately 2,800°F and the kiln flue gas outlet temperature is approximately 1,000°F. Flue gas from the kiln enters a multiclone system to remove large particles. Flue gas is then cooled in a flue gas-ambient air heat exchanger with the flue gas on the tubeside and an exit temperature in the range of 500 – 600°F. Ambient air is pushed through the shell side of the heat exchanger using a FD fan. The heat exchanger is baffled on the ambient air side. Ambient air is also allowed to enter the flue gas duct after the heat exchanger to further cool the flue gases. The temperature is controlled at approximately 425°F using a damper. At this point lime is mixed with the cooled flue gas, which passes into a three-cell baghouse. Norlite tries to keep the temperature of the flue gas below 450°F to maximize the life of the fiberglass bags. Flue gas flows from the bag house via a 400 HP ID fan. The flue gas from the ID fan passes through a venturi scrubber and a two-stage mist eliminator system (Ducon scrubber) and out an elevated stack. Soda ash solution is used to remove acid gases in the venturi scrubber, with scrubber blowdown going to wastewater treatment.

Norlite has reviewed options to reduce flue gas dioxin/furan concentrations. The option that has been selected for implementation is to further cool the flue gas from the multi-clone before it enters the baghouse by maximizing the heat exchange capability of the existing flue gas-ambient air heat exchanger. The basic layout of this heat exchanger is shown in Figure 1 and 2.

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One of the ways in which dioxin formation in combustion systems can be minimized is to maintain flue gas temperature above 750-850 °F and then quench rapidly to less than 400-450°F. Although flue gas from the kiln loses temperature as it passes through ductwork and the multi-clone, it is still typically at 950 - 970°F when it reaches the air/flue gas heat exchanger. Flue gas flows through the exchanger tubes, with cooling air on the exchanger's shell side. Currently flue gas exits the heat exchanger at a temperature of 500 - 570°F. The outlet temperature varies with changes in kiln outlet temperature, flue gas flowrate, and ambient air temperature. Lowering the exchanger outlet temperature to a maximum of 400°F would be expected to minimize the formation of dioxins in the exchanger and in downstream equipment.

Heat transfer in the existing flue gas-to-air exchanger can be increased without increased fan pressure drop by using two fans, one to supply air to the bottom exchanger shell (the existing fan) and a second fan to supply ambient air directly to the top exchanger shell. The decrease in pressure drop resulting from this revised configuration would increase flow from the existing fan slightly, and the lower temperature of the air entering the shell of the upper exchanger would increase heat transfer based on the improved temperature differential. Calculation indicates that this configuration would reduce the flue gas tube side outlet temperature by approximately 45°F and minimize the amount of direct ambient air injection.

The revised flow configuration for the exchanger and the expected temperature profile is shown in Figure 3 and 4.

Figure 1

Existing Heat Exchanger Layout

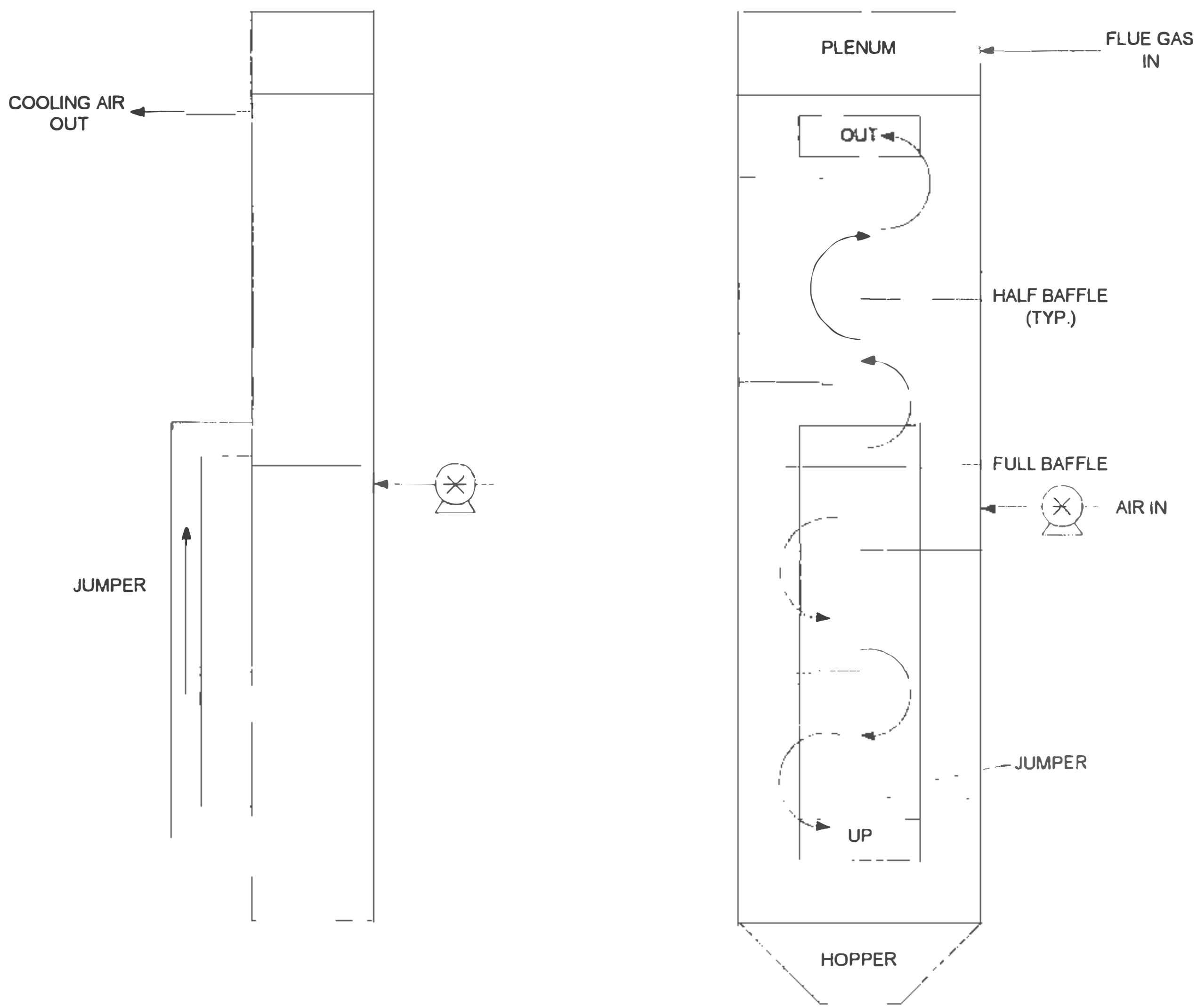
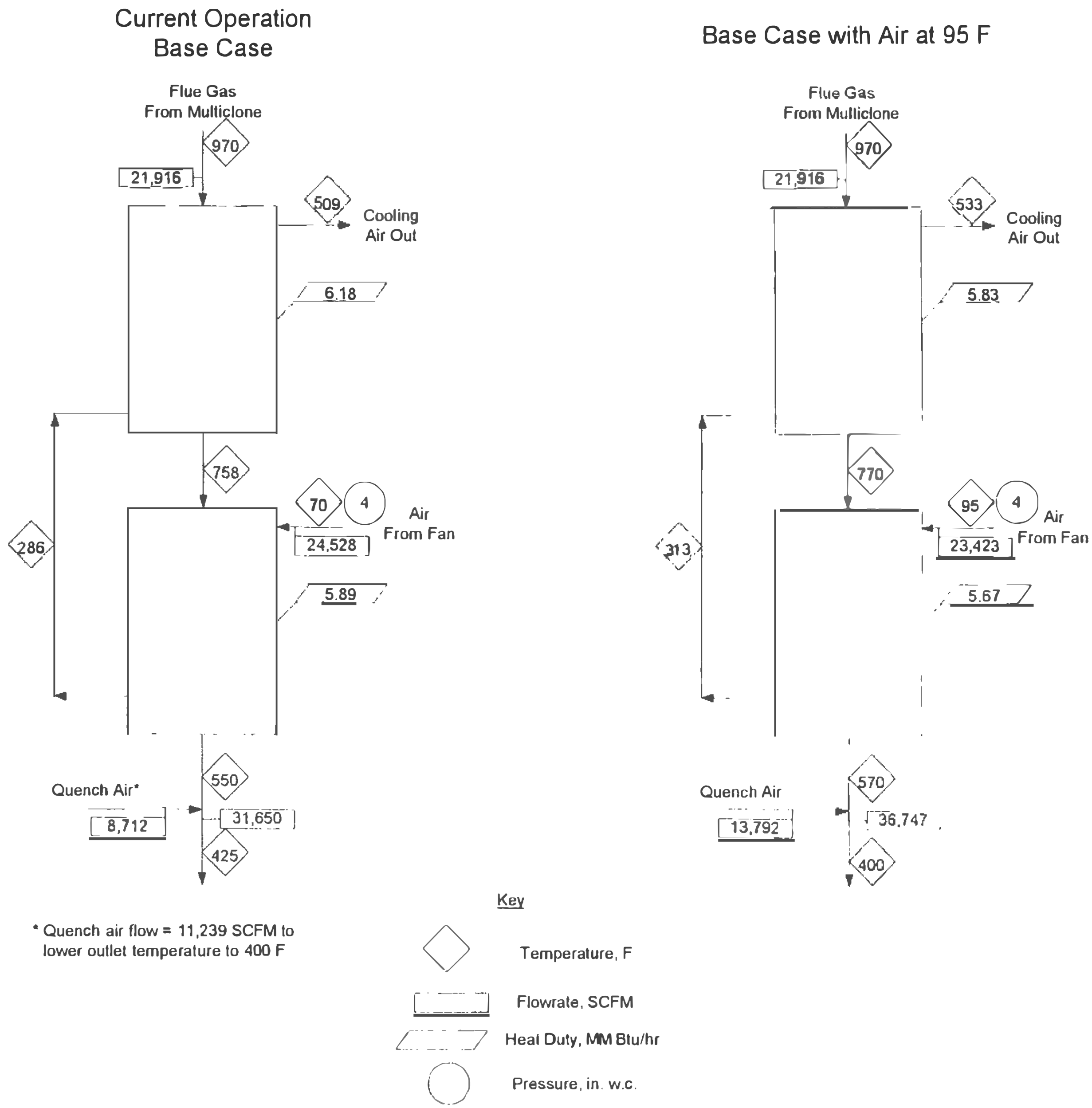


Figure 2
Current Operation



* Quench air flow = 11,239 SCFM to lower outlet temperature to 400 F

Figure 3

Revised Heat Exchanger Layout

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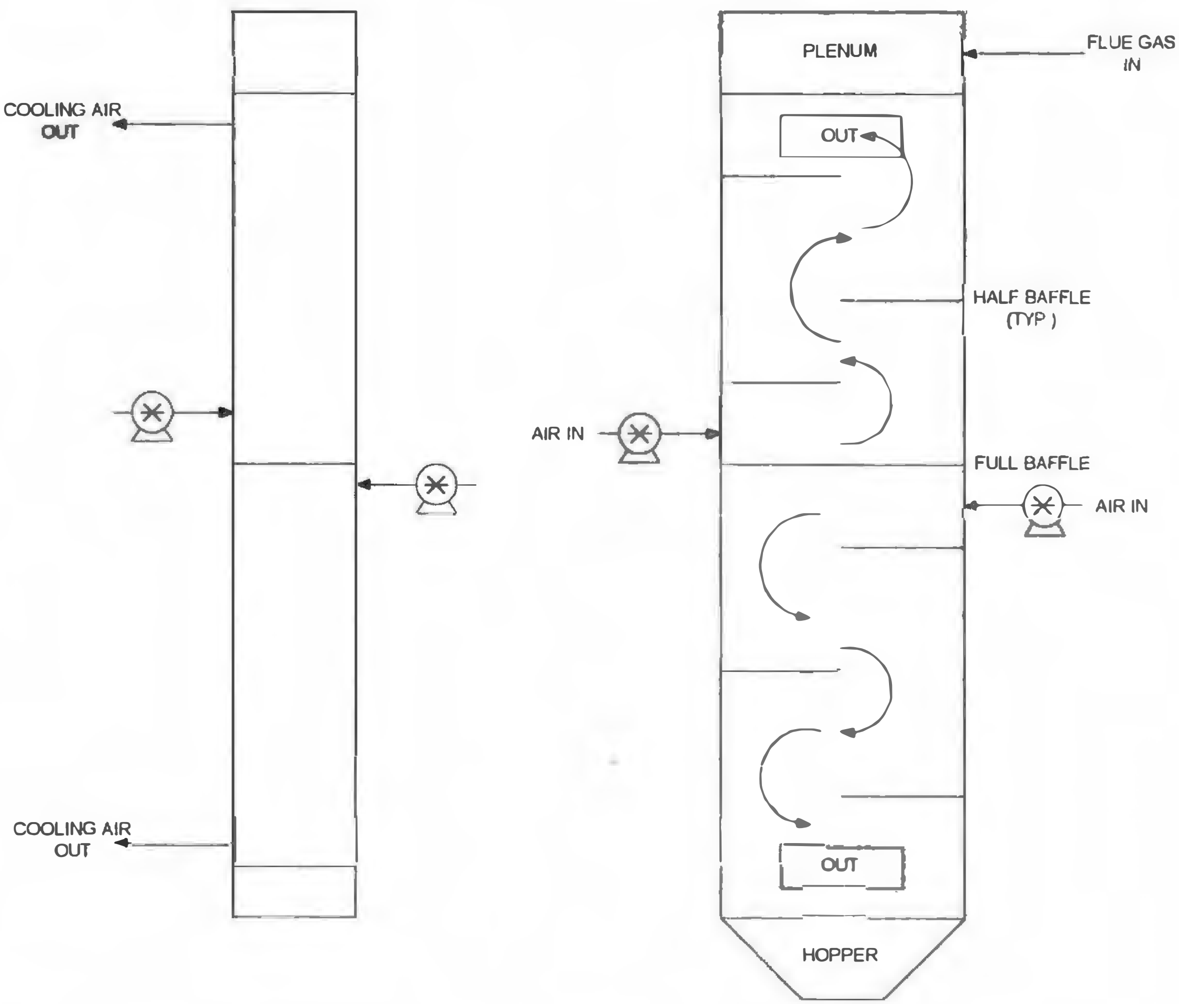
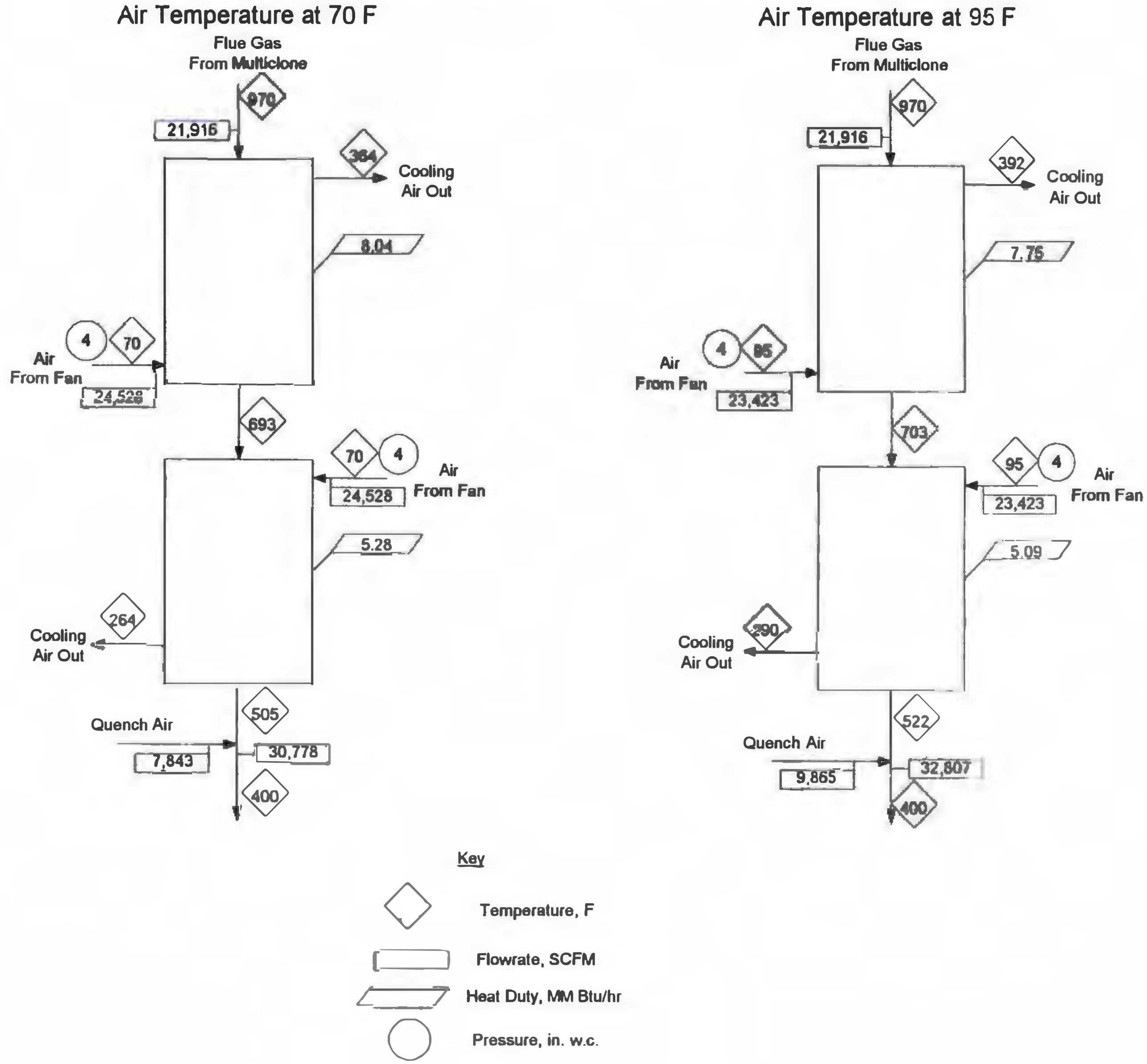


Figure 4

Heat Balance for Two Fans



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