



# ASHRAE Research CANADA

A NON-PROFIT CORPORATION FOR SCIENTIFIC RESEARCH IN CANADA  
97 Salisbury Drive, Saskatoon, Sask., Canada S7H 3J3

K. William (Bill) Dean, P.Eng.  
President

Phone: (306) 975-4198  
Fax: (306) 975-6503

CHORLEY & BISSET LTD.	
LONDON	ONTARIO
FILE NO.	
REC'D AUG 1, 2 1992	
1 ORG	

## MEMORANDUM

**Date:** August 5, 1992

**To:** Class A Members  
Class B Members (Chapter Delegates)  
Chapter Alternates

**From:** K. William (Bill) Dean, P. Eng.  
ARC President

**Re:** 1992 ARC Annual General Meeting

Enclosed is a meeting notice and proxy for the ASHRAE Research Canada Annual General Meeting to be held in Halifax August 29, 1992.

Class A and B members of the corporation may send in proxies if they are unable to attend. Only Region II delegates will have their travel paid by ASHRAE to this meeting.

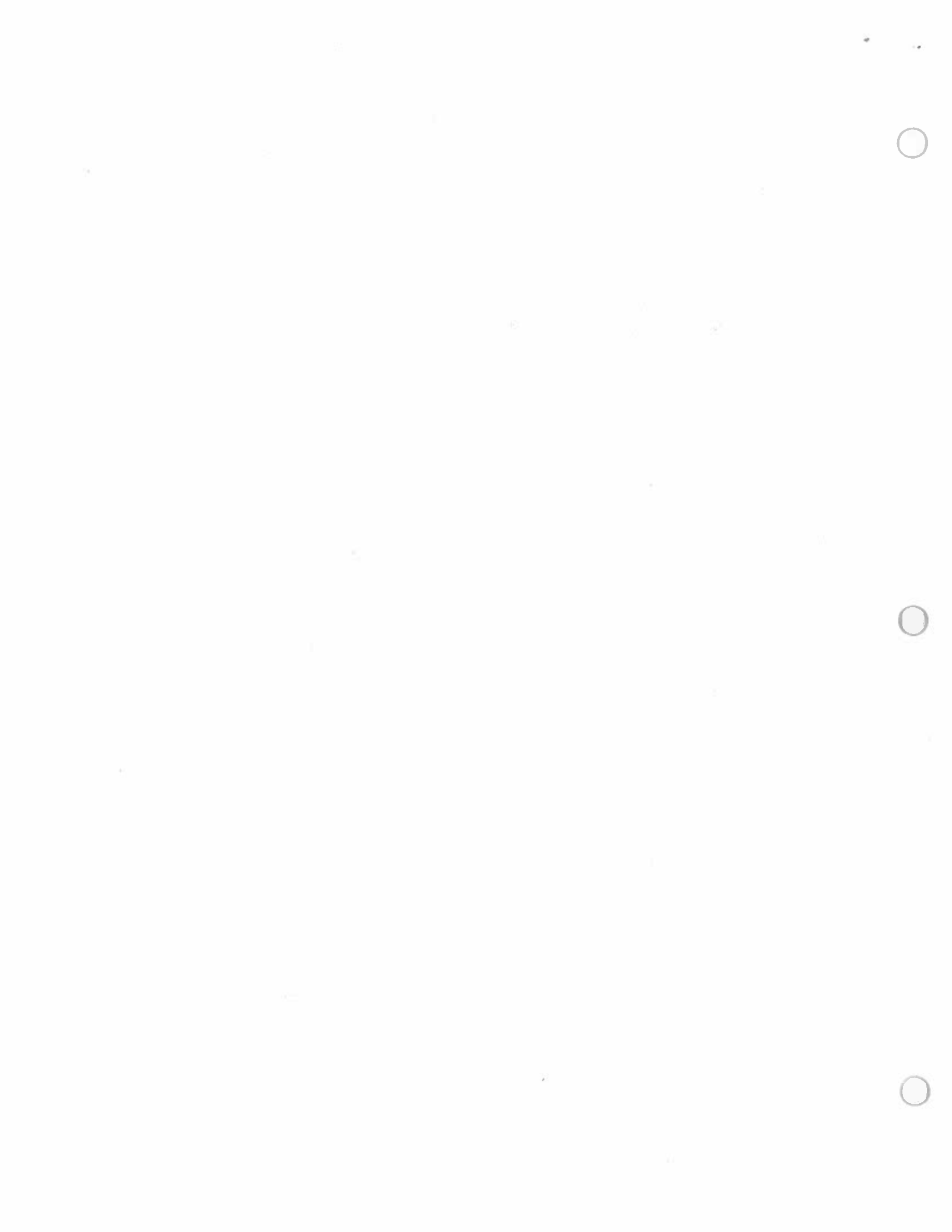
Please return the proxy as soon as possible. Chapter alternates are being copied in case the chapter delegate is unavailable between now and August 24.

### CLASS "A" MEMBERS

The following individuals have been approved by the directors of the corporation and submitted to the Society President, Mr. Richard Charles for endorsement.

K. William Dean	President	Donald Holte	Director
Norm Johnson	Vice-President	Dan Castellan	Director
Dalton McIntyre	Secretary Treasurer		





**SIGN AND RETURN TODAY, PLEASE !!!**

**ASHRAE RESEARCH CANADA**

**PROXY**

I, the undersigned, Class "A" or Class "B" member of ASHRAE Research Canada, do hereby appoint K. William Dean, who is a member of the Corporation, or \_\_\_\_\_ who is a member of the Corporation, as my proxy to vote on my behalf at the Annual General Meeting of the Corporation to be held in Halifax, Nova Scotia, at 7:00 a.m. local time on August 29, 1992, all in accordance with Section 33 of the by-laws.

\_\_\_\_\_  
Member Name (please print)

\_\_\_\_\_  
Member Signature

\_\_\_\_\_  
Dated

\_\_\_\_\_  
Chapter (please print)

**INSTRUCTIONS:**

1. Sign and date proxy.

2. Mail or FAX to:

K. William Dean  
ASHRAE Research Canada  
97 Salisbury Drive  
Saskatoon, Saskatchewan  
S7H 3J3

FAX: 306 975-6503

3. Class "A" members of the corporation are the President, Vice-President, Secretary - Treasurer, and the two Directors of ASHRAE Research Canada.

4. Class "B" members are the Canadian ASHRAE Chapter Delegates to the CRC's Region II and XI (one from each Chapter = 18).

**NOTE:** Please be sure that this proxy is returned, preferably by fax no later than August 24, 1992, to ensure that we have a quorum at our meeting.



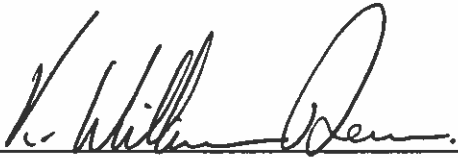
**ASHRAE RESEARCH CANADA**  
**NOTICE OF MEETING**

TO: ALL MEMBERS OF THE CORPORATION

Notice is hereby given that the twenty-second Annual General Meeting of the Corporation will be held on Saturday August 29th at 7:00 a.m. local time at the Halifax Sheraton in Halifax, Nova Scotia, at which meeting will be presented for consideration, and if deemed advisable, the ratification and confirmation of the following:

- 1.) The annual report of the ARC President.
- 2.) Minutes of the 1991 Annual General Meeting, Windsor, Ontario.
- 3.) Preliminary financial statements for the period ending June 30, 1992.
- 4.) Auditor's report for the period ending June 30, 1991.
- 5.) Review situation for individuals claiming their research investments as a tax deduction - re: Section 37.1 of the Income Tax Act.
- 6.) Review the list of Canadian institutions available to do research.
- 7.) Status of current Canadian research projects.
- 8.) Election of Officers for 1992/93.
- 9.) Appointment of Auditors.
- 10.) Any other such business as may properly come before the meeting.
- 11.) Adjournment.

Proxies from Region XI Chapters must be delivered to the president of the Corporation no later than 4:00 p.m. C.S.T. August 24, 1992.

  
\_\_\_\_\_  
K. William Dean, P.Eng., President  
Saskatoon, Saskatchewan  
July 22, 1992





# ASHRAE Research CANADA

A NON-PROFIT CORPORATION FOR SCIENTIFIC RESEARCH IN CANADA

Danny A. Castellan, P.Eng.  
Vice Chairman, Region II  
Research Promotion

MR. DARRLY BOYCE  
RESEARCH PROMOTION CHAIRMAN  
UNIVERSITY OF WESTERN ONTARIO  
ROOM 102, SERVICES BUILDING  
LONDON, ONTARIO  
N6A 5B9

COPILEY & BISSET LTD. ONTARIO

SEP 11 0 1992

1 or 9


Reply to:

UNIVERSITY OF WINDSOR  
Physical Plant Department  
401 Sunset Avenue  
Windsor, Ontario, Canada  
N9B 3P4  
☎ 519-253-4232 Ext. 2164  
Fax 519-973-7050

September 8, 1992

Re: ASHRAE - RESEARCH PROMOTION

I like to thank you for attending the Research Promotion Workshop at the CRC in Halifax. The information presented to you should help you put on a successful campaign. One area that will make it happen is to start early. Another area is communication, that's why we asked you to pick 3 to 5 past contributors that did not invest in Research last year and solicit an investment. These names are listed in your binder under historical contributors that did not give in 1991-92 (green sheets). Please report back to myself, Tom Anderson or Tom Gilbertson on how you accomplished in the next few weeks. Again start your campaign EARLY.

I would also like to receive from you the dates and time, if the chapter is planning a Research Promotion Night as part of the chapter program. I would like to attend if possible.

I have enclosed two forms to be filled out and returned, the 1992-93 Chapter Research Promotion Action Plan and the Research Promotion Kickoff Workshop Evaluation.

One other area of consideration is that the Region is considering having the Research Workshop at a different time (Sept./Oct.) rather than at the CRC. There will be further discussions on this, but in the mean time I would like to receive any comments or suggestions.

I am looking forward in working with you, if you have any question or concerns please contact me at your convenience.

Good Luck with your campaign.

Yours truly,

Danny A. Castellan, P. Eng.  
Regional Vice Chairman

cc: MR. OWEN R. GLENDON  
LONDON CHAPTER PRESIDENT  
DALTON MCINTYRE, DRC

ASHRAE\CHAP-RP1.LTR



In Association With  
AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS, INC.  
1791 Tullie Circle N.E., Atlanta, GA 30329-2305 Tel: (404) 636-8400 Fax: (404) 321-5478





**Research Promotion  
Kickoff Workshop Evaluation**

Region \_\_\_\_\_

Date \_\_\_\_\_

	Circle one					
	Poor	←-----→			Excelent	
Material	1	2	3	4	5	_____
Speakers	1	2	3	4	5	_____
Room Setting	1	2	3	4	5	_____
Handouts	1	2	3	4	5	_____

What part of the workshop was most valuable? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What can be added? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What can be changed? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Additional Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**1992-93 Chapter Research Promotion Action Plan**

Complete sections I & II at Kickoff Workshop. Send copy to RPRVC and Headquarters.

Date: \_\_\_\_\_ Chapter Goal \_\_\_\_\_  
 Chapter: \_\_\_\_\_ Number Contributors \_\_\_\_\_  
 Chairman: \_\_\_\_\_ Total \$ \_\_\_\_\_

**I. Goals**

- 1. Renewed/Upgraded Contributions:      Number \_\_\_\_\_      Total \$ \_\_\_\_\_
- 2. New Contributions:                      Number \_\_\_\_\_      Total \$ \_\_\_\_\_
- 3. Solicitations planned:
 

(1 vol:20 calls)	Direct Mail	Yes _____	Number Prospects _____
(1 vol:6 calls)	Member Phonathon	Yes _____	Number Prospects _____
(selected individuals)	Personal Contact	Yes _____	Number Prospects _____
	Major Investor Assig.	Yes _____	Number Prospects _____
	Other (Please specify)		_____

4. Chapter Event? (Please specify type and time table)

\_\_\_\_\_

5. Number of Volunteers Needed for:      Number      Activity Chairman

Phonathon	_____	_____
Personal Contact	_____	_____
Chapter Event	_____	_____

6. Chapter Research Night? (One to recognize contributors, present case for research and begin campaign; a second to present a program of technical interest on research--specify type(s) and date(s):

\_\_\_\_\_

7. How will you Recognize Volunteers and Contributors?

\_\_\_\_\_

8. Other

**II. Tasks to Accomplish (page 43 RP Activity Guide)**

Tasks	Who is Responsible - Estimated Hours
August	
September	
October	

**Continued - Tasks to Accomplish**

**Tasks**  
**November**

**Who is Responsible - Estimated Hours**

**December**

**January**

**February**

**March**

**April**

**May**

**June**      **Campaign Ends - Last date for Chapter & Honor Roll credit; June 30**

**July**

**August**

**Complete the Following Sections During & After the Campaign**

**III. Problems Encountered**

**IV. Suggestions for Next Year**

**V. Persons Contacted for Major Investment (Volunteers should be asked to make multiple year commitments. Add pages as required)**

<b>Name</b>	<b>Company</b>	<b>Address</b>	<b>Phone</b>	<b>Assigned Volunteer</b>
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				

VI. **Committee Members & Volunteers** (List everyone who helps. Add to this list after every meeting.)

<b>Name</b>	<b>Company</b>	<b>Address</b>	<b>Phone</b>	<b>How</b>
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

VII. **Expenses** (Keep track of postage, telephone, stationary, etc.)



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FILE NO.	
SEP 23 1992	
1 ORG	

**DISTRIBUTION:** 1991-92 Research Promotion Chairman  
1992-93 Research Promotion Chairman  
Chapter President

**FROM:** Catherine Bolen, Research Promotion Secretary

**DATE:** September 17, 1992

**SUBJECT:** Contributor Recognitions for 1991-92

**(Please respond by September 23rd)**

Attached is a list of certificates and plaques to be presented to contributors at one of your chapter's Research nights. Please review and fax or phone any needed name corrections or additions by September 23rd (Phone: 404-636 8400 ext. 513 Fax: 404- 321-5478). I will assume that this list is correct if we do not hear from you.

If you plan to recognize contributors in October or early November, please let me know the specific date. We will prepare certificates and plaques in time for your meeting.

Recognition items will be shipped to last year's Research Promotion Chairman. If we need to ship to someone other than last year's RP Chairman, please let me know so that I may provide the vendor with the correct label.

**CERTIFICATES/PLAQUES/DATE BARS**

II/116 London Canada  
1991-92 date bars  
Chorley & Bisset Ltd.  
Union Gas Ltd.  
Certificates C-0025  
Drennan Refrigeration Inc.  
Glover Hill Inc.

Thank you for your help.







ASHRAE RESEARCH PROMOTION

MAJOR INVESTOR FOLLOW-UP

REGION 02      CHAPTER 116      # : 1917556

Name/Address of Investor : CHORLEY & BISSET LIMITED  
521 COLBORNE STREET  
LONDON, ON N6B 2T6  
CANADA

has made major research investments in recent years as shown below:

1991-92	500.00	1988-89	450.00
1990-91	500.00	1987-88	350.00
1989-90	450.00		

Early planning of Major Investor solicitation is important for success. As of 10/26/92, ASHRAE headquarters has not received an investment for the current year. Please indicate the status of your solicitation effort and return this form as indicated below.

\_\_\_\_\_ An investment of \$\_\_\_\_\_ was obtained on (date)\_\_\_\_\_ and (was, will be) sent to headquarters on (date)\_\_\_\_\_.

\_\_\_\_\_ The investor has not yet been contacted but a contact is scheduled for (date)\_\_\_\_\_ by (solicitor's name)\_\_\_\_\_.

\_\_\_\_\_ A contact was made on (date)\_\_\_\_\_ by (solicitor)\_\_\_\_\_ and no investment can be obtained.

\_\_\_\_\_ Other (be specific)\_\_\_\_\_

CHAPTER RP CHAIRMAN OR COMMITTEEMAN      DATE

RETURN TO: REGION 02      RESEARCH PROMOTION VICE CHAIRMAN:

DANNY A CASTELLAN  
UNIVERSITY OF WINDSOR  
401 SUNSET AVENUE  
WINDSOR, ON N9B 3P4  
CANADA

SEND COPY TO: THOMAS ANDERSON  
MANAGER OF RESEARCH PROMOTION  
ASHRAE  
1791 TULLIE CIRCLE, NE  
ATLANTA, GA. 30329



ASHRAE RESEARCH PROMOTION

MAJOR INVESTOR FOLLOW-UP

REGION 02      CHAPTER 116      # : 5050308

Name/Address of Investor : LONDON CANADA CHAPTER ASHRAE  
C/O OWEN GLENDON  
521 COLBORNE STREET  
LONDON, ON N6B 2T6  
CANADA

has made major research investments in recent years as shown below:

1991-92	1,000.00	1988-89	0.00
1990-91	1,000.00	1987-88	0.00
1989-90	0.00		

Early planning of Major Investor solicitation is important for success. As of 10/26/92, ASHRAE headquarters has not received an investment for the current year. Please indicate the status of your solicitation effort and return this form as indicated below.

\_\_\_\_\_ An investment of \$\_\_\_\_\_ was obtained on (date)\_\_\_\_\_ and (was, will be) sent to headquarters on (date)\_\_\_\_\_.

\_\_\_\_\_ The investor has not yet been contacted but a contact is scheduled for (date)\_\_\_\_\_ by (solicitor's name)\_\_\_\_\_.

\_\_\_\_\_ A contact was made on (date)\_\_\_\_\_ by (solicitor)\_\_\_\_\_ and no investment can be obtained.

\_\_\_\_\_ Other (be specific)\_\_\_\_\_

CHAPTER RP CHAIRMAN OR COMMITTEEMAN      DATE

RETURN TO: REGION 02      RESEARCH PROMOTION VICE CHAIRMAN:

DANNY A CASTELLAN  
UNIVERSITY OF WINDSOR  
401 SUNSET AVENUE  
WINDSOR, ON N9B 3P4  
CANADA

SEND COPY TO: THOMAS ANDERSON  
MANAGER OF RESEARCH PROMOTION  
ASHRAE  
1791 TULLIE CIRCLE, NE  
ATLANTA, GA. 30329



ASHRAE RESEARCH PROMOTION

MAJOR INVESTOR FOLLOW-UP

REGION 02      CHAPTER 116      # : 5048033

Name/Address of Investor : UNION GAS LIMITED-CHATAM ONTARIO  
50 KEIL DRIVE NORTH  
P O BOX 2001  
CHATAM ONTARIO, NS N7M 5M1  
CANADA

has made major research investments in recent years as shown below:

1991-92	2,000.00	1988-89	0.00
1990-91	1,000.00	1987-88	0.00
1989-90	0.00		

Early planning of Major Investor solicitation is important for success. As of 10/26/92, ASHRAE headquarters has not received an investment for the current year. Please indicate the status of your solicitation effort and return this form as indicated below.

\_\_\_\_\_ An investment of \$ \_\_\_\_\_ was obtained on (date) \_\_\_\_\_  
and (was, will be) sent to headquarters on (date) \_\_\_\_\_.

\_\_\_\_\_ The investor has not yet been contacted but a contact is scheduled  
for (date) \_\_\_\_\_ by (solicitor's name) \_\_\_\_\_.

\_\_\_\_\_ A contact was made on (date) \_\_\_\_\_ by (solicitor) \_\_\_\_\_  
\_\_\_\_\_ and no investment can be obtained.

\_\_\_\_\_ Other (be specific) \_\_\_\_\_  
\_\_\_\_\_

CHAPTER RP CHAIRMAN OR COMMITTEEMAN      DATE

RETURN TO: REGION 02      RESEARCH PROMOTION VICE CHAIRMAN:

DANNY A CASTELLAN  
UNIVERSITY OF WINDSOR  
401 SUNSET AVENUE  
WINDSOR, ON N9B 3P4  
CANADA

SEND COPY TO: THOMAS ANDERSON  
MANAGER OF RESEARCH PROMOTION  
ASHRAE  
1791 TULLIE CIRCLE, NE  
ATLANTA, GA. 30329





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Thomas Anderson, CFRE  
Manager of Research Promotion

TO: Research Promotion Chapter Chairmen  
FROM: Thomas Anderson *TA.*  
DATE: November 2, 1992  
SUBJECT: October Research Contributions Report

SEARCHED		INDEXED	
SERIALIZED		FILED	
FBI - LONDON			
FILE NO.			
REC'D NOV 10 1992			
<i>1026</i>			

Research Promotion goals totaling \$1,616,741 have been established for 1992-93. When achieved, this will become a new record for ASHRAE and most chapters. Year-to-date research contributions are about equal to last October's total with \$148,754 received in Atlanta (9.2% of chapter goals).

Your work in finding investors and developing closer involvement of our industry friends has never been more important. Our industry's technology is rapidly changing and ASHRAE is committed to help manage this change. ASHRAE Research validates technical responses to improving IAQ, energy conservation and other HVAC&R-related issues.

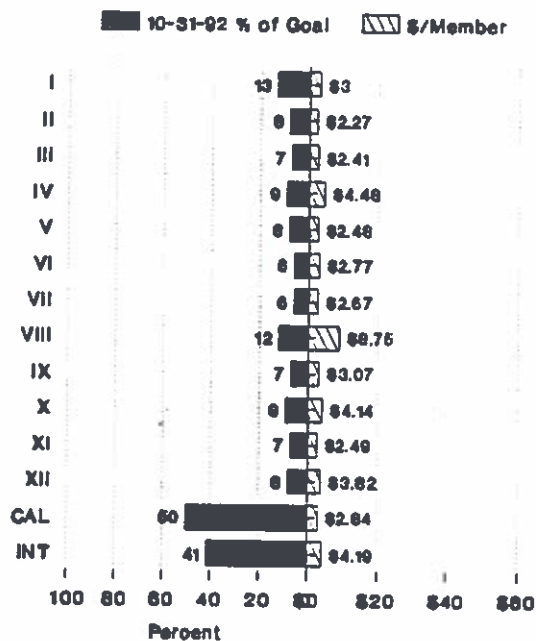
At Technology Council's October meeting two research projects (totaling \$242,570) were approved and 10 workstatements (totaling \$1,047,000) were approved for bidding. Of concern, is that for the first time in many years, ASHRAE has had to postpone research. An additional 8 projects are ready to go forward but were deferred because of limited funding.

Enclosed with this mailing are Major Investor Followup Forms and 6 ASHRAE Journal reprints of the ASHRAE Research Annual Report and Honor Roll. Additional copies are available.

### 25% of Goal

Featured later in this report are the names of 12 RP Chairmen who have already accomplished the RP MBO Goal of achieving 25% of goal by the Winter ASHRAE meeting. Congratulations for a fine job.

### ALL REGIONS PERCENT OF GOAL



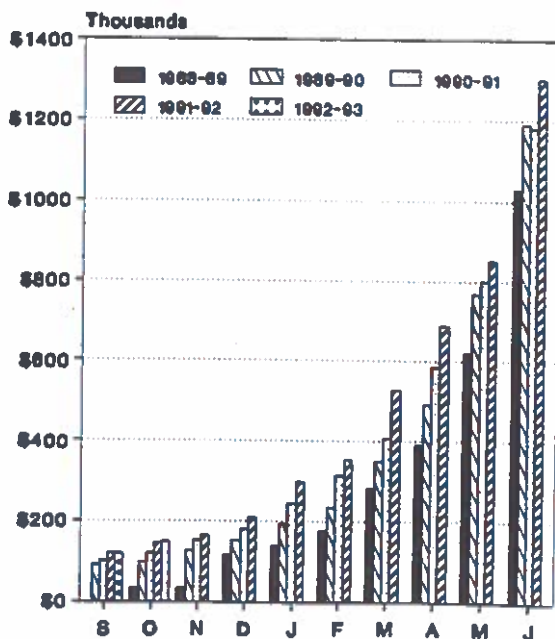
notion

Congratulations to our leading

\$ Contributed  
through 10-31-92

C. Oklahoma	\$ 5,583
Dallas	4,088
N. Jersey	3,938
N.E. Oklahoma	3,679
Austin	3,515
New York	3,393
Atlanta	3,135
Boston	2,800
Toronto	2,646
Illinois	2,515

### MONTHLY YTD CONTRIBUTIONS COMPARED WITH PRIOR YEARS



ge A. Jackins, DAL  
Pearson, V-PRES  
own, R&T  
ath W. Dean, ARC



12:28:23 02 NOV 1992

PAGE: 36

A S H R A E  
YTD CHAPTER CONTRIBUTIONS DETAIL REPORT  
FOR ALL DATES

REGION 02 - CHAPTER 116 - LONDON

CONTRIB DATE	S NAME OF CONTRIBUTOR	MEMBER NUMBER	CHECK NUMBER	NON-MEMBER	MEMBER	GENERAL	TYPE	MEMORIAL
08/03/92	X RENZO FERRERA	2050869	0214333		50.00	50.00		
	CHAPTER 116 - TOTAL	1		0.00	50.00	50.00		0.00
	HIGHERIVE		5,180					
	CHAPTER GOAL		5,300					
	ASSIGNED MEMBERS (PAGE)		110					50.00
	CHAPTER GOAL PER ASSIGNED MEMBER		48.18					0.45

CONTRIBUTION TOTAL  
ASSIGNED MEMBERS (PAGE) 50.00  
CONTRIBUTIONS PER  
ASSIGNED MEMBER 0.45





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TO: Research Promotion Chapter Chairmen  
FROM: Thomas Anderson *TA*  
DATE: October 29, 1992  
SUBJECT: Major Investor Follow-Up

**[Status Report Requested by December 12, 1991]**

Attached are three copies of the Major Investor Follow-Up form for each contributor in your chapter who has given \$500.00 or more in any of the last five years. Please use these forms to let your Research Promotion Vice Chairman (Blue copy) and me (Goldenrod copy) know what your plans are for contacting these investors during the current campaign year. Also, let me know if there are any changes in company addresses, names or contact people and I will update our records.

Plan on meeting soon with contributors that are candidates for the "Golden Circle." Ask for their commitment early in the year. Companies that contribute \$10,000 or more by the Chicago ASHRAE meeting will be recognized at the President's Luncheon. Also, plan an early meeting with utilities and other companies that need to budget for increased support.

Thank our contributors and let each know how investments are spent for research needed by the industry. Point out the ways their company benefits from this research.

Follow-Up forms Attached

cc: Research Promotion Committee  
Chapter Presidents







1791 Tullie Circle NE • Atlanta, Georgia 30329 ☎ 404-636-8400 • Tlx 705343 ASHRAE • Fax 404-321-5478

Thomas Anderson, CFRE  
Manager of Research Promotion

12 NOV 1992

Chorley & Bisset Limited  
521 Colborne Street  
London ON N6B 2T6

CHORLEY & BISSET LTD.	
LONDON	ONTARIO
FILE NO.	
REC'D NOV 11 9 1992	
1	ORG?

Dear Colleague:

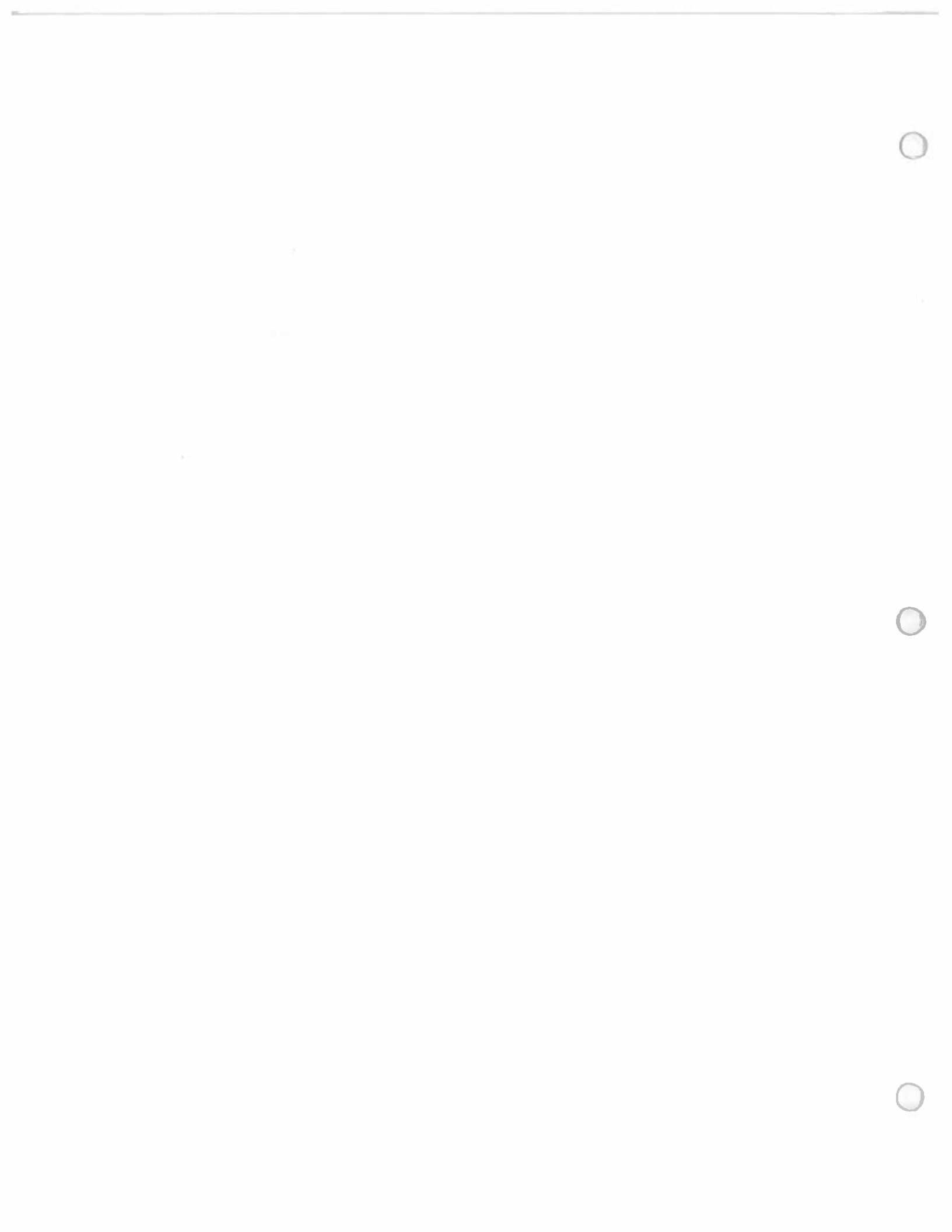
The 1992-93 Annual Report and Honor Roll is being sent to you because of your interest and investment in ASHRAE Research. This report summarizes current research projects and lists the names of 1991-92 Honor Roll contributors. Upon review, I believe you will agree that your dollars are being well spent.

ASHRAE Research is vital to all of us. ASHRAE's R&T Committee and its technical committees have mapped and are aggressively addressing the technical questions of a rapidly changing industry. While implementing our research plan, ASHRAE Research has grown 250% over the last five years and yet we are challenged to meet funding requirements. The importance of your continued support cannot be stressed enough.

We appreciate your support and are pleased to provide this update of research. Your investment is making a difference for our industry.

Sincerely,

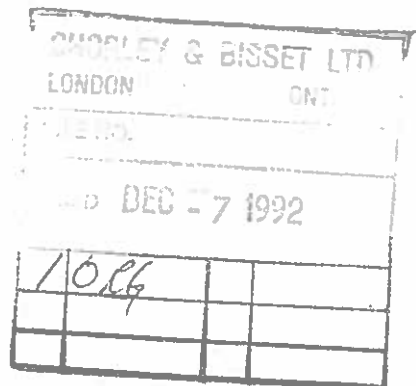
Thomas Anderson





1791 Tullie Circle NE • Atlanta, Georgia 30329 ☎ 404-636-8400 • Tlx 705343 ASHRAE • Fax 404-321-5478

Thomas Anderson, CFRE  
Manager of Research Promotion



TO: Research Promotion Chapter Chairmen  
FROM: Thomas Anderson TA  
DATE: December 1, 1992  
SUBJECT: November Research Contributions Report

Year-to-date research contributions received in Atlanta are \$176,093 (10.9% of chapter goals and 6% ahead of last November).

This year's survey of the Independent Sector, "Giving and Volunteering in the United States," indicates that regardless of the economy people are still generous. Individuals reported contributing 1.9% to 2.5% of their income. More than 50% of all Americans volunteered for worthwhile causes in 1991 (certainly demonstrated by many ASHRAE members). The report concluded that the fastest and most significant way to increase giving of time and money is to ask more people to help.

Your efforts in telling the ASHRAE Research story and inviting members and others in the industry to help will make a difference. You and your chapter will be more successful with Research Promotion and the industry will benefit from improved technology.

To help you tell the research story, I have enclosed this year's video, "ASHRAE Research: Sharing Resources Globally". In the video three principal investigators describe their work and its potential impact. I encourage you to show this to your committee and chapter board, to ASHRAE members, and to corporate executives from which you want help. The video will assist each in making an informed decision about their investment in ASHRAE Research.

#### 25% of Goal

Congratulations to the two new chairmen who have accomplished the RP MBO Goal of achieving 25% of goal by the Winter ASHRAE meeting. I hope every chapter chairman will strive to achieve this goal and be listed with the top performers:

Brad Smith, North Piedmont  
R. Anthony Pierce, Tri County

### Excellence in Research Promotion

The **Best Ten** include 30 different ASHRAE chapters. Five chapters are new to one or more categories (bold type). Congratulations to our leading chairmen for a fine job.

\$ per Member		# Contributors through 11-30-92		\$ Contributed through 11-30-92	
Austin	\$ 36.46	Austin	86	Austin	\$ 6,636
N. Piedmont	22.07	New York	55	Dallas	6,198
N.E. Oklahoma	19.81	Atlanta	53	C. Oklahoma	5,956
C. Oklahoma	15.27	C. Oklahoma	52	New York	4,443
Ozarks	13.04	Dallas	50	N. Piedmont	4,127
N. Nevada	12.52	Philadelphia	49	N. Jersey	4,113
Dallas	11.92	Boston	49	Atlanta	3,995
Big Sky	11.86	N. Jersey	48	N.E. Oklahoma	3,704
Tri County	11.31	National Capital	47	<b>Triangle</b>	<b>2,984</b>
Cedar Valley	10.80	Minnesota	45	Boston	2,925
		<b>N. Piedmont</b>	<b>45</b>		

% of Goal		% Contributors to Members	
Hong Kong	79.3%	Austin	47.3%
Singapore	56.1	N. Piedmont	24.1
Spacecoast	50.7	N.E. Oklahoma	16.6
Boston	50.4	C. Oklahoma	13.3
Bi-State	41.9	N. Nevada	12.7
Malaysia	36.5	Big Sky	12.4
Ozarks	33.3	<b>S.W. Florida</b>	<b>12.4</b>
Cedar Valley	31.7	E.C. Illinois	12.0
N. Piedmont	30.6	<b>Triangle</b>	<b>11.8</b>
Taiwan	30.0	Cedar Valley	11.4

Distribution: RP Committee  
 Regional Directors  
 Chapter Presidents  
 Frank M. Coda, E DIR  
 J. Richard Wright, D TECH

George A. Jackins, DAL  
 Frederick J. Pearson, V-PRES  
 Conny R. Brown, R&T  
 Kenneth W. Dean, ARC



# 25% of Goal or Better

(Chronological Order)

The following 14 Research Promotion Chairmen have accomplished the Research Promotion MBO Goal of achieving 25% of their Chapter Goal by February 1, 1992. Congratulations for an outstanding job.

RP Chairman	Chapter	Region	% of Goal
Patrick R. Kroos	Hong Kong	X-INT	79.3
Yew Wah Wong	Singapore	X-INT	56.1
Robert P. O'Connell	Boston	I	50.4
Robert H. Leveridge	Spacecoast	XII	50.7
Robert A. Roston	Bi-State	II	41.9
Chan Cheong Hoo	Malaysia	X-INT	36.5
Gerald J. Labenz	Ozarks	IX	33.3
Ronald C. Johnson	Cedar Valley	VI	31.7
Jimmy Wang (Pres.)	Taiwan	X-INT	30.0
Pavan Metha	North Jersey	I	27.4
Tony Moore	N.E. Oklahoma	VIII	25.5
R. Anthony Pierce	Tri County	X	25.8

## New Since Last Report

Brad Smith	North Piedmont	IV	30.6
John B. Grapsas	New Mexico	IX	28.9

## Goal Completion Analysis

% of Chap Goal	# Chapters	% Total Chapters	Average \$/Member	\$ Needed to Reach Goal
100% +	0	0.0%	\$ 0.00	\$ 0
80-99%	0	0.0%	\$ 0.00	\$ 0
50-79%	4	2.6%	\$ 5.02	\$ 4,556
25-49%	11	7.1%	\$ 9.95	\$ 69,148
10-24%	44	28.6%	\$ 6.39	\$ 409,121
< 10%	95	61.7%	\$ 2.59	\$ 928,103
Total	154	100.0%	\$ 4.12	\$ 1,410,928

**RESEARCH PROMOTION FUNDS RECEIVED**  
Compared with Prior Years

<u>As of</u>	<u>90-91</u>		<u>91-92</u>		<u>92-93</u>	
	Amt	%*	Amt	%*	Amt	%*
Sept 30	\$ 94,254	5.9	\$ 121,415	7.2	\$ 119,460	7.0
Oct 31	119,920	7.5	146,792	8.7	148,754	8.8
Nov 30	151,061	9.4	166,124	9.9	176,093	10.4
Dec 31	179,033	11.2	210,349	12.5		
Jan 31	244,115	15.8	300,278	27.9		
Feb 28	314,245	19.6	353,805	21.1		
Mar 15	356,596	22.3	422,962	25.2		
Mar 31	407,430	25.5	528,348	31.4		
Apr 15	487,087	30.4	609,157	36.3		
Apr 30	586,768	36.7	687,997	41.0		
May 15	704,220	44.0	797,793	47.5		
May 31	799,789	50.0	850,322	50.6		
Jun 15	878,514	54.9	958,387	57.1		
Jun 30 - Final	\$1,181,141	79.0	\$1,303,560	77.6		

\*% of goal:      90-91 Budget \$1,600,000  
                      91-92 Budget \$1,680,000  
                      92-93 Budget \$1,700,000

**1992-93 CONTRIBUTIONS BY SOURCE**

<u>Source</u>	<u>\$\$\$</u>	<u>Number</u>	<u>Average Contribution</u>
Golden Circle	\$ 0	0	\$ 0.00
Dual	7,625	36	211.81
Direct	21,072	136	154.94
Chap RP Vols	41,271	399	103.44
Direct Mail	0	0	0.00
Telephone	300	5	60.00
Dues	<u>105,825</u>	<u>1,818</u>	<u>58.2</u>
Totals	\$ 176,092	2,394	\$ 73.56

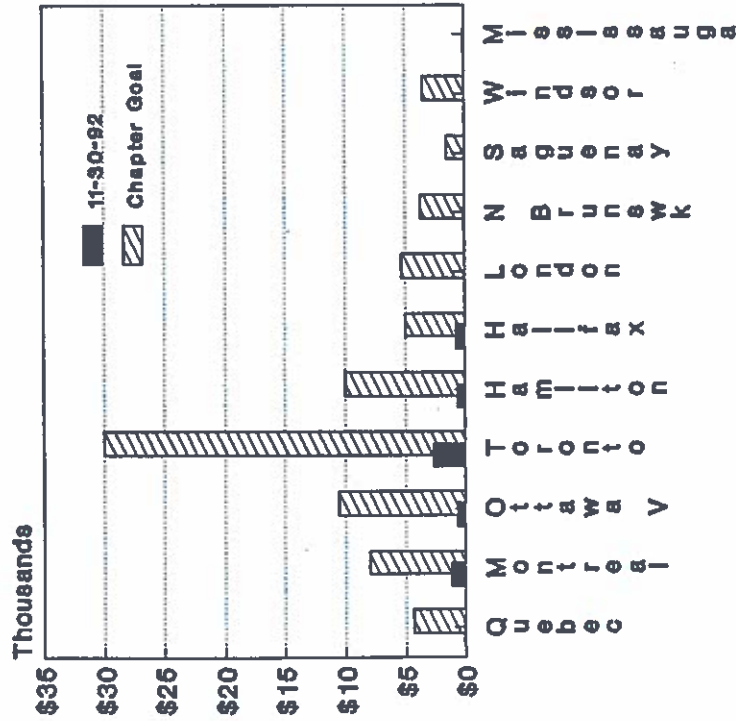
YEAR-TO-DATE RESEARCH INVESTMENT REPORT

November 30, 1992

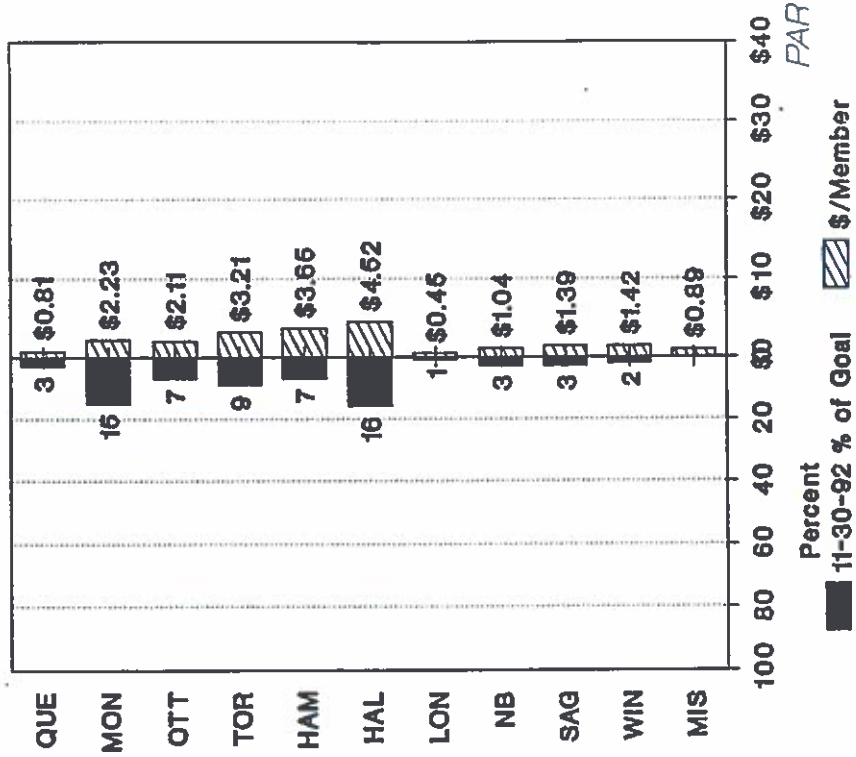
<u>Region</u>	<u>Sum of Chapter Goals</u>	<u>V Chm Goal</u>	<u>Oct 31 Cum Amount</u>	<u>% of Chp Goal</u>	<u>Nov 30 Cum Amount</u>	<u>% of Chap Goal</u>
I	\$ 130,000	\$ 130,000	\$ 16,970	13.1	\$ 20,640	15.9
II	82,000	82,000	6,194	7.6	6,694	8.2
III	155,500	155,500	10,398	6.7	11,162	7.2
IV	103,800	103,800	9,617	9.3	14,470	13.9
V	106,480	106,480	8,081	7.6	9,356	8.8
VI	179,105	179,105	11,104	6.2	14,058	7.8
VII	95,290	100,000	5,472	5.7	6,171	6.5
VIII	200,635	200,635	24,501	12.2	30,465	15.2
IX	110,790	110,790	7,400	6.7	9,567	8.6
X	187,000	187,000	16,160	8.6	17,135	9.2
XI	104,448	104,448	6,923	6.6	8,162	7.8
XII	85,893	85,893	6,692	7.8	8,316	9.7
X-INT	5,700	5,700	2,873	50.4	3,023	53.0
INT'L	40,100	40,100	16,464	41.1	16,969	42.3
OTHER	<u>30,000</u>	<u>30,000</u>	<u>-95</u>	<u>0.0</u>	<u>-95</u>	<u>0.0</u>
TOTAL	\$1,616,741	\$1,621,451	\$148,754	9.2	\$176,093	10.9

Next Report on December 31, 1992

## REGION II Year-to-Date/Goal



## PROGRESS



YEAR-TO-DATE RESEARCH CONTRIBUTIONS SUMMARY  
November 30, 1992

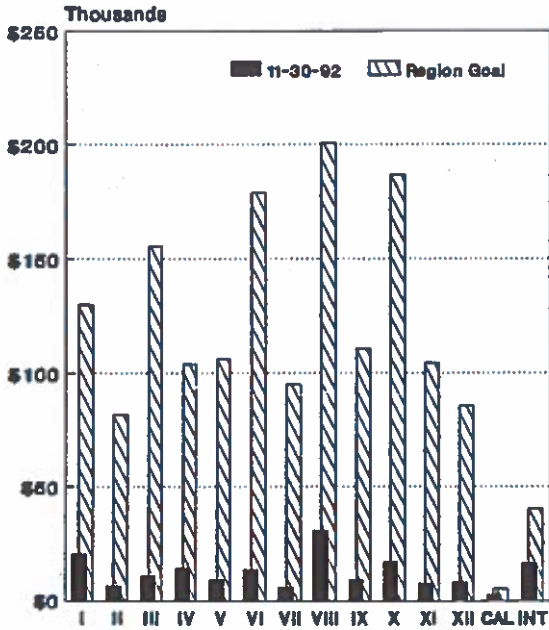
REG	CHAP	CHAPTER	MEMB	GOAL	YTD CONT	YTD \$	% OF GOAL	% OF MEMB	YTD \$/MEMB
2	13	Quebec	173	4400	2	140	3.2%	1.2%	\$0.81
2	14	Montreal	539	8000	13	1200	15.0%	2.4%	\$2.23
2	15	Ottawa	341	10500	3	721	6.9%	0.9%	\$2.11
2	16	Toronto	839	30000	29	2696	9.0%	3.5%	\$3.21
2	37	Hamilton	193	10000	8	705	7.1%	4.1%	\$3.65
2	100	Halifax	178	5000	12	804	16.1%	6.7%	\$4.52
2	116	London	110	5300	1	50	0.9%	0.9%	\$0.45
2	117	N Brunswick	120	3800	1	125	3.3%	0.8%	\$1.04
2	140	Saguenay	36	1500	1	50	3.3%	2.8%	\$1.39
2	141	Windsor	55	3500	2	78	2.2%	3.6%	\$1.42
2	153	Mississauga	140	0	1	125		0.7%	\$0.89
2	902	Total 2	2724	82000	73	6694	8.2%	2.7%	\$2.46

1992-93 PAOE CALCULATIONS-ADDITIONAL DOLLARS NEEDED FOR GOALS AND AWARDS  
11/30/92

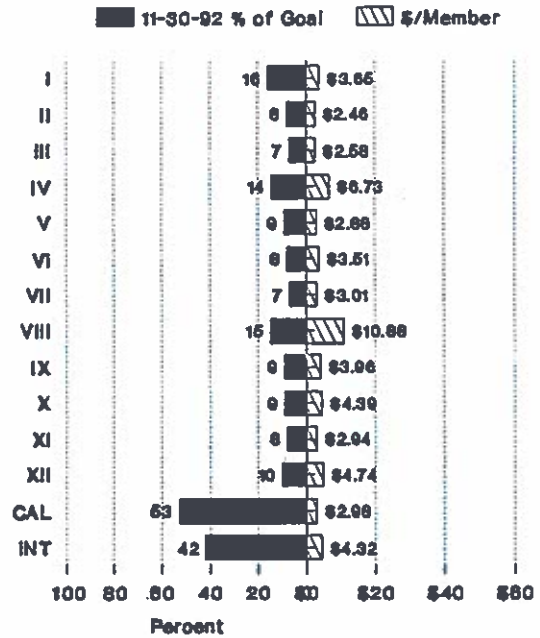
YTD RP PAOE	YTD \$ PER MEMBER	CHAPTER	ADDT'L \$ FOR 400+ PAOE	ADDT'L \$ FOR 200 PAOE	ADDT'L \$ FOR CHAP GOAL	ADDT'L \$ FOR NEW HIGH 5
8	\$0.77	QUEBEC	\$7,140	\$3,500	\$4,260	\$4,221 *
23	\$2.33	MONTREAL	\$19,360	\$9,080	\$6,800	\$5,655
20	\$2.05	OTTAWA V.	\$13,359	\$6,319	\$9,779	\$13,915
32	\$3.22	TORONTO	\$30,274	\$13,814	\$27,354	\$31,781
37	\$3.67	HAMILTON	\$6,975	\$3,135	\$9,295	\$8,291
47	\$4.67	HALIFAX	\$6,076	\$2,636	\$4,196	\$6,735
5	\$0.47	LONDON	\$4,230	\$2,090	\$5,250	\$5,131 *
11	\$1.11	NEW BRUNSWICK	\$4,395	\$2,135	\$3,675	\$2,856
15	\$1.47	SAGUENAY-LAC	\$1,310	\$630	\$1,450	\$1,576
14	\$1.37	WINDSOR	\$2,202	\$1,062	\$3,422	\$3,328
9	\$0.94	MISSISSAUGA	\$5,195	\$2,535	OVER GOAL	\$1,386
20	\$2.48	REGION II AVG.	221	TOTAL RP PAOE		\$84,865

\* 1992-93 Research Promotion High 5 Award Candidates

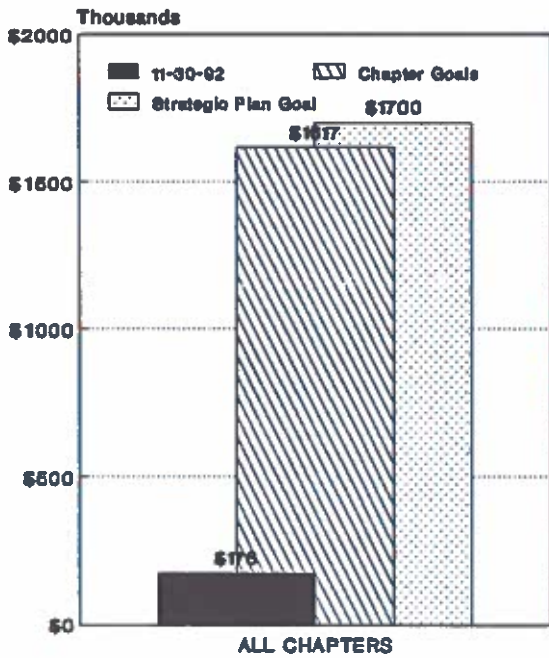
### All REGIONS Year-to-Date/Goal



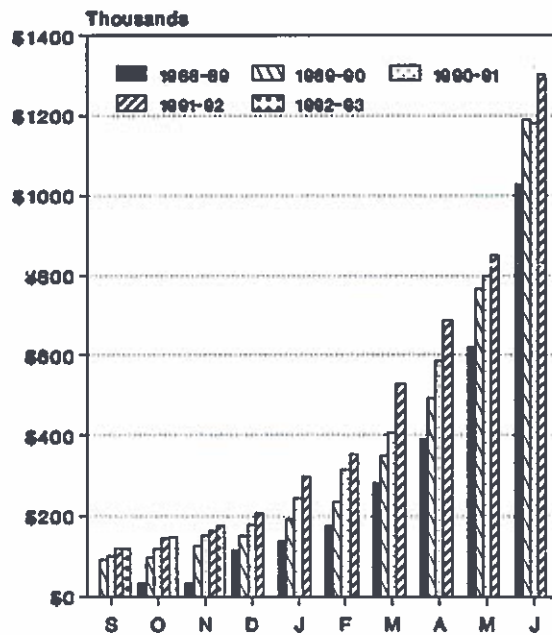
### ALL REGIONS PERCENT OF GOAL



### YTD TO GOAL



### MONTHLY YTD CONTRIBUTIONS COMPARED WITH PRIOR YEARS



REGION 02 - CHAPTER 116 - LONDON

SOURCE	SOURCE DESCRIPTION	CONTRIBUTION	NUMBER	AVERAGE CONTRIBUTION
X	DUES	50.00	1	50.00
TOTALS:		50.00	1	50.00





A S H R A E  
YTD CHAPTER CONTRIBUTIONS DETAIL REPORT  
FOR ALL DATES

REGION 02 - CHAPTER 116 - LONDON

CONTRIB DATE	S NAME OF CONTRIBUTOR	MEMBER NUMBER	CHECK NUMBER	NON-MEMBER	MEMBER	TYPE		
						GENERAL	EARNERED	MEMORIAL
08/03/92	X RENZO FERRERA	2050869	0214333		50.00	50.00		
	CHAPTER 116 - TOTAL	1		0.00	50.00	50.00	0.00	0.00
	HIGHPIVE CHAPTER GOAL ASSIGNED MEMBERS (PAGE)		5,180 5,300 110					50.00 110
	CHAPTER GOAL PER ASSIGNED MEMBER		48.18					0.45
								CONTRIBUTION TOTAL ASSIGNED MEMBERS (PAGE)
								CONTRIBUTIONS PER ASSIGNED MEMBER





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Thomas Anderson, CFRE  
Manager of Research Promotion

TO: Research Promotion Chapter Chairmen  
FROM: Thomas Anderson *TA*  
DATE: March 3, 1993  
SUBJECT: February Research Contributions Report

CHORLEY & BISSET LTD.	
LONDON	ONTARIO
FILE NO.	
REC'D MAR 29 1993	
1 ORG	

Research Promotion campaigns are picking up, and by now, each of you should be at full steam. Year-to-date research contributions are ahead of last February with \$380,654 in Atlanta (23.5% of chapter goals).

Please let your Regional Vice Chairman or me know if you have questions, need materials or assistance. Enclosed are news releases highlighting recent research and industry issues. These can be used in your chapter's newsletter, with local business press or as brief informational announcements during meetings.

### Goal Busters

Beginning with this report, I will regularly report on chapter chairmen exceeding goal. Special commendation will also be made for every "Goal Buster" which exceeds \$40 per assigned chapter member average (PAR) and establishes a new chapter record (HIGH 5). Because chairmen and chapters stretch to reach new records, ASHRAE can provide research which meet the technical demands of a rapidly changing industry.

Congratulations to "Goal Buster" William J. Kushner, Rockford Chapter, for an outstanding job in Research Promotion (exceeding goal, PAR and HIGH 5).

Because of late mail last month, I missed acknowledging the accomplishments of Raynald Courtemanche, Quebec Chapter. Congratulations on exceeding 30% of goal by the end of January.

**Excellence in Research Promotion**

The **Best Ten** include 23 different ASHRAE chapters. Eight chapters are new to one or more categories (bold type). Congratulations to our leading chairmen for a fine job.

\$ per Member		# Contributors through 2-28-93		\$ Contributed through 2-28-93	
Rockford	\$124.09	Dallas	147	Dallas	\$ 15,910
Austin	57.98	Austin	128	<b>Minnesota</b>	<b>15,301</b>
N. Piedmont	43.65	St. Louis	92	C. Pennsylvania	11,930
C. Pennsylvania	40.30	<b>Baltimore</b>	<b>88</b>	C. Oklahoma	11,210
Iowa	38.16	C. Oklahoma	87	Hawaii	11,030
<b>Hawaii</b>	<b>37.52</b>	N. Piedmont	85	Rockford	10,672
Dallas	30.60	<b>Hawaii</b>	<b>84</b>	Austin	10,552
C. Oklahoma	28.74	Atlanta	82	<b>Baltimore</b>	<b>9,913</b>
<b>Alamo</b>	<b>28.15</b>	Minnesota	68	Atlanta	9,909
N.E. Oklahoma	27.92	New York	64	Iowa	8,625
% of Goal		% Contributors to Members			
Rockford	187.2%	Austin	70.3%		
Hong Kong	84.0	N. Piedmont	45.5		
Iowa	77.0	La Crosse	33.3		
Dallas	63.6	Hawaii	28.6		
Singapore	62.3	Dallas	28.3		
<b>Hawaii</b>	<b>61.3</b>	Iowa	25.7		
N. Piedmont	60.5	N.E. Oklahoma	22.5		
Boston	59.7	C. Oklahoma	22.3		
<b>Evansville</b>	<b>59.2</b>	Triangle	19.5		
<b>C. Illinois</b>	<b>58.2</b>	Arkansas	17.2		

Distribution:	RP Committee	George A. Jackins, DAL
	Regional Directors	Frederick J. Pearson, V-PRES
	Chapter Presidents	Conny R. Brown, R&T
	Frank M. Coda, E DIR	Kenneth W. Dean, ARC
	J. Richard Wright, D TECH	John Blossom

# 1992-93 GOAL BUSTERS

(Chronological Order)

Congratulations on a successful year. Your success enables ASHRAE to keep its commitment of meeting the technology needs of the HVAC&R industry.

<u>RP Chairman</u>	<u>Chapter</u>	<u>Region</u>	<u>High 5</u>	<u>PAR</u>	<u>% Goal</u>
William J. Kushner	Rockford	VI	Yes	Yes	187.2%

## Goal Completion Analysis

<u>% of Chap Goal</u>	<u># Chapters</u>	<u>% Total Chapters</u>	<u>Average \$/Member</u>	<u>\$ Needed to Reach Goal</u>
100% +	1	0.6%	\$ 124.09	\$ 0
80-99%	1	0.6%	\$ 3.74	\$ 320
50-79%	12	7.8%	\$ 21.08	\$ 56,324
25-49%	45	29.2%	\$ 14.01	\$ 338,072
10-24%	39	25.3%	\$ 7.01	\$ 347,502
< 10%	56	36.4%	\$ 2.80	\$ 468,466
Total	154	100.0%	\$ 8.91	\$ 1,210,684

YEAR-TO-DATE RESEARCH INVESTMENT REPORT

February 28, 1993

<u>Region</u>	<u>Sum of Chapter Goals</u>	<u>V Chm Goal</u>	<u>Jan 31 Cum Amount</u>	<u>% of Chp Goal</u>	<u>Feb 28 Cum Amount</u>	<u>% of Chap Goal</u>
I	\$ 130,000	\$ 130,000	\$33,030	25.4	\$37,884	29.1
II	82,000	82,000	7,224	8.8	11,026	13.4
III	155,500	155,500	28,523	18.3	43,724	28.1
IV	103,800	103,800	29,132	28.1	33,557	32.3
V	106,480	106,480	15,056	14.1	18,474	17.3
VI	179,105	179,105	39,708	22.2	54,709	30.5
VII	95,290	100,000	8,721	9.2	12,021	12.6
VIII	200,635	200,635	54,533	27.2	62,205	31.0
IX	110,790	110,790	13,357	12.1	14,512	13.1
X	192,700	192,700	29,528	15.3	37,406	19.4
XI	104,448	104,448	11,597	11.1	19,610	18.8
XII	85,893	85,893	8,995	10.5	12,752	14.8
INT'L	40,100	40,100	20,710	51.6	23,535	58.7
OTHER	<u>30,000</u>	<u>30,000</u>	<u>-440</u>	<u>0</u>	<u>-760</u>	<u>0</u>
TOTAL	\$1,616,741	\$1,621,451	\$299,675	18.5	\$380,654	23.5

Next Report on March 16, 1993  
Including checks received by Noon, March 15

**RESEARCH PROMOTION FUNDS RECEIVED**  
Compared with Prior Years

<u>As of</u>	<u>90-91</u>		<u>91-92</u>		<u>92-93</u>	
	Amt	%*	Amt	%*	Amt	%*
Sept 30	\$ 94,254	5.9	\$ 121,415	7.2	\$ 119,460	7.0
Oct 31	119,920	7.5	146,792	8.7	148,754	8.8
Nov 30	151,061	9.4	166,124	9.9	176,093	10.4
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Jan 31	244,115	15.8	300,278	17.9	299,675	17.6
Feb 28	314,245	19.6	353,805	21.1	380,654	22.4
Mar 15	356,596	22.3	422,962	25.2		
Mar 31	407,430	25.5	528,348	31.4		
Apr 15	487,087	30.4	609,157	36.3		
Apr 30	586,768	36.7	687,997	41.0		
May 15	704,220	44.0	797,793	47.5		
May 31	799,789	50.0	850,322	50.6		
Jun 15	878,514	54.9	958,387	57.1		
Jun 30 - Final	\$1,181,141	79.0	\$1,303,560	77.6		

\*% of goal:      90-91 Budget \$1,600,000  
                       91-92 Budget \$1,680,000  
                       92-93 Budget \$1,700,000

**1992-93 CONTRIBUTIONS BY SOURCE**

<u>Source</u>	<u>\$\$\$</u>	<u>Number</u>	<u>Average Contribution</u>
Golden Circle	\$ 30,000	3	\$10,000.00
Dual	17,395	93	187.04
Direct	43,680	219	199.45
Chap RP Vols	176,196	1,430	123.21
Direct Mail	0	0	0.00
Telephone	300	5	60.00
Dues	<u>113,081</u>	<u>1,942</u>	<u>58.23</u>
Totals	\$ 380,652	3,692	\$103.10

YEAR-TO-DATE RESEARCH CONTRIBUTIONS SUMMARY  
February 28, 1993

REG	CHAP	CHAPTER	MEMB	GOAL	YTD CONT	YTD \$	% OF GOAL	% OF MEMB	YTD \$/MEMB
2	13	Quebec	173	4400	28	2180	49.5%	16.2%	\$12.60
2	14	Montreal	539	8000	13	1200	15.0%	2.4%	\$2.23
2	15	Ottawa	341	10500	5	1378	13.1%	1.5%	\$4.04
2	16	Toronto	839	30000	33	2971	9.9%	3.9%	\$3.54
2	37	Hamilton	193	10000	11	930	9.3%	5.7%	\$4.82
2	100	Halifax	178	5000	15	1429	28.6%	8.4%	\$8.03
2	116	London	110	5300	1	50	0.9%	0.9%	\$0.45
2	117	N Brunswick	120	3800	5	625	16.4%	4.2%	\$5.21
2	140	Saguenay	36	1500	1	50	3.3%	2.8%	\$1.39
2	141	Windsor	55	3500	2	78	2.2%	3.6%	\$1.42
2	153	Other	140	0	2	135		1.4%	\$0.96
2	902	Total 2	2724	82000	116	11026	13.4%	4.3%	\$4.05

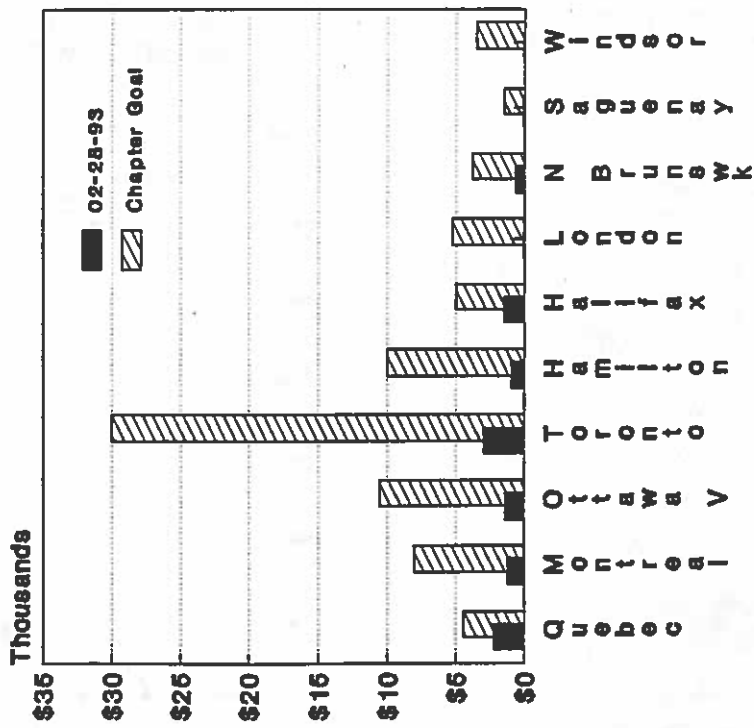
1992-93 PAOE CALCULATIONS-ADDITIONAL DOLLARS NEEDED FOR GOALS AND AWARDS  
03/02/93

YTD RP PAOE	YTD \$ PER MEMBER	CHAPTER	ADDT'L \$ FOR 400+ PAOE	ADDT'L \$ FOR 200 PAOE	ADDT'L \$ FOR CHAP GOAL	ADDT'L \$ FOR NEW HIGH 5
120	\$11.98	QUEBEC	\$5,100	\$1,460	\$2,220	\$2,181 *
23	\$2.33	MONTREAL	\$19,360	\$9,080	\$6,800	\$5,655
39	\$3.91	OTTAWA V.	\$12,702	\$5,662	\$9,122	\$13,258
61	\$3.61	TORONTO	\$27,892	\$11,432	\$27,029	\$31,456
48	\$4.84	HAMILTON	\$6,750	\$2,910	\$9,070	\$8,066
83	\$8.31	HALIFAX	\$5,451	\$2,011	\$3,571	\$6,110
5	\$0.47	LONDON	\$4,230	\$2,090	\$5,250	\$5,131 *
55	\$5.53	NEW BRUNSWICK	\$3,895	\$1,635	\$3,175	\$2,356
15	\$1.47	SAGUENAY-LAC	\$1,310	\$630	\$1,450	\$1,576
14	\$1.37	WINDSOR	\$2,202	\$1,062	\$3,422	\$3,328
42	\$4.28	REGION II AVG.	463	TOTAL RP PAOE		\$79,108

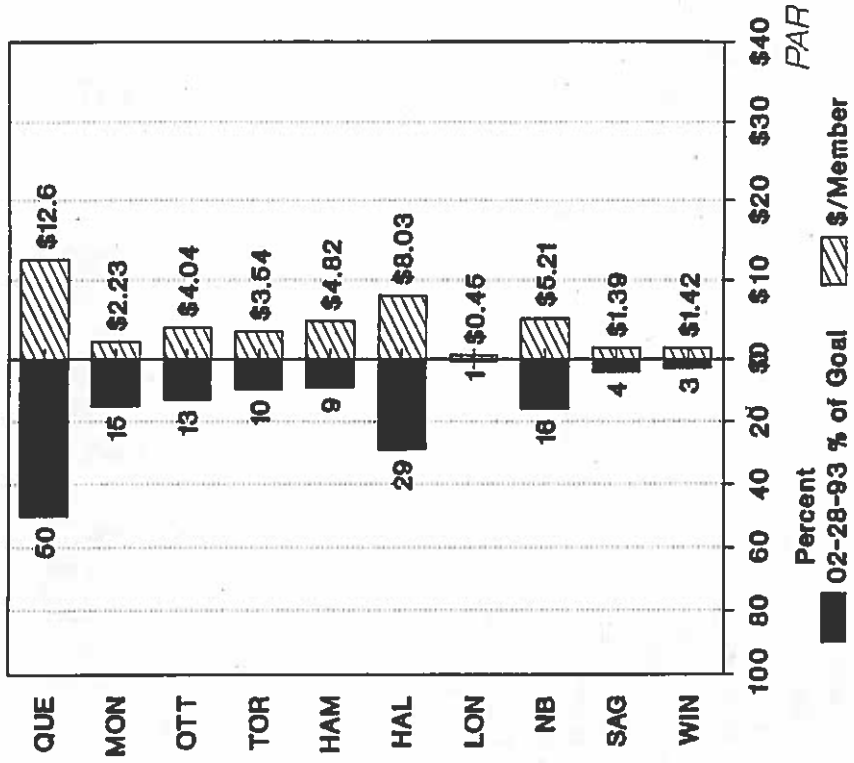
\* 1992-93 Research Promotion High 5 Award Candidates



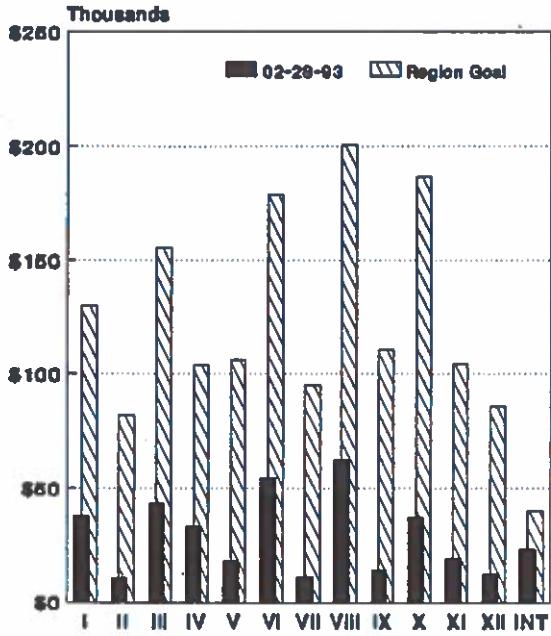
# REGION II Year-to-Date/Goal



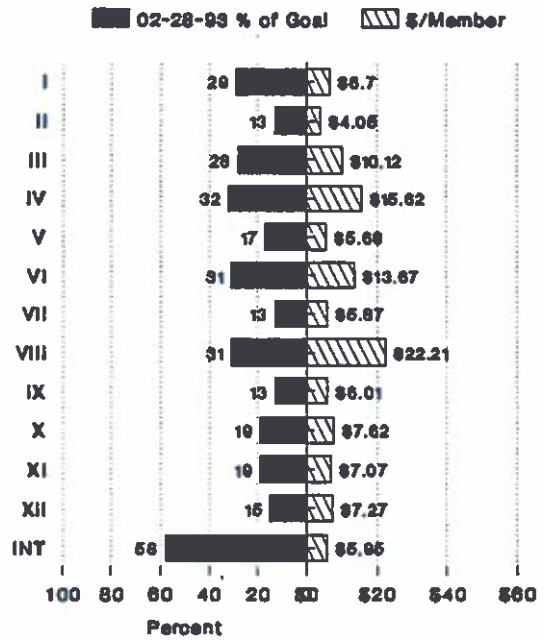
# PROGRESS



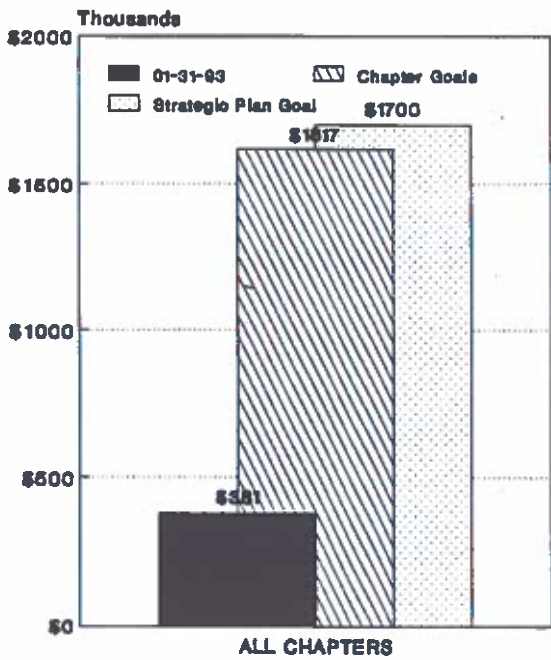
### ALL REGIONS Year-to-Date/Goal



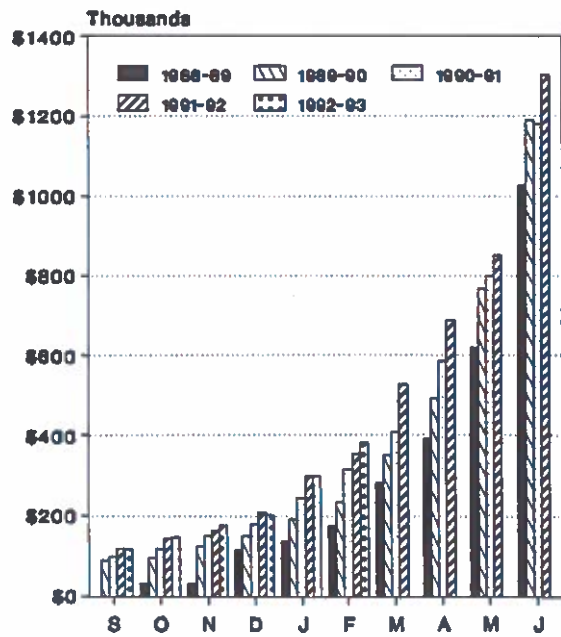
### ALL REGIONS PERCENT OF GOAL



### YTD TO GOAL



### MONTHLY YTD CONTRIBUTIONS COMPARED WITH PRIOR YEARS





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Thomas Anderson, CFRE  
 Manager of Research Promotion

FILE NO. \_\_\_\_\_  
 REC'D MAR 22 1993  
 J.B.B.  
 O.R.G.

TO: Research Promotion Chapter Chairmen  
 FROM: Thomas Anderson *T.A.*  
 DATE: March 17, 1993  
 SUBJECT: Mid-March Research Contributions Report

Year-to-date research contributions are about even with last year's totals with \$427,016 received in Atlanta (26.4% of chapter goals).

I hope each of you will strive to wrap up your campaigns before the end of May. RP Chairmen that establish a new High 5 (more dollars collected than any of the previous five years) by May 31 will earn an additional 75 points towards the Presidential Award of Excellence (PAOE).

**Excellence in Research Promotion**

The **Best Ten** include 21 different ASHRAE chapters. Five chapters are new to one or more categories (bold type). Congratulations to our leading chairmen for a fine job.

\$ per Member	# Contributors through 3-15-93	\$ Contributed through 3-15-93
Rockford	Dallas	Dallas
\$124.09	168	\$ 20,180
Austin	<b>Houston</b>	Minnesota
57.98	154	18,351
N. Piedmont	C. Oklahoma	C. Oklahoma
48.14	145	17,361
C. Oklahoma	Austin	Baltimore
44.51	128	12,253
Iowa	<b>Baltimore</b>	C. Pennsylvania
42.15	101	11,930
C. Pennsylvania	St. Louis	Hawaii
40.30	99	11,030
Dallas	N. Piedmont	Rockford
38.81	99	10,672
Hawaii	Hawaii	Austin
37.52	84	10,552
N.E. Oklahoma	Atlanta	Atlanta
33.94	82	9,909
Delaware	Minnesota	Iowa
31.58	78	9,525
	<b>Oregon</b>	
	78	

% of Goal		% Contributors to Members	
Rockford	187.2%	Austin	70.3%
Iowa	85.0	N. Piedmont	52.9
Hong Kong	84.0	La Crosse	39.6
Dallas	80.7	C. Oklahoma	37.2
C. Illinois	70.6	Dallas	32.3
N. Piedmont	66.7	Iowa	29.2
Singapore	60.5	Houston	28.7
Hawaii	61.3	Hawaii	28.6
Boston	60.5	C. Illinois	25.8
Baltimore	59.8	N.E. Oklahoma	25.1

Distribution: RP Committee  
 Regional Directors  
 Chapter Presidents  
 Frank M. Coda, E DIR  
 J. Richard Wright, D TECH

George A. Jackins, DAL  
 Frederick J. Pearson, V-PRES  
 Conny R. Brown, R&T  
 Kenneth W. Dean, ARC  
 John Blossom

# 1992-93 GOAL BUSTERS

(Chronological Order)

Congratulations on a successful year. Your success enables ASHRAE to keep its commitment of meeting the technology needs of the HVAC&R industry.

<u>RP Chairman</u>	<u>Chapter</u>	<u>Region</u>	<u>High 5</u>	<u>PAR</u>	<u>% Goal</u>
William J. Kushner	Rockford	VI	Yes	Yes	187.2%

Who will be the next **Goal Buster**?

Will it be the RP Chairman from Iowa, Hong Kong, or Dallas?

Or will it be **YOU**?

## Goal Completion Analysis

<u>% of Chap Goal</u>	<u># Chapters</u>	<u>% Total Chapters</u>	<u>Average \$/Member</u>	<u>\$ Needed to Reach Goal</u>
100% +	1	0.6%	\$ 124.09	\$ 0
80-99%	3	1.9%	\$ 28.23	\$ 6,816
50-79%	14	9.1%	\$ 22.19	\$ 89,579
25-49%	46	29.9%	\$ 14.20	\$ 292,539
10-24%	37	24.0%	\$ 7.18	\$ 326,147
< 10%	53	34.4%	\$ 2.82	\$ 449,157
<b>Total</b>	<b>154</b>	<b>100.0%</b>	<b>\$ 10.00</b>	<b>\$ 1,164,237</b>

**YEAR-TO-DATE RESEARCH INVESTMENT REPORT**  
**March 15, 1993**

<u>Region</u>	<u>Sum of Chapter Goals</u>	<u>V Chm Goal</u>	<u>Feb 28 Cum Amount</u>	<u>% of Chp Goal</u>	<u>Mar 15 Cum Amount</u>	<u>% of Chap Goal</u>
I	\$ 130,000	\$ 130,000	\$37,884	29.1	\$38,743	29.8
II	82,000	82,000	11,026	13.4	11,026	13.4
III	155,500	155,500	43,724	28.1	51,743	33.3
IV	103,800	103,800	33,557	32.3	37,231	35.9
V	106,480	106,480	18,474	17.3	19,527	18.3
VI	179,105	179,105	54,709	30.5	59,874	33.4
VII	95,290	100,000	12,021	12.6	12,821	13.5
VIII	200,635	200,635	62,205	31.0	79,877	39.8
IX	110,790	110,790	14,512	13.1	15,747	14.2
X	192,700	192,700	37,406	19.4	39,536	20.5
XI	104,448	104,448	19,610	18.8	22,450	21.5
XII	85,893	85,893	12,752	14.8	15,575	18.1
INT'L	40,100	40,100	23,535	58.7	23,710	59.1
OTHER	<u>30,000</u>	<u>30,000</u>	<u>-760</u>	<u>-2.5</u>	<u>-845</u>	<u>-2.8</u>
<b>TOTAL</b>	<b>\$1,616,741</b>	<b>\$1,621,451</b>	<b>\$380,654</b>	<b>23.5</b>	<b>\$427,016</b>	<b>26.4</b>

Next Report on April 1, 1993

Including checks received by Noon, March 31

**RESEARCH PROMOTION FUNDS RECEIVED**  
Compared with Prior Years

<u>As of</u>	<u>90-91</u>		<u>91-92</u>		<u>92-93</u>	
	Amt	%*	Amt	%*	Amt	%*
Sept 30	\$ 94,254	5.9	\$ 121,415	7.2	\$ 119,460	7.0
Oct 31	119,920	7.5	146,792	8.7	148,754	8.8
Nov 30	151,061	9.4	166,124	9.9	176,093	10.4
Dec 31	179,033	11.2	210,349	12.5	204,490	12.0
Jan 31	244,115	15.8	300,278	17.9	299,675	17.6
Feb 28	314,245	19.6	353,805	21.1	380,654	22.4
Mar 15	356,596	22.3	422,962	25.2	427,016	25.1
Mar 31	407,430	25.5	528,348	31.4		
Apr 15	487,087	30.4	609,157	36.3		
Apr 30	586,768	36.7	687,997	41.0		
May 15	704,220	44.0	797,793	47.5		
May 31	799,789	50.0	850,322	50.6		
Jun 15	878,514	54.9	958,387	57.1		
Jun 30 - Final	\$1,181,141	79.0	\$1,303,560	77.6		

\*% of goal:      90-91 Budget \$1,600,000  
                      91-92 Budget \$1,680,000  
                      92-93 Budget \$1,700,000

**1992-93 CONTRIBUTIONS BY SOURCE**

<u>Source</u>	<u>\$\$\$</u>	<u>Number</u>	<u>Average Contribution</u>
Golden Circle	\$ 30,000	3	\$10,000.00
Dual	19,465	107	181.92
Direct	47,231	253	189.05
Chap RP Vols	215,566	1,794	120.16
Direct Mail	250	1	250.00
Telephone	300	5	60.00
Dues	<u>113,605.6</u>	<u>1,949</u>	<u>58.29</u>
Totals	\$ 427,016	4,112	\$103.85

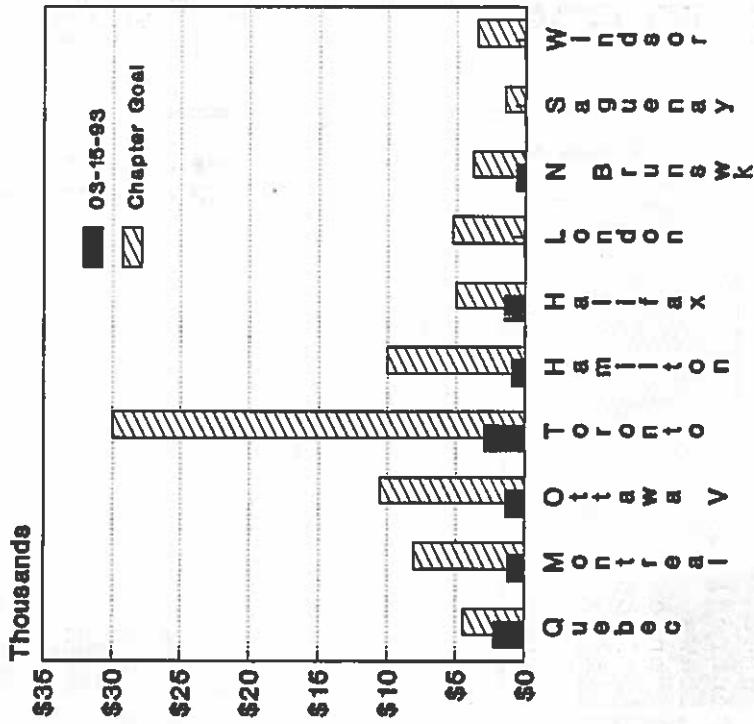
YEAR-TO-DATE RESEARCH CONTRIBUTIONS SUMMARY

March 15, 1993

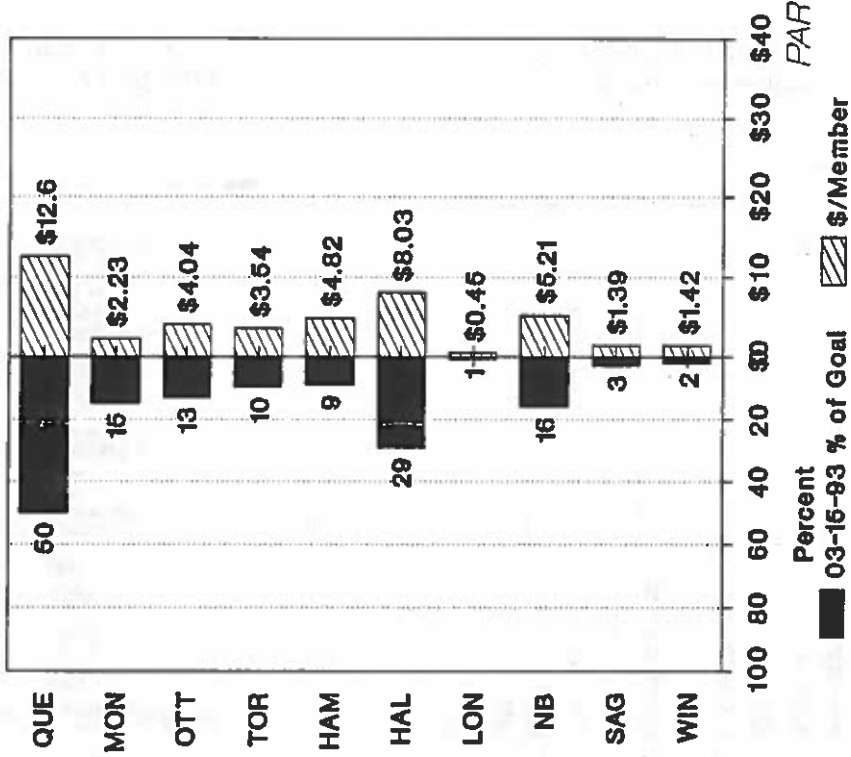
REG	CHAP	CHAPTER	MEMB	GOAL	YTD	YTD	% OF	% OF	YTD	GOAL	\$/MEMB	GOAL	* HIGH 5
					CONT	\$	GOAL	MEMB	\$/MEMB			\$/MEMB	AWARD
							GOAL						CANDIDATES
2	13	Quebec	173	4400	28	2180	49.5%	16.2%	\$12.60	25.43			*
2	14	Montreal	539	8000	13	1200	15.0%	2.4%	\$2.23	14.84			
2	15	Ottawa	341	10500	5	1378	13.1%	1.5%	\$4.04	30.79			
2	16	Toronto	839	30000	33	2971	9.9%	3.9%	\$3.54	35.76			
2	37	Hamilton	193	10000	11	930	9.3%	5.7%	\$4.82	51.81			
2	100	Halifax	178	5000	15	1429	28.6%	8.4%	\$8.03	28.09			
2	116	London	110	5300	1	50	0.9%	0.9%	\$0.45	48.18			*
2	117	N Brunswick	120	3800	5	625	16.4%	4.2%	\$5.21	31.67			
2	140	Saguenay	36	1500	1	50	3.3%	2.8%	\$1.39	41.67			
2	141	Windsor	55	3500	2	78	2.2%	3.6%	\$1.42	63.64			
2	153	Other	140	0	2	135		1.4%	\$0.96	0.00			
2	902	Total	2724	82000	116	11026	13.4%	4.3%	\$4.05	\$30.10			



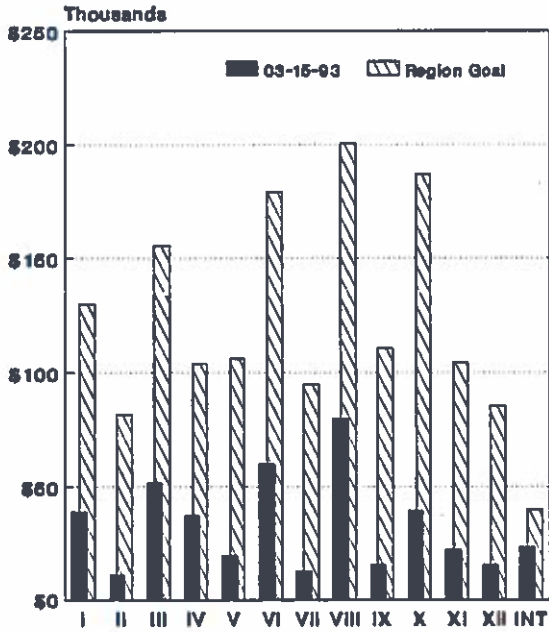
## REGION II Year-to-Date/Goal



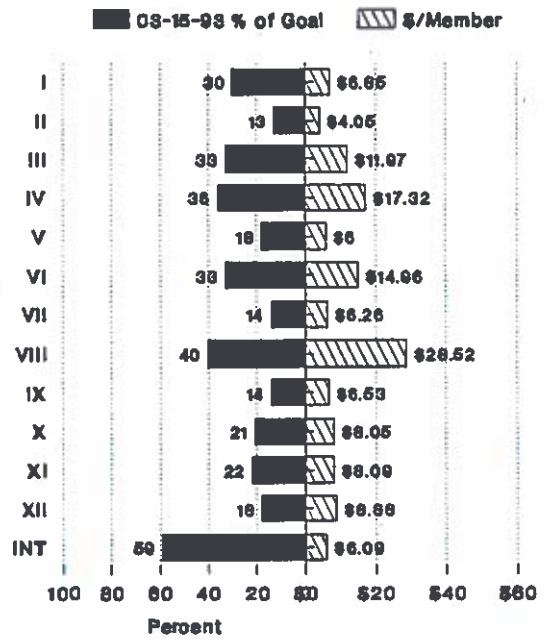
## PROGRESS



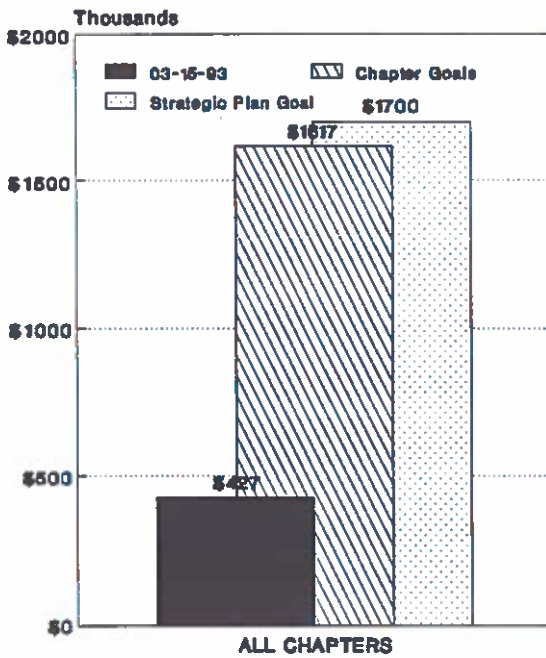
### All REGIONS Year-to-Date/Goal



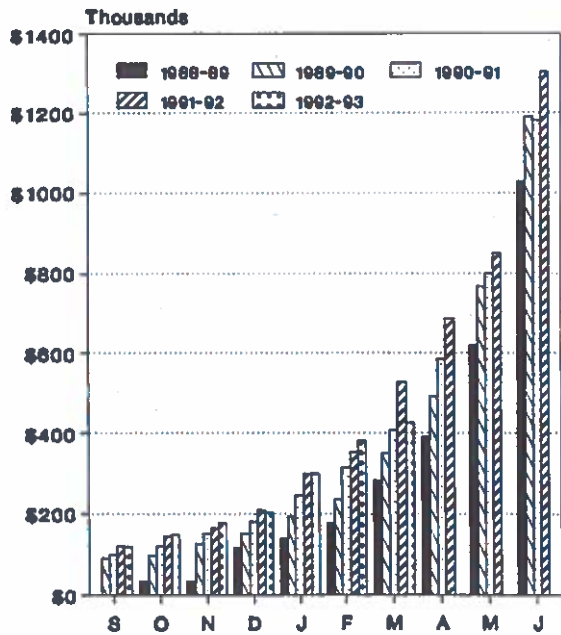
### ALL REGIONS PERCENT OF GOAL



### YTD TO GOAL



### MONTHLY YTD CONTRIBUTIONS COMPARED WITH PRIOR YEARS





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Thomas Anderson, CFRE  
 Manager of Research Promotion

CHORLEY & BISSET LTD.	
PERSON	ONTARIO
FILE NO.	
REC'D APR 28 1993	
1026	

TO: Research Promotion Chapter Chairmen  
 FROM: Thomas Anderson *TA*  
 DATE: April 1, 1993  
 SUBJECT: March Research Contributions Report

Year-to-date research contributions have fallen behind last year's totals with \$493,711 received in Atlanta (30.5% of chapter goals). While 2/3 chapters are making progress with Region VIII leading the way, many chapters have few contributions credited to their chapter.

I encourage everyone to complete solicitations of regular and past contributors in April. New plans are underway to identify and solicit HVAC&R companies with more than \$5 million in sales which have never given to ASHRAE Research. We will be asking for your help in May. Details will follow soon.

Only a few chapters have submitted information on their Chapter Research Night (page 44 of Research Promotion Activity Guide). If you have held a chapter meeting with a focus on HVAC Research or to recognize contributors and introduce the Research Promotion Campaign, you may have 25 to 50 PAOE points due. Please provide details.

### Excellence in Research Promotion

The **Best Ten** include 22 different ASHRAE chapters. Five chapters are new to one or more categories (bold type). Congratulations to our leading chairmen for a fine job.

\$ per Member	# Contributors through 3-31-93	\$ Contributed through 3-31-93		
Rockford	\$124.09	C. Oklahoma 207	Dallas	\$ 22,780
Austin	74.76	Dallas 187	C. Oklahoma	21,130
<b>E. Texas</b>	<b>67.23</b>	Austin 173	Minnesota	20,021
Hawaii	56.92	Houston 155	Hawaii	16,735
C. Oklahoma	54.18	Hawaii 138	Austin	13,606
N. Piedmont	52.56	N. Piedmont 110	Fla. W. Coast	12,428
Iowa	43.83	St. Louis 109	Atlanta	12,374
Dallas	43.81	Baltimore 101	New York	12,353
N.E. Oklahoma	40.81	New York 101	Baltimore	12,253
C. Pennsylvania	40.30	Minnesota 95	C. Pennsylvania	11,930

% of Goal		% Contributors to Members	
Rockford	187.2%	Austin	95.1%
Hawaii	93.0	N. Piedmont	58.8
Dallas	91.1	C. Oklahoma	53.1
Iowa	88.4	Hawaii	46.9
Hong Kong	84.0	La Crosse	39.6
Quebec	77.8	Dallas	36.0
Fla. W. Coast	75.3	E. Texas	35.7
N. Piedmont	72.8	Iowa	33.6
C. Illinois	71.6	Houston	28.9
Evansville	70.3	N.E. Oklahoma	27.8

Distribution: RP Committee  
 Regional Directors  
 Chapter Presidents  
 Frank M. Coda, E DIR  
 J. Richard Wright, D TECH  
 John E. Wolfert  
 Gary L. Cooper

George A. Jackins, DAL  
 Frederick J. Pearson, V-PRES  
 Conny R. Brown, R&T  
 Kenneth W. Dean, ARC  
 John Blossom  
 David Lee Kittrell  
 David E. Knebel

# 1992-93 GOAL BUSTERS

(Chronological Order)

Congratulations on a successful year. Your success enables ASHRAE to keep its commitment of meeting the technology needs of the HVAC&R industry.

<u>RP Chairman</u>	<u>Chapter</u>	<u>Region</u>	<u>High 5</u>	<u>PAR</u>	<u>% Goal</u>
William J. Kushner	Rockford	VI	Yes	Yes	187.2%

Who will be the next **Goal Buster**?

Will it be the RP Chairman from Quebec, Dallas or Hawaii?

Or will it be **YOU**?

## Goal Completion Analysis

Please note that 1/3 Chapters are under 10%  
Two months remain to achieve PAOE bonus for High 5

<u>% of Chap Goal</u>	<u># Chapters</u>	<u>% Total Chapters</u>	<u>Average \$/Member</u>	<u>\$ Needed to Reach Goal</u>
100% +	1	0.6%	\$ 124.09	\$ 0
80-99%	4	2.6%	\$ 37.07	\$ 5,101
50-79%	21	13.6%	\$ 25.19	\$ 109,134
25-49%	51	33.1%	\$ 15.00	\$ 321,934
10-24%	27	17.5%	\$ 7.03	\$ 231,872
< 10%	50	32.5%	\$ 2.97	\$ 429,221
<b>Total</b>	<b>154</b>	<b>100.0%</b>	<b>\$ 11.57</b>	<b>\$ 1,097,262</b>

YEAR-TO-DATE RESEARCH INVESTMENT REPORT

March 31, 1993

<u>Region</u>	<u>Sum of Chapter Goals</u>	<u>V Chm Goal</u>	<u>Mar 15 Cum Amount</u>	<u>% of Chp Goal</u>	<u>Mar 31 Cum Amount</u>	<u>% of Chap Goal</u>
I	\$ 130,000	\$ 130,000	\$38,743	29.8	\$47,963	36.9
II	82,000	82,000	11,026	13.4	13,345	16.3
III	155,500	155,500	51,743	33.3	52,118	33.5
IV	103,800	103,800	37,231	35.9	43,491	41.9
V	106,480	106,480	19,527	18.3	20,917	19.6
VI	179,105	179,105	59,874	33.4	63,290	35.3
VII	95,290	100,000	12,821	13.5	17,351	18.2
VIII	200,635	200,635	79,877	39.8	99,350	49.5
IX	110,790	110,790	15,747	14.2	20,417	18.4
X	192,700	192,700	39,536	20.5	48,025	24.9
XI	104,448	104,448	22,450	21.5	24,158	23.1
XII	85,893	85,893	15,575	18.1	20,700	24.1
INT'L	40,100	40,100	23,710	59.1	23,710	59.1
OTHER	<u>30,000</u>	<u>30,000</u>	<u>-845</u>	<u>0.0</u>	<u>-1,125</u>	<u>-3.8</u>
TOTAL	\$1,616,741	\$1,621,451	\$427,016	26.4	\$493,711	30.5

Next Report on April 16, 1993

Including checks received by Noon, April 15

**RESEARCH PROMOTION FUNDS RECEIVED**  
Compared with Prior Years

<u>As of</u>	<u>90-91</u>		<u>91-92</u>		<u>92-93</u>	
	Amt	%*	Amt	%*	Amt	%*
Sept 30	\$ 94,254	5.9	\$ 121,415	7.2	\$ 119,460	7.0
Oct 31	119,920	7.5	146,792	8.7	148,754	8.8
Nov 30	151,061	9.4	166,124	9.9	176,093	10.4
Dec 31	179,033	11.2	210,349	12.5	204,490	12.0
Jan 31	244,115	15.8	300,278	17.9	299,675	17.6
Feb 28	314,245	19.6	353,805	21.1	380,654	22.4
Mar 15	356,596	22.3	422,962	25.2	427,016	25.1
Mar 31	407,430	25.5	528,348	31.4	493,711	29.0
Apr 15	487,087	30.4	609,157	36.3		
Apr 30	586,768	36.7	687,997	41.0		
May 15	704,220	44.0	797,793	47.5		
May 31	799,789	50.0	850,322	50.6		
Jun 15	878,514	54.9	958,387	57.1		
Jun 30 - Final	\$1,181,141	79.0	\$1,303,560	77.6		

\*% of goal:      90-91 Budget \$1,600,000  
                      91-92 Budget \$1,680,000  
                      92-93 Budget \$1,700,000

**1992-93 CONTRIBUTIONS BY SOURCE**

<u>Source</u>	<u>\$\$\$</u>	<u>Number</u>	<u>Average Contribution</u>
Golden Circle	\$ 30,000	3	\$10,000.00
Dual	22,640	124	182.58
Direct	54,436	283	192.35
Chap RP Vols	272,235	2,289	118.93
Direct Mail	250	1	250.00
Telephone	300	5	60.00
Dues	<u>113,851</u>	<u>1,953</u>	<u>58.30</u>
Totals	\$ 493,711	4,658	\$105.99

YEAR-TO-DATE RESEARCH CONTRIBUTIONS SUMMARY  
March 31, 1993

REG	CHAP	CHAPTER	MEMB	GOAL	YTD CONT	YTD \$	% OF GOAL	% OF MEMB	YTD \$/MEMB
2	13	Quebec	173	4400	36	3425	77.8%	20.8%	\$19.80
2	14	Montreal	539	8000	13	1200	15.0%	2.4%	\$2.23
2	15	Ottawa	341	10500	5	1378	13.1%	1.5%	\$4.04
2	16	Toronto	839	30000	33	2971	9.9%	3.9%	\$3.54
2	37	Hamilton	193	10000	11	930	9.3%	5.7%	\$4.82
2	100	Halifax	178	5000	18	1854	37.1%	10.1%	\$10.42
2	116	London	110	5300	2	150	2.8%	1.8%	\$1.36
2	117	N Brunswick	120	3800	9	1100	28.9%	7.5%	\$9.17
2	140	Saguenay	36	1500	1	50	3.3%	2.8%	\$1.39
2	141	Windsor	55	3500	3	153	4.4%	5.5%	\$2.78
2	153	Other	140	0	2	135		1.4%	\$0.96
2	902	Total 2	2724	82000	133	13345	16.3%	4.9%	\$4.90

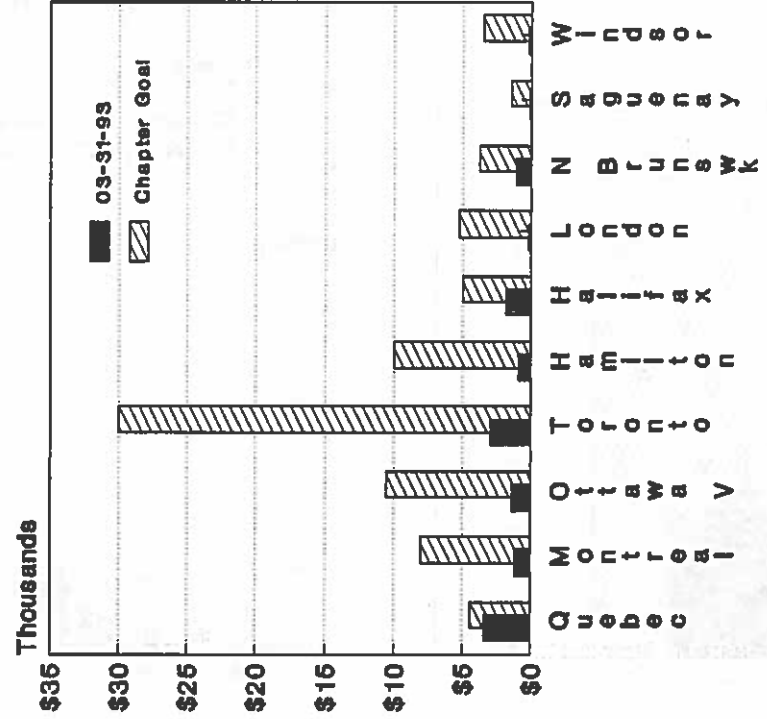
1992-93 PAOE CALCULATIONS-ADDITIONAL DOLLARS NEEDED FOR GOALS AND AWARDS  
03/31/93

YTD RP PAOE	YTD \$ PER MEMBER	CHAPTER	ADDT'L \$ FOR 400+ PAOE	ADDT'L \$ FOR 200 PAOE	ADDT'L \$ FOR CHAP GOAL	ADDT'L \$ FOR NEW HIGH 5
188	\$18.82	QUEBEC	\$3,855	\$215	\$975	\$936 *
23	\$2.33	MONTREAL	\$19,360	\$9,080	\$6,800	\$5,655
39	\$3.91	OTTAWA V.	\$12,702	\$5,662	\$9,122	\$13,258
61	\$3.61	TORONTO	\$27,892	\$11,432	\$27,029	\$31,456
48	\$4.84	HAMILTON	\$6,750	\$2,910	\$9,070	\$8,066
108	\$10.78	HALIFAX	\$5,026	\$1,586	\$3,146	\$5,685
14	\$1.40	LONDON	\$4,130	\$1,990	\$5,150	\$5,031 *
97	\$9.73	NEW BRUNSWICK	\$3,420	\$1,160	\$2,700	\$1,881
15	\$1.47	SAGUENAY-LAC	\$1,310	\$630	\$1,450	\$1,576
27	\$2.68	WINDSOR	\$2,127	\$987	\$3,347	\$3,253
56	\$5.19	REGION II AVG.	621	TOTAL RP PAOE		\$76,788

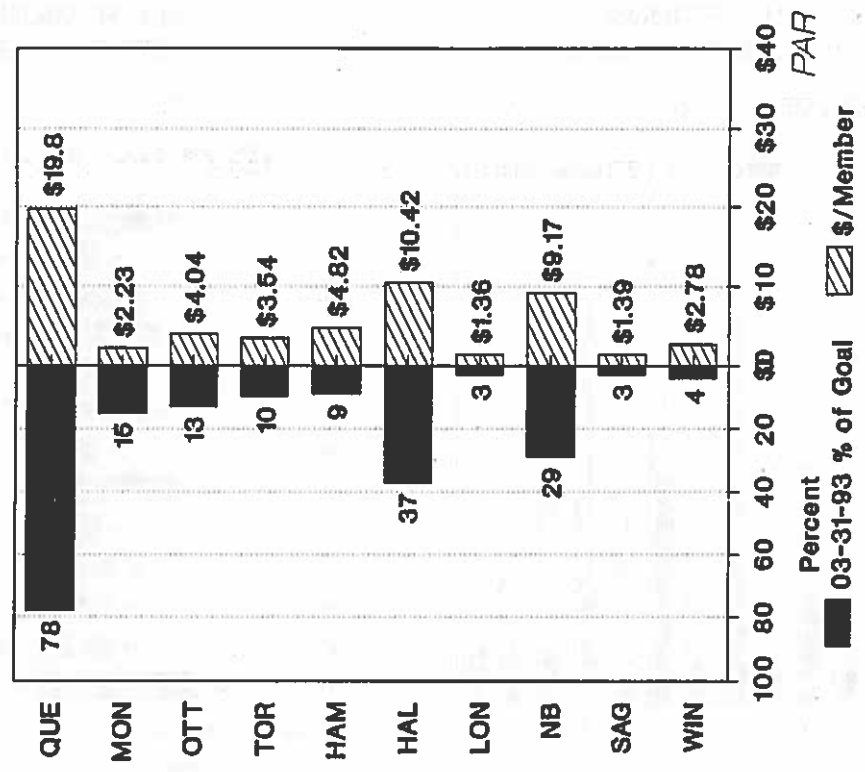
\* 1992-93 Research Promotion High 5 Award Candidates



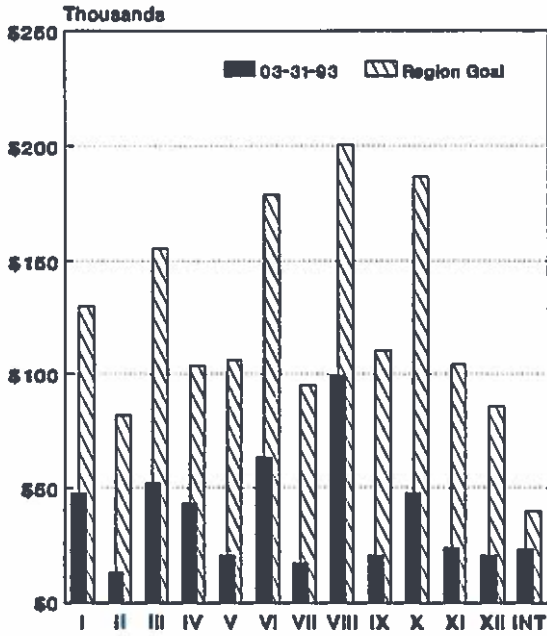
## REGION II Year-to-Date/Goal



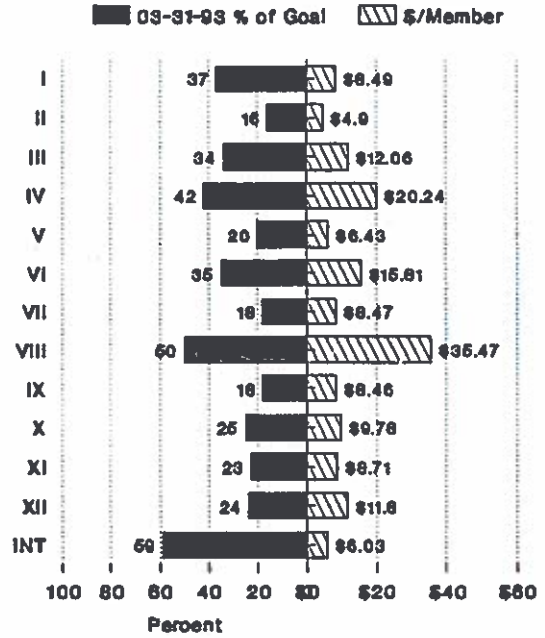
## PROGRESS



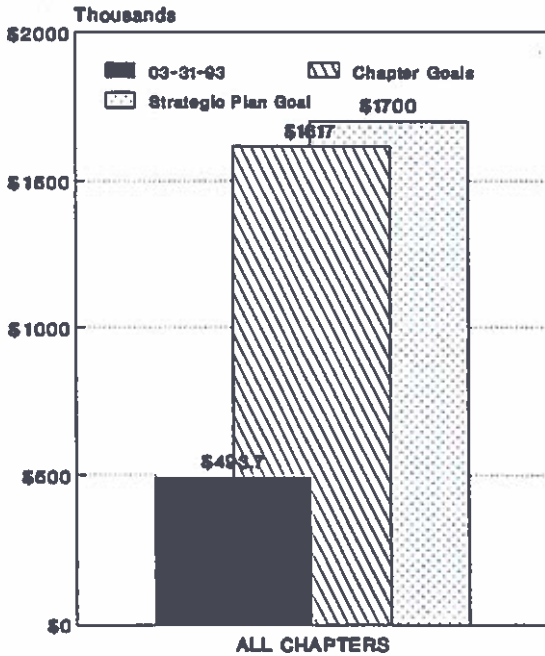
### All REGIONS Year-to-Date/Goal



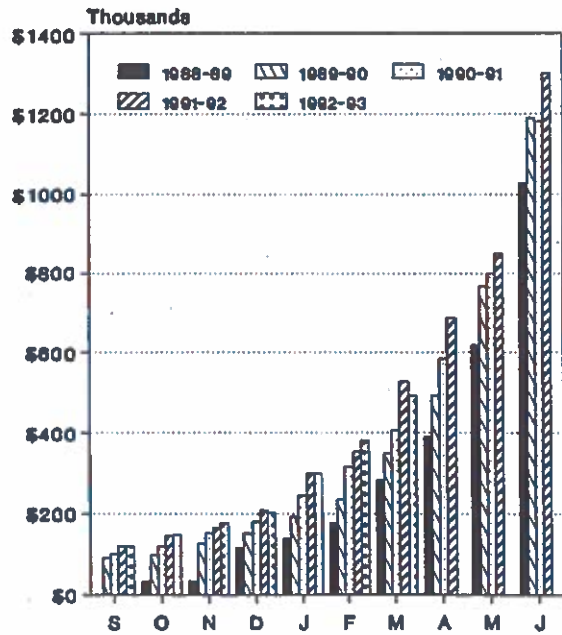
### ALL REGIONS PERCENT OF GOAL



### YTD TO GOAL



### MONTHLY YTD CONTRIBUTIONS COMPARED WITH PRIOR YEARS





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CHORLEY & BISSET LTD.	
LONDON	ONTARIO
FILE NO.	
REC'D APR 23 1993	
1026	

Thomas Anderson, CFRE  
 Manager of Research Promotion

TO: Research Promotion Chapter Chairmen  
 FROM: Thomas Anderson  
 DATE: April 16, 1993  
 SUBJECT: Mid-April Research Contributions Report

TA

Year-to-date research contributions lag last year's totals with \$548,280 received in Atlanta [32.3% of chapter goals and 9% (\$60,877) behind last year]. About 25% of RP chairmen are more than half way to goal.

I encourage you to carefully review the letter from Dennis Kiselbach, Research Promotion Chairman of Society Committee, and the accompanying corporate prospect information. Chapters should rely on past contributors to reach their goal, but, solicitation of these newly identified firms can help you to exceed your goal.

**Goal Buster**

Congratulations to Benjamin Sun, Hawaii Research Promotion Chairman, for exceeding goal, PAR and establishing a new High Five. Thanks for an outstanding job. His work in finding friends and investors for ASHRAE Research is appreciated.

**Excellence in Research Promotion**

The Best Ten include 23 different ASHRAE chapters. Five chapters are new to one or more categories (bold type). Congratulations to our leading chairmen for a fine job.

\$ per Member		# Contributors through 4-15-93		\$ Contributed through 4-15-93	
Rockford	\$124.09	Dallas	250	Dallas	\$ 24,775
Austin	69.19	C. Oklahoma	210	C. Oklahoma	22,127
E. Texas	64.92	Houston	185	Minnesota	20,046
Hawaii	62.40	Austin	174	Hawaii	18,345
N. Piedmont	61.11	Hawaii	156	Austin	13,631
C. Oklahoma	57.32	St. Louis	136	St. Louis	13,075
Dallas	49.16	N. Piedmont	114	Fla. W. Coast	12,778
Iowa	43.83	<b>Oregon</b>	114	Baltimore	12,513
<b>W. Texas</b>	41.45	Baltimore	103	New York	12,428
C. Pennsylvania	40.39	New York	103	Atlanta	12,424

% of Goal		% Contributors to Members	
Rockford	187.2%	Austin	88.3%
Hawaii	101.9	N. Piedmont	61.0
Dallas	91.1	C. Oklahoma	54.4
Iowa	88.4	La Crosse	54.1
Hong Kong	87.8	Hawaii	53.1
N. Piedmont	84.7	Dallas	49.6
C. Illinois	81.0	E. Texas	43.3
Quebec	77.8	Houston	33.8
Fla. W. Coast	77.4	Iowa	33.6
Pittsburgh	76.9	C. Illinois	33.1

Distribution: RP Committee  
Regional Directors  
Chapter Presidents  
Frank M. Coda, E DIR  
J. Richard Wright, D TECH  
John E. Wolfert  
Gary L. Cooper  
Raymond E. Ruf

George A. Jackins, DAL  
Frederick J. Pearson, V-PRES  
Conny R. Brown, R&T  
Kenneth W. Dean, ARC  
John Blossom  
David Lee Kittrell  
David E. Knebel

# 1992-93 GOAL BUSTERS

(Chronological Order)

Congratulations on a successful year. Your success enables ASHRAE to keep its commitment of meeting the technology needs of the HVAC&R industry.

<u>RP Chairman</u>	<u>Chapter</u>	<u>Region</u>	<u>High 5</u>	<u>PAR</u>	<u>% Goal</u>
William J. Kushner	Rockford	VI	Yes	Yes	187.2%
New Since Last Report					
Benjamin P. Sun	Golden Gate	X	Yes	Yes	101.9

Who will be the next Goal Buster?

Will it be the RP Chairman from Dallas, Iowa or North Piedmont?

Or will it be YOU?

## Goal Completion Analysis

<u>% of Chap Goal</u>	<u># Chapters</u>	<u>% Total Chapters</u>	<u>Average \$/Member</u>	<u>\$ Needed to Reach Goal</u>
100% +	2	1.3%	\$ 93.25	\$ 0
80-99%	5	3.2%	\$ 38.66	\$ 4,863
50-79%	32	20.8%	\$ 24.27	\$ 142,312
25-49%	46	29.9%	\$ 14.69	\$ 308,290
10-24%	27	17.5%	\$ 7.44	\$ 245,969
< 10%	42	27.3%	\$ 2.86	\$ 341,124
<b>Total</b>	<b>154</b>	<b>100.0%</b>	<b>\$ 12.85</b>	<b>\$ 1,042,558</b>

YEAR-TO-DATE RESEARCH INVESTMENT REPORT

April 15, 1993

<u>Region</u>	<u>Sum of Chapter Goals</u>	<u>V Chm Goal</u>	<u>Mar 31 Cum Amount</u>	<u>% of Chp Goal</u>	<u>Apr 15 Cum Amount</u>	<u>% of Chap Goal</u>
I	\$ 130,000	\$ 130,000	\$47,963	36.9	\$51,616	39.7
II	82,000	82,000	13,345	16.3	15,895	19.4
III	155,500	155,500	52,118	33.5	56,636	36.4
IV	103,800	103,800	43,491	41.9	46,376	44.7
V	106,480	106,480	20,917	19.6	25,932	24.4
VI	179,105	179,105	63,290	35.3	72,206	40.3
VII	95,290	100,000	17,351	18.2	20,032	20.0
VIII	200,635	200,635	99,350	49.5	107,006	53.3
IX	110,790	110,790	20,417	18.4	22,227	20.1
X	192,700	192,700	48,025	24.9	54,475	28.3
XI	104,448	104,448	24,158	23.1	31,974	30.6
XII	85,893	85,893	20,700	24.1	21,706	25.3
INTL	40,100	40,100	23,710	59.1	23,805	59.4
OTHER	<u>30,000</u>	<u>30,000</u>	<u>-1,125</u>	<u>-3.8</u>	<u>-1,605</u>	<u>-5.4</u>
TOTAL	\$1,616,741	\$1,621,451	\$493,711	30.5	\$548,280	33.9

Next Report on May 3, 1993

Including checks received by Noon, April 30

**RESEARCH PROMOTION FUNDS RECEIVED**  
**Compared with Prior Years**

<u>As of</u>	<u>90-91</u>		<u>91-92</u>		<u>92-93</u>	
	Amt	%*	Amt	%*	Amt	%*
Sept 30	\$ 94,254	5.9	\$ 121,415	7.2	\$ 119,460	7.0
Oct 31	119,920	7.5	146,792	8.7	148,754	8.8
Nov 30	151,061	9.4	166,124	9.9	176,093	10.4
Dec 31	179,033	11.2	210,349	12.5	204,490	12.0
Jan 31	244,115	15.8	300,278	17.9	299,675	17.6
Feb 28	314,245	19.6	353,805	21.1	380,654	22.4
Mar 15	356,596	22.3	422,962	25.2	427,016	25.1
Mar 31	407,430	25.5	528,348	31.4	493,711	29.0
Apr 15	487,087	30.4	609,157	36.3	548,280	33.9
Apr 30	586,768	36.7	687,997	41.0		
May 15	704,220	44.0	797,793	47.5		
May 31	799,789	50.0	850,322	50.6		
Jun 15	878,514	54.9	958,387	57.1		
Jun 30 - Final	\$1,181,141	79.0	\$1,303,560	77.6		

\*% of goal:      90-91 Budget \$1,600,000  
                      91-92 Budget \$1,680,000  
                      92-93 Budget \$1,700,000

**1992-93 CONTRIBUTIONS BY SOURCE**

<u>Source</u>	<u>\$\$\$</u>	<u>Number</u>	<u>Average Contribution</u>
Golden Circle	\$ 30,000	3	\$10,000.00
Dual	24,390	132	184.77
Direct	60,117	342	175.78
Chap RP Vols	319,004	2,774	115.00
Direct Mail	250	1	250.00
Telephone	300	5	60.00
Dues	<u>114,221</u>	<u>1,958</u>	<u>58.34</u>
Totals	\$ 548,281	5,215	\$105.14

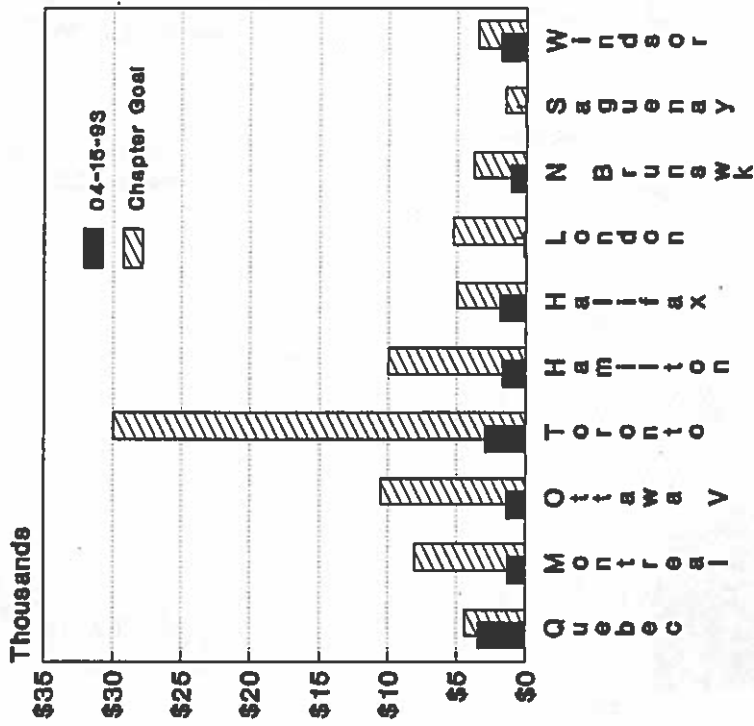
YEAR-TO-DATE RESEARCH CONTRIBUTIONS SUMMARY

April 15, 1993

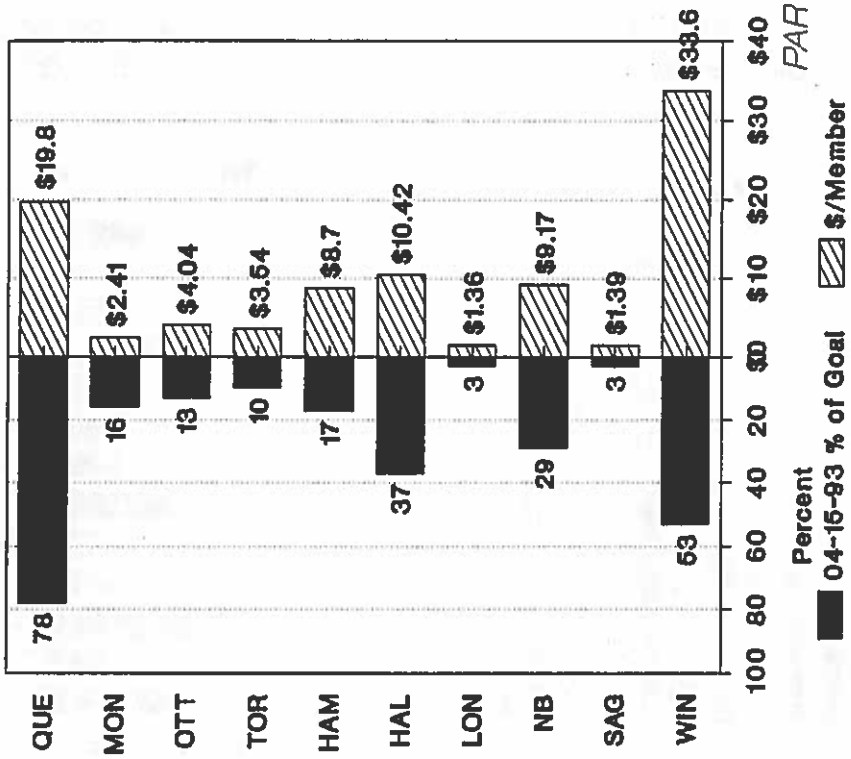
REG	CHAP	CHAPTER	MEMB	GOAL	YTD	% OF GOAL	% OF MEMB	YTD	GOAL	\$/MEMB	* HIGH 5
					CONT						AWARD
											CANDIDATES
											*
2	13	Quebec	173	4400	36	3425	77.8%	20.8%	\$19.80	25.43	*
2	14	Montreal	539	8000	15	1300	16.3%	2.8%	\$2.41	14.84	
2	15	Ottawa	341	10500	5	1378	13.1%	1.5%	\$4.04	30.79	
2	16	Toronto	839	30000	33	2971	9.9%	3.9%	\$3.54	35.76	
2	37	Hamilton	193	10000	17	1680	16.8%	8.8%	\$8.70	51.81	
2	100	Halifax	178	5000	18	1854	37.1%	10.1%	\$10.42	28.09	
2	116	London	110	5300	2	150	2.8%	1.8%	\$1.36	48.18	*
2	117	N Brunswick	120	3800	9	1100	28.9%	7.5%	\$9.17	31.67	
2	140	Saguenay	36	1500	1	50	3.3%	2.8%	\$1.39	41.67	
2	141	Windsor	55	3500	14	1853	52.9%	25.5%	\$33.69	63.64	
2	153	Other	140	0	2	135		1.4%	\$0.96	0.00	
2	902	Total	2724	82000	152	15895	19.4%	5.6%	\$5.84	\$30.10	



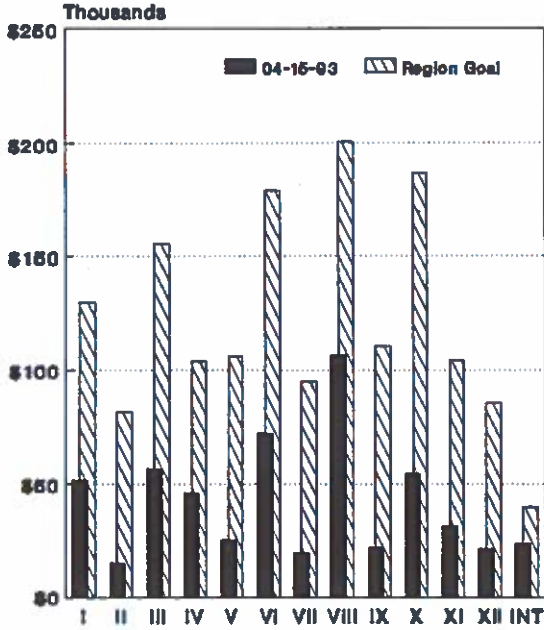
## REGION II Year-to-Date/Goal



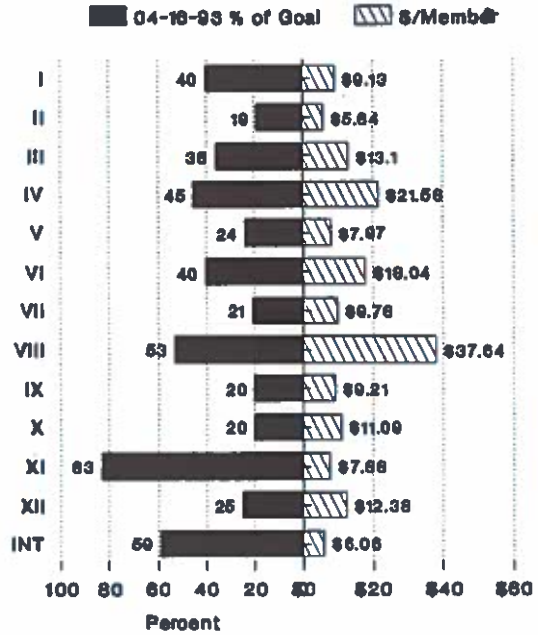
## PROGRESS



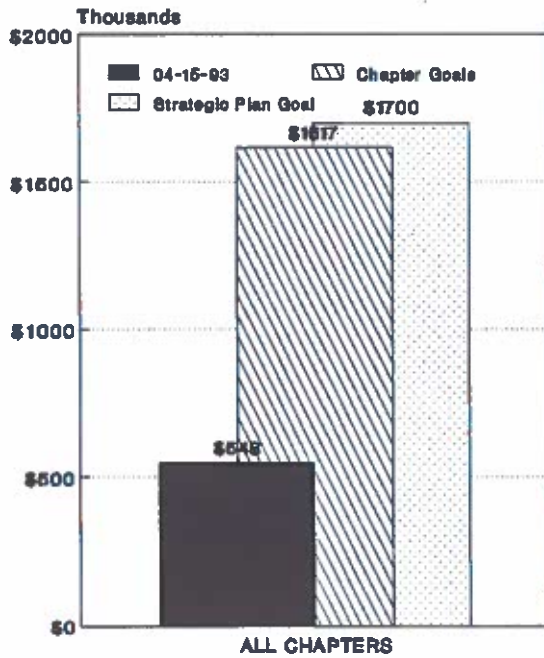
### ALL REGIONS Year-to-Date/Goal



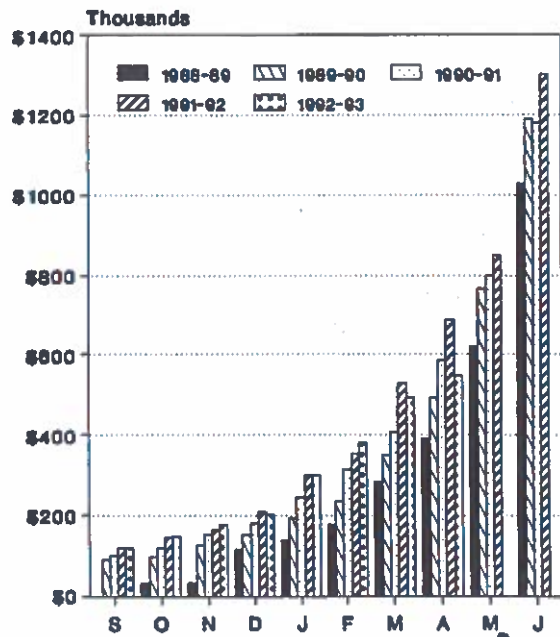
### ALL REGIONS PERCENT OF GOAL



### YTD TO GOAL



### MONTHLY YTD CONTRIBUTIONS COMPARED WITH PRIOR YEARS



A S H R A E  
YTD CHAPTER CONTRIBUTIONS DETAIL REPORT  
FOR ALL DATES

REGION 02 - CHAPTER 116 - LONDON

CONTRIB DATE	S NAME OF CONTRIBUTOR	MEMBER NUMBER	CHECK NUMBER	NON-MEMBER	MEMBER	GENERAL	EARMARKED	MEMORIAL
08/03/92	X RENZO FERRERA	2050869	0214333		50.00	50.00		
03/26/93	I TRANE SALES AGENCY-LONDON	1980988	69871	100.00		100.00		
	CHAPTER 116 - TOTAL	2		100.00	50.00	150.00	0.00	0.00
	HIGHFIVE		5,180					
	CHAPTER GOAL		5,300					
	ASSIGNED MEMBERS (PAGE)		107					
	CONTRIBUTION TOTAL							150.00
	ASSIGNED MEMBERS (PAGE)							107
	CHAPTER GOAL							
	PER ASSIGNED MEMBER		49.53					1.40



A S H R A E  
YTD CHAPTER CONTRIBUTIONS DETAIL REPORT  
FOR ALL DATES

REGION 02 - CHAPTER 116 - LONDON

CONTRIB DATE	S NAME OF CONTRIBUTOR	MEMBER NUMBER	CHECK NUMBER	NON-MEMBER	MEMBER	GENERAL	TYPE	MEMORIAL
08/03/92	X RENZO FERRERA	2050869	02143333		50.00	50.00		
03/26/93	I TRANE SALES AGENCY-LONDON	1980988	69871	100.00		100.00		
04/22/93	I LONDON CANADA CHAPTER ASH	5050308	70682	1,000.00		1,000.00		
04/22/93	I JOHNSON CONROLS LIMITED-	2012904	70685	125.00		125.00		
04/22/93	I GLOVER HILL INCORPORATED	2023101	70684	300.00		300.00		
04/22/93	I E & M DESIGNED SALES & SE	2023100	70686	125.00		125.00		
05/14/93	I UNION GAS LIMITED-CHATAM	5048033	70683	1,000.00		1,000.00		
05/14/93	I CHORLEY & BISSET LIMITED	1917556	71554	500.00		500.00		
05/14/93	I CONTROL SYSTEMS-ONTARIO	2041798	71553	125.00		125.00		
05/14/93	I DRENNAN REFRIGERATION INC	5029330	71552	250.00		250.00		

CHAPTER 116 - TOTAL 10 3,525.00 50.00 3,575.00 0.00 0.00

HIGHERIVE  
CHAPTER GOAL 5,180  
ASSIGNED MEMBERS (PAGE) 5,300  
CONTRIBUTION TOTAL 3,575.00  
ASSIGNED MEMBERS (PAGE) 107  
CHAPTER GOAL PER ASSIGNED MEMBER 49.53  
CONTRIBUTIONS PER ASSIGNED MEMBER 33.41

OPG





1791 Tullie Circle NE • Atlanta, Georgia 30329-2305 ☎ 404-636-8400 • Fax 404-321-5478

Thomas Anderson, CFRE  
 Manager of Research Promotion

TO: Research Promotion Chapter Chairmen  
 FROM: Thomas Anderson *TA*  
 DATE: May 3, 1993  
 SUBJECT: April Research Contributions Report

Year-to-date research contributions are \$667,999 received in Atlanta [41.3% of chapter goals and 3% (\$19,998) behind last year]. One month remains to obtain 75 PAOE bonus points for obtaining a High Five by May 31. I hope each of you will strive to reach this milestone and achieve the best results ever for your chapter.

### Goal Busters

Apologies to Franklin Y.S. Lum, Hawaii Research Promotion Chairman, for missing his name as "Goal Buster" on my last report. Congratulations to Frank and the three new "Goal Buster" chairmen for an outstanding job:

Kenneth M. Fulk, Dallas RP Chairman  
 Mervyn Buhl, Saskatoon RP Chairman  
 William J. Pitz, Baltimore RP Chairman

### Excellence in Research Promotion

The **Best Ten** include 20 different ASHRAE chapters. Five chapters are new to one or more categories (bold type). Congratulations to our leading chairmen for a fine job.

\$ per Member		# Contributors through 4-30-93		\$ Contributed through 4-30-93	
Rockford	\$124.09	Dallas	264	Dallas	\$ 29,025
Austin	88.51	Houston	239	Minnesota	25,096
<b>N.E. Oklahoma</b>	<b>68.77</b>	Austin	233	Baltimore	22,153
E. Texas	67.00	C. Oklahoma	211	C. Oklahoma	22,132
Hawaii	65.80	Oregon	184	Hawaii	19,345
N. Piedmont	61.11	Hawaii	166	Austin	17,436
Dallas	57.59	St. Louis	143	<b>Houston</b>	<b>15,551</b>
C. Oklahoma	57.34	Baltimore	123	St. Louis	14,975
Alamo	52.03	N. Piedmont	114	N.E. Oklahoma	13,342
Iowa	46.60	New York	109	New York	13,278

% of Goal		% Contributors to Members	
Rockford	187.2%	Austin	118.3
Saskatoon	117.5	N. Piedmont	61.0
Dallas	116.1	Hawaii	56.5
Baltimore	108.1	N.E. Oklahoma	55.2
Hawaii	107.5	C. Oklahoma	54.7
Alamo	94.8	La Crosse	54.1
Iowa	94.0	Dallas	52.4
N.E. Oklahoma	92.0	E. Texas	50.0
Hong Kong	91.8	Houston	43.6
Quebec	87.7	Saskatoon	41.7

Distribution: RP Committee  
Regional Directors  
Chapter Presidents  
Frank M. Coda, E DIR  
J. Richard Wright, D TECH  
John E. Wolfert  
Gary L. Cooper  
Raymond E. Ruf

George A. Jackins, DAL  
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John Blossom  
David Lee Kittrell  
David E. Knebel



# 1992-93 GOAL BUSTERS

(Chronological Order)

Congratulations on a successful year. Your success enables ASHRAE to keep its commitment of meeting the technology needs of the HVAC&R industry.

<u>RP Chairman</u>	<u>Chapter</u>	<u>Region</u>	<u>High 5</u>	<u>PAR</u>	<u>% Goal</u>
William J. Kushner	Rockford	VI	Yes	Yes	187.2%
Franklin Y.S. Lum	Hawaii	X	Yes	Yes	107.5

## New Since Last Report

Kenneth M. Fulk	Dallas	VIII	Yes	Yes	116.1%
Mervyn Buhl	Saskatoon	XI	No	No	117.5
William J. Pitz	Baltimore	III	No	No	108.1

Who will be the next Goal Buster?

Will it be the RP Chairman from N.E. Oklahoma, Quebec or Florida W. Coast?

Or will it be YOU?

## Goal Completion Analysis

<u>% of Chap Goal</u>	<u># Chapters</u>	<u>% Total Chapters</u>	<u>Average \$/Member</u>	<u>\$ Needed to Reach Goal</u>
100% +	5	3.2%	\$ 62.30	\$ 0
80-99%	8	5.2%	\$ 38.68	\$ 7,578
50-79%	43	27.9%	\$ 26.99	\$ 173,574
25-49%	43	27.9%	\$ 14.36	\$ 280,497
10-24%	24	15.6%	\$ 8.52	\$ 229,700
< 10%	31	20.1%	\$ 2.44	\$ 243,155
Total	154	100.0%	\$ 15.51	\$ 934,503

**YEAR-TO-DATE RESEARCH INVESTMENT REPORT**

April 30, 1993

<u>Region</u>	<u>Sum of Chapter Goals</u>	<u>V Chm Goal</u>	<u>Apr 15 Cum Amount</u>	<u>% of Chp Goal</u>	<u>Apr 30 Cum Amount</u>	<u>% of Chap Goal</u>
I	\$ 130,000	\$ 130,000	\$51,616	39.7	\$58,880	45.3
II	82,000	82,000	15,895	19.4	22,605	27.6
III	155,500	155,500	56,636	36.4	69,151	44.5
IV	103,800	103,800	46,376	44.7	49,576	47.8
V	106,480	106,480	25,932	24.4	30,932	29.0
VI	179,105	179,105	72,206	40.3	84,536	47.2
VII	95,290	100,000	20,032	21.0	27,227	28.0
VIII	200,635	200,635	107,006	53.3	141,524	70.5
IX	110,790	110,790	22,227	20.1	32,777	29.6
X	192,700	192,700	54,475	28.3	62,905	32.6
XI	104,448	104,448	31,974	30.6	43,994	42.1
XII	85,893	85,893	21,706	25.3	23,708	27.6
INT'L	40,100	40,100	23,805	59.4	20,465	51.0
OTHER	<u>30,000</u>	<u>30,000</u>	<u>-1,605</u>	<u>-5.4</u>	<u>-280</u>	<u>-0.9</u>
TOTAL	\$1,616,741	\$1,621,451	\$548,280	33.9	\$667,999	41.3

Next Report on May 17, 1993  
Including checks received by Noon, April 14

**RESEARCH PROMOTION FUNDS RECEIVED**

Compared with Prior Years

<u>As of</u>	<u>90-91</u>		<u>91-92</u>		<u>92-93</u>	
	Amt	%*	Amt	%*	Amt	%*
Sept 30	\$ 94,254	5.9	\$ 121,415	7.2	\$ 119,460	7.0
Oct 31	119,920	7.5	146,792	8.7	148,754	8.8
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Apr 30	586,768	36.7	687,997	41.0	667,999	39.3
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Jun 15	878,514	54.9	958,387	57.1		
Jun 30 - Final	\$1,181,141	79.0	\$1,303,560	77.6		

\*% of goal:      90-91 Budget \$1,600,000  
                      91-92 Budget \$1,680,000  
                      92-93 Budget \$1,700,000

**1992-93 CONTRIBUTIONS BY SOURCE**

<u>Source</u>	<u>\$\$\$</u>	<u>Number</u>	<u>Average Contribution</u>
Golden Circle	\$ 40,000	4	\$10,000.00
Dual	28,606	151	189.67
Direct	68,606	380	180.54
Chap RP Vols	413,650	3,554	116.39
Direct Mail	250	1	250.00
Telephone	2,435	32	76.09
Dues	<u>114,421</u>	<u>1,962</u>	<u>58.32</u>
Totals	\$ 668,001	6,084	\$109.80

YEAR-TO-DATE RESEARCH CONTRIBUTIONS SUMMARY  
April 30, 1993

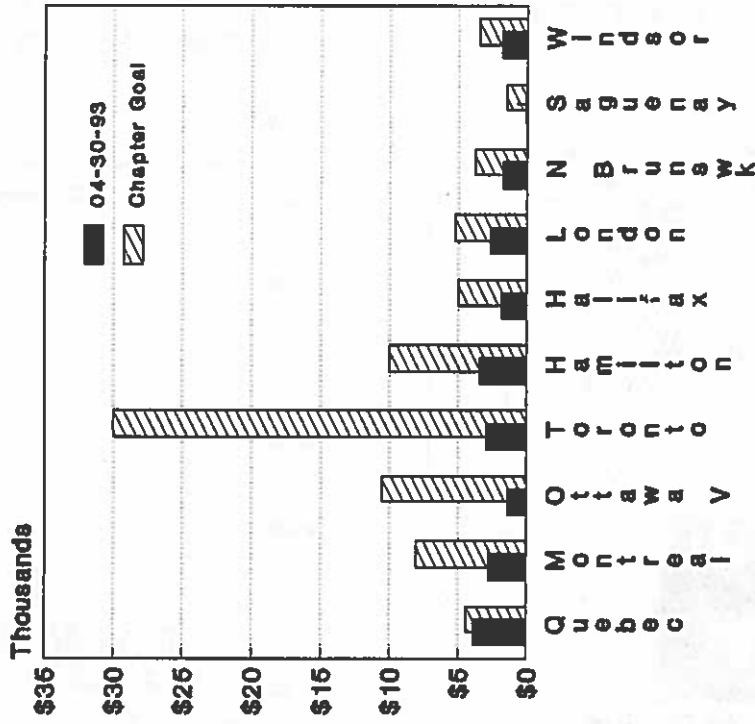
REG	CHAP	CHAPTER	MEMB	GOAL	YTD CONT	YTD \$	% OF GOAL	% OF MEMB	YTD \$/MEMB
2	13	Quebec	173	4400	39	3860	87.7%	22.5%	\$22.31
2	14	Montreal	539	8000	34	2720	34.0%	6.3%	\$5.05
2	15	Ottawa	341	10500	5	1378	13.1%	1.5%	\$4.04
2	16	Toronto	839	30000	33	2971	9.9%	3.9%	\$3.54
2	37	Hamilton	193	10000	22	3380	33.8%	11.4%	\$17.51
2	100	Halifax	178	5000	18	1854	37.1%	10.1%	\$10.42
2	116	London	110	5300	7	2700	50.9%	6.4%	\$24.55
2	117	N Brunswick	120	3800	11	1705	44.9%	9.2%	\$14.21
2	140	Saguenay	36	1500	1	50	3.3%	2.8%	\$1.39
2	141	Windsor	55	3500	14	1853	52.9%	25.5%	\$33.69
2	153	Other	140	0	2	135		1.4%	\$0.96
2	902	Total 2	2724	82000	186	22605	27.6%	6.8%	\$8.30

1992-93 PAOE CALCULATIONS-ADDITIONAL DOLLARS NEEDED FOR GOALS AND AWARDS  
05/03/93

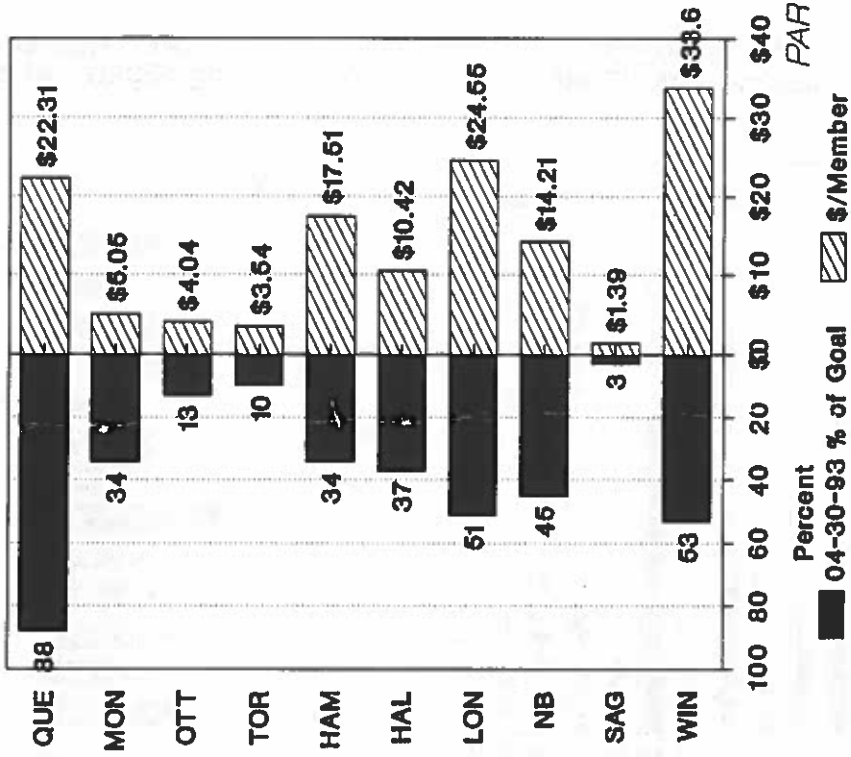
YTD RP PAOE	YTD \$ PER MEMBER	CHAPTER	ADDT'L \$ FOR 400+ PAOE	ADDT'L \$ FOR 200 PAOE	ADDT'L \$ FOR CHAP GOAL	ADDT'L \$ FOR NEW HIGH 5
212	\$21.21	QUEBEC	\$3,420	\$0	\$540	\$501 *
53	\$5.29	MONTREAL	\$17,840	\$7,560	\$5,280	\$4,135
39	\$3.91	OTTAWA V.	\$12,702	\$5,662	\$9,122	\$13,258
61	\$3.61	TORONTO	\$27,892	\$11,432	\$27,029	\$31,456
176	\$17.60	HAMILTON	\$4,300	\$460	\$6,620	\$5,616
108	\$10.78	HALIFAX	\$5,026	\$1,586	\$3,146	\$5,685
252	\$25.23	LONDON	\$1,580	\$0	\$2,600	\$2,481 *
151	\$15.09	NEW BRUNSWICK	\$2,815	\$555	\$2,095	\$1,276
15	\$1.47	SAGUENAY-LAC	\$1,310	\$630	\$1,450	\$1,576
325	\$32.51	WINDSOR	\$427	\$0	\$1,647	\$1,553
127	\$8.83	REGION II AVG.	1392	TOTAL RP PAOE		\$67,528

\* 1992-93 Research Promotion High 5 Award Candidates

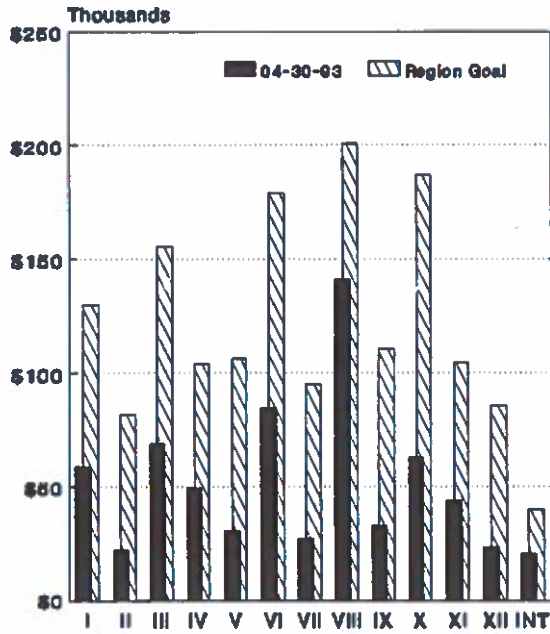
## REGION II Year-to-Date/Goal



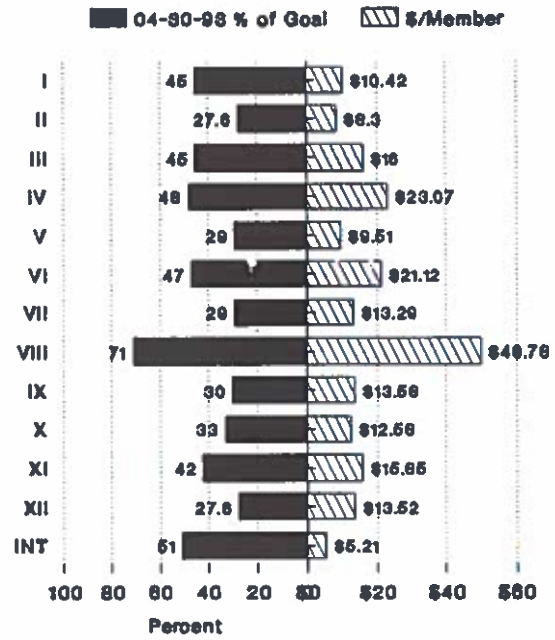
## PROGRESS



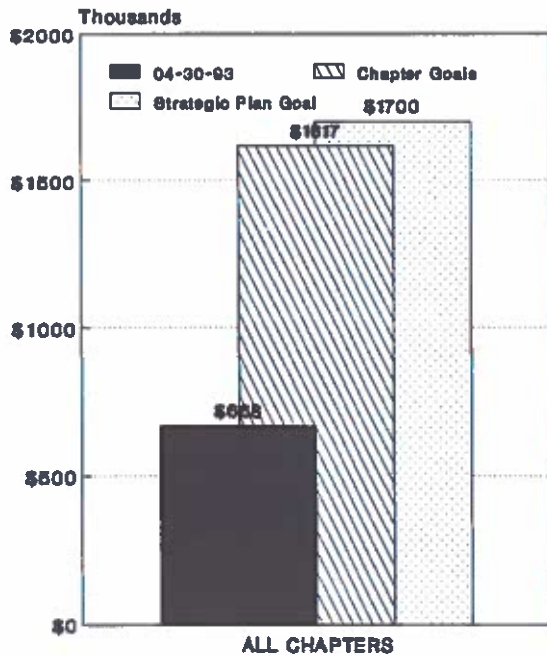
### All REGIONS Year-to-Date/Goal



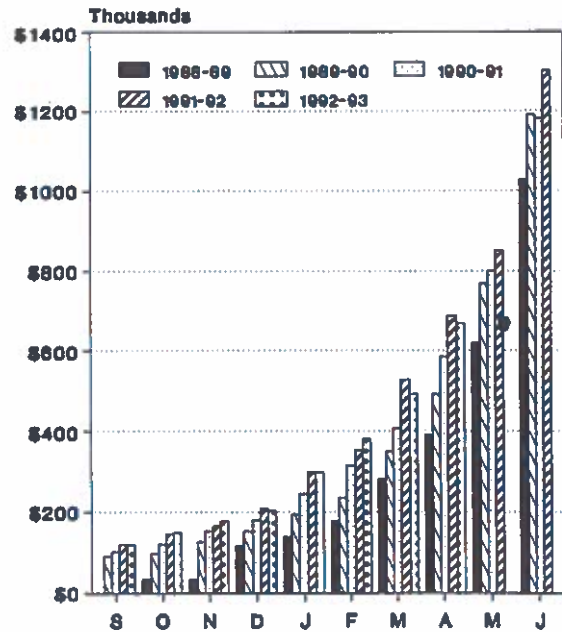
### ALL REGIONS PERCENT OF GOAL



### YTD TO GOAL



### MONTHLY YTD CONTRIBUTIONS COMPARED WITH PRIOR YEARS





1791 Tullie Circle NE • Atlanta, Georgia 30329-2305 ☎ 404-636-8400 • Fax 404-321-5478

Thomas Anderson, CFRE  
Manager of Research Promotion

TO: Research Promotion Chapter Chairmen  
FROM: Thomas Anderson  
DATE: May 17, 1993  
SUBJECT: Mid-May Research Contributions Report

Year-to-date research contributions are \$744,851 received in Atlanta [46.1% of chapter goals and 7% (\$52,942) behind last year].

#### PAOE Bonus

In Research Promotion one milestone is obtaining a **High Five** (most dollars collected in last five years). Chapters that continue to exceed their best year are the reason ASHRAE is able to expand its research. To recognize those chapters, a 75 point RP PAOE bonus will be awarded to all chapters accomplishing the High Five by May 31, 1993. Congratulations to the chairmen that have already accomplished their High Five:

C. Brian Wandling, Evansville  
Ronald C. Johnson, Cedar Valley  
Wayne F. Spell III, Mississippi  
Kenneth M. Fulk, Dallas  
Tony Moore, Northeastern Oklahoma  
Patrick R. Kroos, Hong Kong  
Gregory M. Pelsner, Oregon

William J. Kushner, Rockford  
Walter S. Barnes, Jr., New Orleans  
James T. Rodriguez, Alamo  
Tom A. Willis, Central Oklahoma  
Franklin YS Lum, Hawaii  
Varadhan Seshadri, India

There is still time for additional chapters to reach a **High Five** and obtain 75 PAOE bonus points. I have listed total dollars remaining that need to be collected to obtain this bonus in the section of chapter data (later in this report). May 31, 1993 is the deadline.

#### Goal Busters

Congratulations to the four new "Goal Buster" chairmen for an outstanding job:

Walter S. Barnes, Jr., New Orleans RP Chairman  
Tom A. Willis, Central Oklahoma RP Chairman  
Wayne F. Spell III, Mississippi RP Chairman  
Stephen M. Fedie, La Crosse Area RP Chairman

### Excellence in Research Promotion

The **Best Ten** include 21 different ASHRAE chapters. Eight chapters are new to one or more categories (**bold type**). Congratulations to our leading chairmen for a fine job.

\$ per Member		# Contributors through 5-15-93		\$ Contributed through 5-15-93	
Rockford	\$124.09	C. Oklahoma	306	C. Oklahoma	\$ 36,741
C. Oklahoma	95.18	Dallas	266	Dallas	29,175
Austin	89.03	Houston	239	Minnesota	28,862
<b>La Crosse</b>	<b>75.72</b>	Austin	235	Baltimore	22,153
N.E. Oklahoma	70.24	Oregon	204	Hawaii	19,920
Hawaii	67.76	Hawaii	173	Austin	17,540
E. Texas	67.00	St. Louis	153	St. Louis	16,340
<b>Mississippi</b>	<b>66.32</b>	Baltimore	123	Houston	15,551
N. Piedmont	63.33	<b>Minnesota</b>	<b>122</b>	<b>British Columbia</b>	<b>13,752</b>
<b>S. Nevada</b>	<b>58.95</b>	N. Piedmont	119	N.E. Oklahoma	13,627
% of Goal		% Contributors to Members			
Rockford	187.2%	Austin	119.3		
New Orleans	130.8	C. Oklahoma	79.3		
Saskatoon	117.5	N. Piedmont	63.6		
Dallas	116.7	La Crosse	61.3		
Hawaii	110.7	Hawaii	58.8		
Baltimore	108.1	N.E. Oklahoma	56.7		
<b>C. Oklahoma</b>	<b>106.4</b>	Dallas	52.8		
<b>Mississippi</b>	<b>106.3</b>	E. Texas	50.0		
<b>La Crosse</b>	<b>105.1</b>	Houston	43.6		
<b>New Mexico</b>	<b>98.9</b>	Saskatoon	41.7		

Distribution: RP Committee  
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 Chapter Presidents  
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 J. Richard Wright, D TECH  
 John E. Wolfert  
 Gary L. Cooper  
 Raymond E. Ruf

George A. Jackins, DAL  
 Frederick J. Pearson, V-PRES  
 Conny R. Brown, R&T  
 Kenneth W. Dean, ARC  
 John Blossom  
 David Lee Kittrell  
 David E. Knebel



# 1992-93 GOAL BUSTERS

(Chronological Order)

Congratulations on a successful year. Your success enables ASHRAE to keep its commitment of meeting the technology needs of the HVAC&R industry.

<u>RP Chairman</u>	<u>Chapter</u>	<u>Region</u>	<u>High 5</u>	<u>PAR</u>	<u>% Goal</u>
William J. Kushner	Rockford	VI	Yes	Yes	187.2%
Franklin Y.S. Lum	Hawaii	X	Yes	Yes	110.7
Kenneth M. Fulk	Dallas	VIII	Yes	Yes	116.7
Mervyn Buhl	Saskatoon	XI	No	No	117.5
William J. Pitz	Baltimore	III	No	No	108.1

## **New Since Last Report**

Walter S. Barnes, Jr.	New Orleans	VII	Yes	Yes	130.8%
Tom A. Willis	Central Okla.	VIII	Yes	Yes	106.4
Wayne F. Spell, III	Mississippi	VII	Yes	Yes	106.3
Stephen M. Fedie	La Crosse Area	VI	No	Yes	105.1

Who will be the next Goal Buster?

Will it be the RP Chairman from New Mexico, Alamo, or Iowa?

Or will it be YOU?

## **Goal Completion Analysis**

<u>% of Chap Goal</u>	<u># Chapters</u>	<u>% Total Chapters</u>	<u>Average \$/Member</u>	<u>\$ Needed to Reach Goal</u>
100% +	9	5.8%	\$ 66.17	\$ 0
80-99%	14	9.1%	\$ 37.55	\$ 16,868
50-79%	41	26.6%	\$ 27.81	\$ 151,729
25-49%	37	24.0%	\$ 14.72	\$ 239,052
10-24%	27	17.5%	\$ 8.14	\$ 240,162
< 10%	26	16.9%	\$ 2.60	\$ 215,370
Total	154	100.0%	\$ 17.31	\$ 863,181

YEAR-TO-DATE RESEARCH INVESTMENT REPORT

May 15, 1993

<u>Region</u>	<u>Sum of Chapter Goals</u>	<u>V Chm Goal</u>	<u>Apr 30 Cum Amount</u>	<u>% of Chp Goal</u>	<u>May 15 Cum Amount</u>	<u>% of Chap Goal</u>
I	\$ 130,000	\$ 130,000	\$58,880	45.3	\$65,885	50.7
II	82,000	82,000	22,605	27.6	24,505	29.9
III	155,500	155,500	69,151	44.5	74,712	48.0
IV	103,800	103,800	49,576	47.8	51,884	50.0
V	106,480	106,480	30,932	29.0	32,339	30.4
VI	179,105	179,105	84,536	47.2	95,383	53.3
VII	95,290	100,000	27,227	28.6	38,402	40.3
VIII	200,635	200,635	141,524	70.5	159,183	79.3
IX	110,790	110,790	32,777	29.6	41,477	37.4
X	192,700	192,700	62,905	32.6	69,789	36.2
XI	104,448	104,448	43,994	42.1	46,959	45.0
XII	85,893	85,893	23,708	27.6	24,158	28.1
INT'L	40,100	40,100	20,465	51.0	20,565	51.3
OTHER	<u>30,000</u>	<u>30,000</u>	<u>-280</u>	<u>-0.9</u>	<u>-390</u>	<u>-1.3</u>
TOTAL	\$1,616,741	\$1,621,451	\$667,999	41.3	\$744,851	46.1

Next Report on May 31, 1993  
Including checks received by Noon, May 28

**RESEARCH PROMOTION FUNDS RECEIVED**

Compared with Prior Years

<u>As of</u>	<u>90-91</u>		<u>91-92</u>		<u>92-93</u>	
	Amt	%*	Amt	%*	Amt	%*
Sept 30	\$ 94,254	5.9	\$ 121,415	7.2	\$ 119,460	7.0
Oct 31	119,920	7.5	146,792	8.7	148,754	8.8
Nov 30	151,061	9.4	166,124	9.9	176,093	10.4
Dec 31	179,033	11.2	210,349	12.5	204,490	12.0
Jan 31	244,115	15.8	300,278	17.9	299,675	17.6
Feb 28	314,245	19.6	353,805	21.1	380,654	22.4
Mar 15	356,596	22.3	422,962	25.2	427,016	25.1
Mar 31	407,430	25.5	528,348	31.4	493,711	29.0
Apr 15	487,087	30.4	609,157	36.3	548,280	33.9
Apr 30	586,768	36.7	687,997	41.0	667,999	39.3
May 15	704,220	44.0	797,793	47.5	744,851	43.8
May 31	799,789	50.0	850,322	50.6		
Jun 15	878,514	54.9	958,387	57.1		
Jun 30 - Final	\$1,181,141	79.0	\$1,303,560	77.6		

\*% of goal:      90-91 Budget \$1,600,000  
                      91-92 Budget \$1,680,000  
                      92-93 Budget \$1,700,000

**1992-93 CONTRIBUTIONS BY SOURCE**

<u>Source</u>	<u>\$\$\$</u>	<u>Number</u>	<u>Average Contribution</u>
Golden Circle	\$ 40,000	4	\$10,000.00
Dual	32,040	166	193.01
Direct	83,030	426	194.91
Chap RP Vols	472,524	3,943	119.84
Direct Mail	250	1	250.00
Telephone	2,435	32	76.09
Dues	<u>114,571</u>	<u>1,965</u>	<u>58.31</u>
Totals	\$ 744,850	6,537	\$113.94

YEAR-TO-DATE RESEARCH CONTRIBUTIONS SUMMARY  
 May 15, 1993

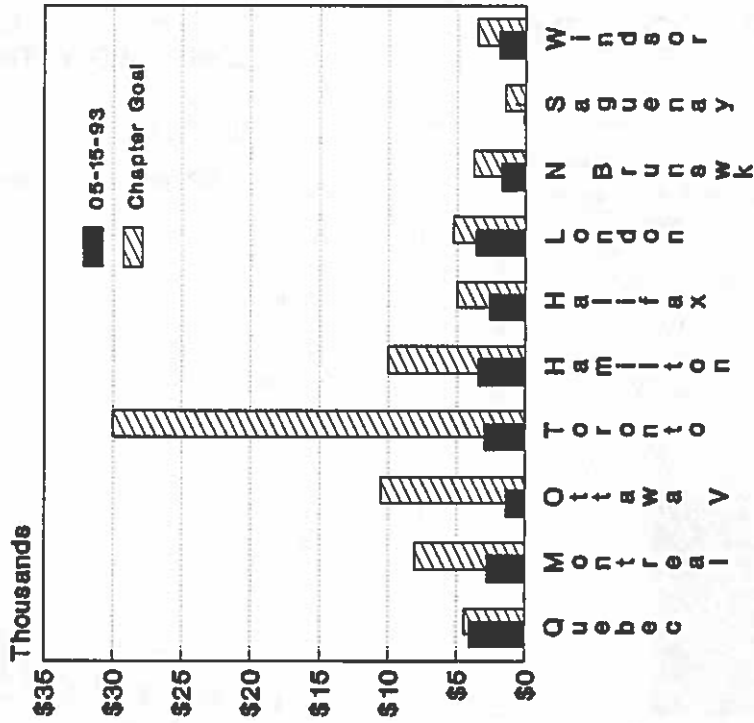
REG	CHAP	CHAPTER	MEMB	GOAL	YTD CONT	YTD \$	% OF GOAL	% OF MEMB	YTD \$/MEMB
2	13	Quebec	173	4400	42	4085	92.8%	24.3%	\$23.61
2	14	Montreal	539	8000	34	2720	34.0%	6.3%	\$5.05
2	15	Ottawa	341	10500	5	1378	13.1%	1.5%	\$4.04
2	16	Toronto	839	30000	33	2971	9.9%	3.9%	\$3.54
2	37	Hamilton	193	10000	22	3380	33.8%	11.4%	\$17.51
2	100	Halifax	178	5000	20	2604	52.1%	11.2%	\$14.63
2	116	London	110	5300	10	3575	67.5%	9.1%	\$32.50
2	117	N Brunswick	120	3800	11	1705	44.9%	9.2%	\$14.21
2	140	Saguenay	36	1500	1	50	3.3%	2.8%	\$1.39
2	141	Windsor	55	3500	15	1903	54.4%	27.3%	\$34.60
2	153	Other	140	0	2	135		1.4%	\$0.96
2	902	Total 2	2724	82000	195	24505	29.9%	7.2%	\$9.00

75 RP PAOE BONUS POINTS ARE AWARDED  
 FOR REACHING HIGH 5 BY MAY 31, 1993

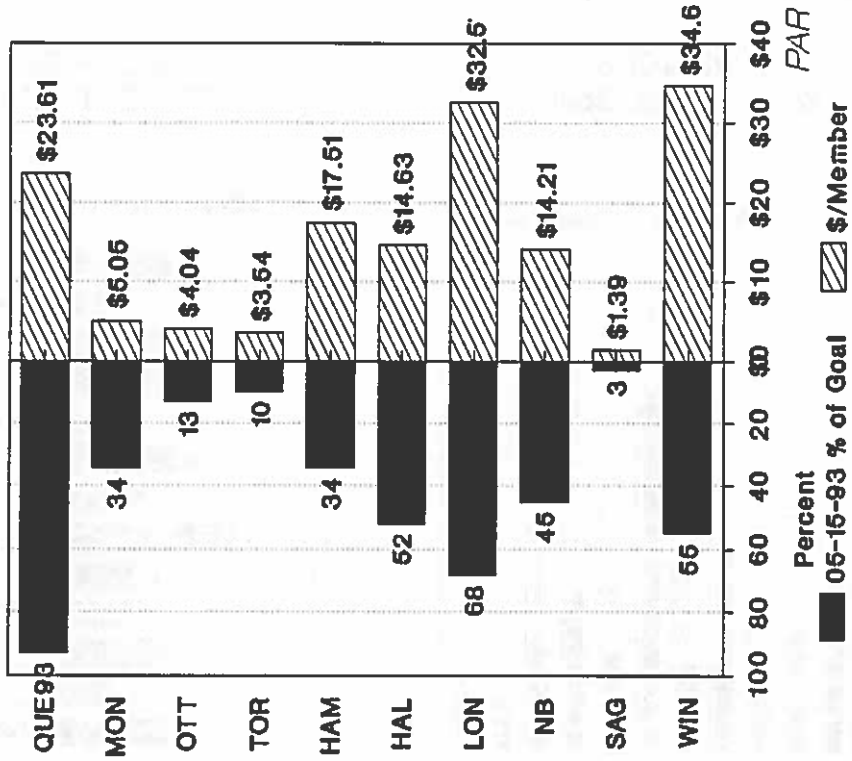
REG CHAP CHAPTER ADDT'L \$ NEEDED  
 FOR NEW HIGH 5

2	13	QUEBEC	\$276
2	14	MONTREAL	\$4,135
2	15	OTTAWA V	\$13,258
2	16	TORONTO	\$31,456
2	37	HAMILTON	\$5,616
2	100	HALIFAX	\$4,935
2	116	LONDON C	\$1,606
2	117	NEW BRUNSWICK	\$1,276
2	140	SAGUENAY-LAC	\$1,576
2	141	WINDSOR	\$1,503
			\$65,628

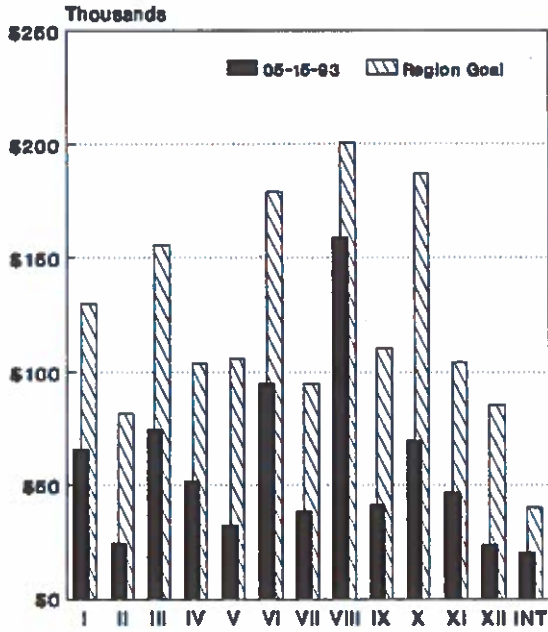
## REGION II Year-to-Date/Goal



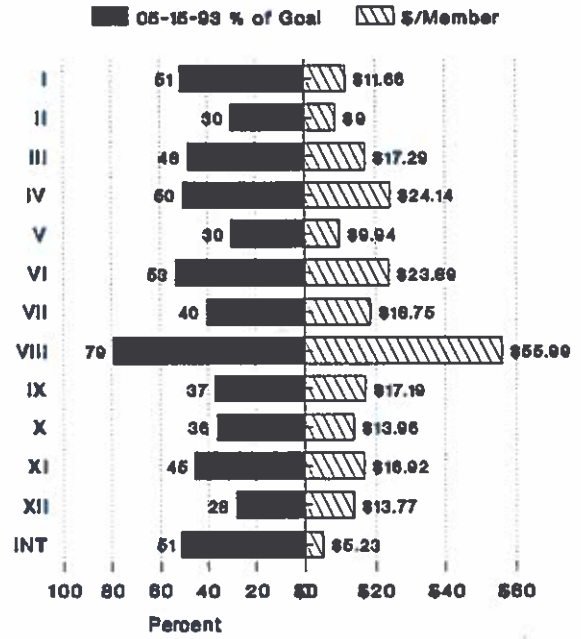
## PROGRESS



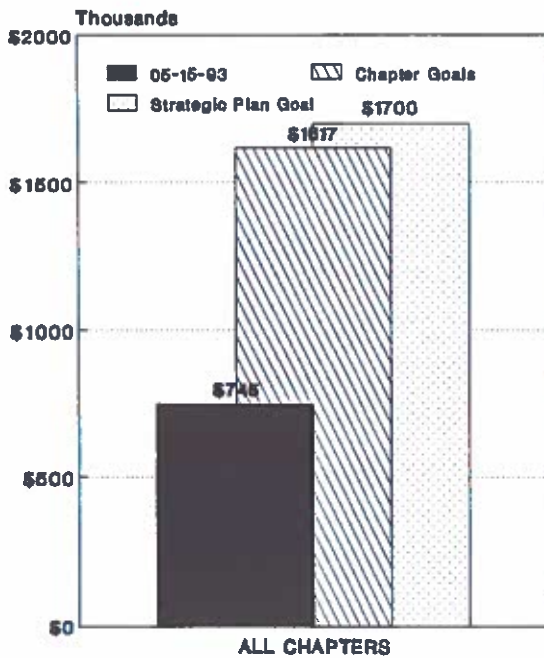
### All REGIONS Year-to-Date/Goal



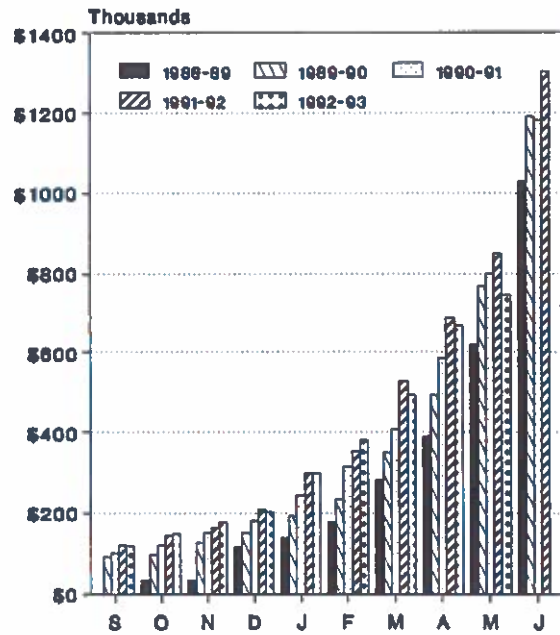
### ALL REGIONS PERCENT OF GOAL



### YTD TO GOAL



### MONTHLY YTD CONTRIBUTIONS COMPARED WITH PRIOR YEARS



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Montreal, Quebec

Affiliated with ASHRAE, 1791 Tullie Circle, NE, Atlanta, GA 30329—U.S.A.

## CONTRIBUTOR/PARTICIPANT

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REPRESENTATIVE  
AND ADDRESS

LONDON CANADA CHAPTER ASHRAE  
C/O OWEN GLENDON

NOM DU  
REPRESENTANT  
ET ADRESSE

521 COLBORNE STREET  
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DATE: April 15 / 92

CHAPTER/  
CHAPITRE London

SOLICITED BY/  
SOLLICITE PAR \_\_\_\_\_

CONTRIBUTION BY—(CHECK 1)  
CONTRIBUTION DE—(COCHER 1)

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COMPANY AND INDIVIDUAL/SOCIÉTÉ ET REPRÉSENTANT  
(FOR DUAL RECOGNITION, CONTRIBUTIONS MUST EQUAL \$125 OR MORE FOR EACH INDIVIDUAL LISTED.)

(POUR QUE DEUX NOMS FIGURENT SUR LA LISTE DES  
DONATEURS, IL FAUT CONTRIBUER 125\$ OU PLUS PAR  
CONTRIBUER 125\$ OU PLUS PAR PERSONNE.)

NAMES OF INDIVIDUALS  
NOMS DES REPRÉSENTANTS \_\_\_\_\_

GENERAL RESEARCH FUND  
FONDS DE RECHERCHE GENERALE

CHECK ENCLOSED/CHEQUE INCLUS

\$ 1000.00

TYPE OF CONTRIBUTION  
GENRE DE CONTRIBUTION

MEMORIAL TO/A LA MEMOIRE DE \_\_\_\_\_

Send acknowledgment to/Faire parvenir accuse de reception a: \_\_\_\_\_

Thank you,/Merci

Signed  
Signature



SOLICITOR/SOLLICITEUR

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Chapter

LONDON

Contributor Number

5050308

C

Chapter Number

116

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Nous tenons à vous remercier pour les contributions antérieures

1991

1990

1989

1988

1987

1000.00

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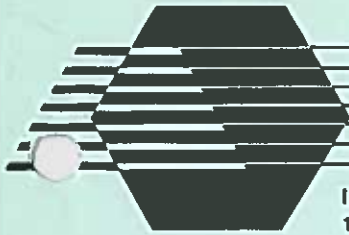
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# RECEIPT/INVOICE RECU/FACTURE



## ASHRAE Research CANADA

NON-PROFIT CANADIAN CORPORATION FOR  
SCIENTIFIC RESEARCH IN CANADA  
SOCIÉTÉ CANADIENNE À BUT NON LUCRATIF  
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<p><b>Contributor Participant</b> LONDON CANADA CHAPTER ASHRAE C/O OWEN GLENDON 521 COLBORNE STREET LONDON, ON N6B 2T6 CANADA</p> <p><b>Address Adresse:</b></p> <p><b>Attention:</b> À L'Attention De: <u>GRANT HILLIARD.</u></p> <p>Make cheques payable to "ASHRAE RESEARCH CANADA" Faire votre cheque payable a "ASHRAE RESEARCH CANADA"</p>	<p>Indicate Name and Address Changes Here Indiquer Tout Changement d'Adresse</p> <p><input type="checkbox"/> BUSINESS TEL. AFFAIRE    <input type="checkbox"/> HOME PHONE TEL. RÉSIDENCE</p> <p>All corporate contributions to ASHRAE RESEARCH CANADA are fully tax deductible under Section 37 (1) of the Income Tax Act. Toute Contribution à ASHRAE RESEARCH CANADA est déductible aux fins d'impôt en vertu du paragraphe 37 (1) de la loi de l'impôt sur le revenu.</p>
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GENERAL RESEARCH FUND / FONDS DE RECHERCHE GENERALE  
 EARMARK FOR RESEARCH PROJECT (\$1000 minimum)  
AFFECTATION POUR PROJET DE RECHERCHE (MINIMUM 1000\$)

AMOUNT  \$50    \$75    \$125    OTHER \$ 1000.00

DATE: March 15/93    CHAPTER/ CHAPITRE: LONDON CANADA    SOLICITED BY/ SOLLICITE PAR: Daniel K. Boyce

ASHRAE HEADQUARTERS USE ONLY  
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Chapter Chapitre	LONDON	Contributor Number Numero Du Participant	5050308	C
Chapter Number Numero Du Chapitre	116			

We wish to express our thanks for contributions received in the previous fiscal year(s):  
Nous tenons à vous remercier pour les contributions antérieures

1992	1991	1990	1989	1988
1000.00	1000.00	0.00	0.00	0.00

ASSEMBLY

REPUBLICAN PARTY OF CANADA



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- Andersen Corp.
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- Austin Air Balancing Corp.
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- Baltimore Alrocoil Company Inc.
- Blue Flame Gas Assn. of Nebraska
- Benjamin T. Boothe
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- H.E. Butt Grocery Co.
- H.M. Webb & Associates Inc.
- H.W. Goodman, Jr. Engineers Inc.
- Hawaii ASHRAE Chapter
- Henningsen Durham & Richardson Inc.
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- Houston ASHRAE Chapter
- Houston Trans
- Richard O. Hunton
- Husman Corp.-Bridgton
- I.C. Thomasson & Associates Inc.
- Iowa Power & Light Co.
- Jaros Baum & Bolles Consulting Engineers
- JWP Mechanical Services
- Kansas City Power & Light Co.
- Frederick H. Kohlss
- Lennox Industries
- London Canada ASHRAE Chapter
- Louisville ASHRAE Chapter
- Marley Cooling Tower Co.-Mission Woods
- MCA of Memphis Promotion Fund
- Mechanical Contractors Assn. of America Inc.
- Mechanical Contractors Assn.-Chicago
- Brandt Engineering Company Inc.-Dallas
- Paul E. Briscoe
- Broom County NY Assn. of Plumbing Heating & Cooling
- Brown & Root Inc.
- Bullard Roberson Co.
- Burch Associates Inc.
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- Cadillac Fairview Corp. Ltd.
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- Dan P. Cason
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- Columbia Gas of Ohio
- Colvin Engineering Associates Inc.
- Comfort Products Distributing-Kansas City
- Commercial Air Management Inc.
- Kenneth W. Cooper
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- Edwards & Zuck PC Consulting Engineers
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- Memphis ASHRAE Chapter
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- Minneapolis Inc.-St. Louis
- Minnesota ASHRAE Chapter
- Mississippi Power & Light Co.
- Mounthamer ASHRAE Chapter
- Nashville ASHRAE Chapter
- Nashville Gas Company Inc.
- National Capitol ASHRAE Chapter
- Nebbraska ASHRAE Chapter
- New Brunswick ASHRAE Chapter
- New York ASHRAE Chapter
- New York State Electric & Gas Corp.
- Niagara Frontier ASHRAE Chapter
- Northeast ASHRAE Chapter
- Northwestern Oklahoma ASHRAE Chapter
- Northern Illinois Gas Co.
- Northern States Power Co.
- Northwest Natural Gas Co.
- Oklahoma Gas & Electric
- Ontario Hydro
- Pacific Power/Uran Power
- Pacific Power & Light Co.
- Panasonic Industrial Co.
- Pennsylvania Power & Light Co.
- Petitt & Petitt Consulting Engineers Inc.
- Piedmont Oisen Inc.
- Pittsburgh ASHRAE Chapter
- Plumbing & Mechanical Contractors Assn. of Milwaukee & SE Wisconsin
- Portland General Electric
- Potomac Electric Power
- Precision Air Products Co.
- Piglet Sound Power & Light Co.
- Regina ASHRAE Chapter
- Rhode Island ASHRAE Chapter
- Richmond ASHRAE Chapter
- Richmond ASHRAE Chapter Engineering Club
- River City Mechanical Inc.
- Ronack ASHRAE Chapter
- Salt River Project
- San Diego ASHRAE Chapter
- San Diego Gas & Electric Co.
- Sar Jose ASHRAE Chapter
- Sheet Metal Contractors Industry Fund Delaware Local #89
- Sheet Metal & Air Conditioning of Milwaukee Inc.
- Shreveport ASHRAE Chapter
- SMACNA-Los Angeles
- SMACNA-Metro Detroit
- SMACNA-St. Louis
- Smith Seekman Reid Inc.
- Southern California Gas Co.
- Southern Piedmont ASHRAE Chapter
- Southern Union Gas Co.
- Southern Industries
- Sport Valve Co.
- St. Louis ASHRAE Chapter
- Steamfitting Industry Fund of New York & Long Island
- Territoil Inc.
- The Prudential Realty Group
- The Start Fin Foundation Inc.
- The Trane Co.-Clarksville
- Thomas A. Gilberston & Associates
- Toledo ASHRAE Chapter
- Ti County ASHRAE Chapter
- Triangle ASHRAE Chapter
- United Cities Gas Co.
- United Illuminating Co.
- Vancouver Island ASHRAE Chapter
- Venture Foundation Inc.
- Washington Gas Light Co.
- Washington Natural Gas Co.
- West Penn Power Co.
- Wisconsin ASHRAE Chapter
- J. Richard Wright
- Xerox Corp.
- York Air Conditioning Ltd.

Investors of \$500 to \$999

- Elmer Beckel Inc.
- Energy Engineering Associates Inc.
- Energy North Natural Gas
- Engineered Air Balance Co.-Houston
- Entek Inc.
- Enviro Tex
- Fanning Farming & Associates Inc.
- Norris L. Fanning
- Farr Co.-EI Segundo
- Fontanae & Kann Co.
- Ford Motor Co.-Dearborn
- Kerry D. Freeman
- David B. Fruel
- Gayle King Carr & Lynch Inc.
- Gas Metropolitan Inc.
- George W. Jenkins Foundation Inc.
- Georgia Trane Equipment Co.
- Giffels Associates Inc.-Southfield
- L.L. Roy Gifford
- Goodley Weedmark & Associates (1985) Ltd.
- Gilton & Associates Inc.
- Gulf Power Co.
- Gustave A. Larson Co.
- HVAC Mechanical Services-Houston
- Hammel Green & Abrahamson Inc.
- Cyril G. Hansen
- John L. Harrod
- Michael N. Hart
- Heavy Engineering
- Heating Piping Cooling Council
- Louis C. Hoffman, Jr.
- Hoffman & Hoffman Inc.-Greenboro
- William L. Holaday
- Hooper Foundation
- Hurst Facility Services Inc.
- Hutchesson Engineering Products Inc.
- Illinois Power Co.
- Low Blue Flame Assn.
- Low Illinois Gas & Electric Co.
- Insolterm Engineering Ltd.-Mississauga
- J.T. Paik & Company Inc.
- Jack Walters Inc.
- Jalina Holdings Ltd.
- JBA Consulting Engineers
- Joseph R. Loring & Associates Inc.
- Julian Spear Co.
- Keen Engineering Company Ltd.
- Ronald J. Kessner
- Christie R. Kleinman
- Kripp Equipment Inc.
- LA Department of Water & Power Systems
- L.S. Staples Co.
- LaCade Gas Co.
- LCH Systems Inc.
- Lehigh Valley ASHRAE Chapter
- Lennor Industries Ltd.
- Leo A. Daly Co.
- Lewis & Lambert Metal Contractors
- Lieber Associates of Greater LA Inc.
- Limbach Co.
- Long & Associates Inc.-Salt Lake City
- Lorenze & Associates Inc.
- Marysals ASHRAE Chapter
- McClure Engineering Associates
- McKenney's Inc.
- Faye C. McClusison
- Mechanical Contractors Assn. of Dallas
- Mechanical Contractors Assn.-Appleton
- Mechanical Contractors Assn.-Kansas City
- Mechanical Contractors Assn.-St. Louis
- Mechanical Contractors Industry Fund of Houston
- Mechanical Systems Balance Inc.
- Mitchell Financial Ltd.
- Middleton & Associates Inc.-Miami
- Middley Huber Inc.
- Midwest Gas
- Miller-Picking Corp.
- Mills Wilson George Inc.
- Mingledorff's Inc.
- Minneapolis Inc.-St. Paul
- Mississippi Power Co.
- Mississippi Valley Gas Co.
- Missouri Public Service Co.
- Mobile Gas Service Corp.
- Mobile Mechanical Contractors Assn.
- Montgomery ASHRAE Chapter
- Montreal ASHRAE Chapter
- Morris & Associates-Raleigh
- Charles L. Morse
- Mountain Fuel Supply Co.
- Hayward G.S. Murray
- Nalor Hart Industries Inc.
- Nalton & Co.-Dallas
- Nebbraska Trane
- Nevada Power Co.
- North Piedmont ASHRAE Chapter
- North Natural Gas Co.
- Northwest Florida ASHRAE Chapter
- O'Connor Co.-St. Paul
- Oklahoma Natural Gas Co.
- Olsen & Peterson Consulting Engineers
- Ostin Nation Co.-Dallas
- Palmer Plumbing Heating & Air Conditioning
- Parsons Brinckerhoff Quade & Douglas Inc.
- Peoples Gas Light & Coke Co.
- Peoples Natural Gas Co.
- Philadelphia Electric Co.
- Phoenix Design Group
- Pikes Peak ASHRAE Chapter
- Plumbers & Pipelitters Local #12-Birmingham
- Process & Air Conditioning Equipment Inc.
- Professional Engineering Consultants PA
- Public Service Co. of Colorado
- Public Service of North Carolina Inc.
- Pumps Unlimited
- Research Products Corp.
- Raynolds Metals Co.
- Rheem Canada Ltd.
- Jack F. Roberts
- Roofing & Sheet Metal Contractors
- Associates
- Sabot & Rice Inc.-Salt Lake City
- San Joaquin ASHRAE Chapter
- Sandoz Pharmaceuticals Corp.
- Sheet Metal Service Co.-Oklahoma City
- Shen Milson & Wilke Inc.
- SMACNA-Burnaby
- SMACNA-Joliet Area
- SMACNA-Kansas City
- SMACNA-Orange County-Long Beach
- Smith Hinchman & Grylls Associates Inc.
- Erwin Solitow
- South Carolina ASHRAE Chapter
- South Carolina Electric & Gas Co.
- South Texas ASHRAE Chapter
- Southern California Edison Co.
- Suggs Sales & Service
- Superior Valve Co.
- Systems Controls And Services Inc.
- TC. Bearden Co.
- Tampa Electric Co.
- Temperature Equipment Corp.-Melrose Park
- Tempsel Controls Inc.
- Tennessee Valley ASHRAE Chapter
- The Brose Co.
- The Detroit Edison Co.
- The Hershey Foods Corp. Fund
- The North Carolina Alternative Energy Corp.
- The Trane Co.-Salt Lake City
- Thermal Equipment Co.
- Thermo King Corp.
- Tozou-Trane
- Trane Little Rock Sales
- Trinity Contractors Inc.
- TSBA Controls Inc.
- Union Electric Co.
- Vico Inc.
- W.M. Carroll & Co.
- W.W. Gay Mechanical Contractor
- Wade Co.
- Ward Mechanical Equipment Inc.
- West Texas ASHRAE Chapter
- Western Michigan ASHRAE Chapter
- Wichita ASHRAE Chapter
- Wisconsin Insulation Contractors Assn.
- Wisconsin Power & Light Foundation Inc.
- Worthington Air Products Inc.
- Yankee Gas Services Co.
- Yoneda & Associates

Investors of \$250 to \$499

- A.A. Maycock Company Inc.
- AC Corp.
- ACSTICS
- AH Mechanical Contractors Inc.
- A.H. Roy & Associates Ltd.
- A.H. Witt Inc.
- AT Distributors
- Abacus Consultants
- ABCO Refrigeration Supply
- ABS Consultants Inc.
- Advanced Lab Concepts Inc.
- Advanced Thermal Systems Inc.
- Aero Tech Industries Inc.
- Aerovent Inc.
- AES of Tulsa
- Affiliated Engineers Inc.-Madison
- Affiliated Steam Equipment Co.
- Air Conditioning Contractors Assn.-MI. Clemens
- Air Distribution Products
- Air Distribution Products Inc.-Little Rock
- Air Engineers Inc.
- Air Filler Testing Labs
- Air Products & Chemicals Inc.
- Air Side Components Inc.
- Aircon Air Conditioning Co.
- Air Tech Corp.
- Alaska ASHRAE Chapter
- Alaska Mechanical Contractors Associates Inc.
- Albert Weiss Air Conditioning Products Inc.
- Allen & Hoshall Inc.
- Alpha Mechanical Contractors Inc.
- American Family Mutual Insurance Co.
- Andrews Distributing Company Inc.-Nashville
- Appalachian Power Co.
- Applied Mechanical Equipment Inc.
- Edward A. Arens
- Armstrong Forsteth Skold & Rydeem Inc.
- Arrowhead Environmental Control
- Jean Paul Arsenault
- Associated Consulting Engineers Inc.
- Associated Insulation Co.
- Astoring Branch Architects Engineers Inc.
- Atlanta Consulting Engineers
- Aikinson Electronics
- Auer Steel & Heating Supply Co.
- John C. Auslin
- Automated Building Systems Inc.
- Automatic Temperature Controls Inc.
- Avation Mechanical
- B&I Contractors Inc.
- Back Karinski Associates
- Baile Forsteth Inc.
- Barber Colman Co.-Mississauga
- Barge Waggoner Sumner & Cannon Inc.
- Barry Engineering Inc.
- Barry W. Barry
- Batson Engineering PA
- Baymar Air Conditioning Supply Ltd
- BCE Mechanical Inc.
- Beardslee Holland Associates Inc.
- Beaver Engineering Ltd.-Hamilton
- Herbert P. Becker
- Bellme Aircontrols (USA) Inc.
- Ned W. Bell
- Bernard Mechanical Contractors Inc.
- Andrew T. Boggs
- Bohn Refrigeration Co.
- Boiler Supply Company Inc.-Nashville
- Billion Corp. Mechanical Contractor
- William G. Boone
- Bolto Mechanical Corp.
- Roland Bouchillatte
- Bowman & McLean Mechanical
- Brady Trane Sales
- Brandt Engineering Company Inc.-San Antonio
- Beck Mar Sales Ltd.
- Doug Breckenridge
- Bridgers & Paxton Consulting Engineers Inc.
- Brinjac Kamble & Associates
- Brophy Associates Inc.
- Commy R. Brown
- Bryant Heating & Cooling
- Jack B. Buckley
- James A. Buckner
- Building Automation Systems Inc.
- Burgess Group Inc.
- Burlington Industries Inc.
- David S. Butler
- CHE Inc.
- C.M. Hoskins Company Inc.
- C&S Hydraulics Inc.
- California Cooling Supply Company Inc.
- Calumet Region ASHRAE
- Canadian Blower/Canadian Pumps Ltd.
- Capron Company Inc.
- Captive Aive Systems Inc.
- Carnes Company Inc.
- Carrier Bock Co.-Irvine
- Carrier Building Services-Las Vegas
- Carrier Building Systems & Services
- Carrier Eastern
- Carrier Puerto Rico Inc.
- Carrier West Inc.
- Charles Calledge Company Inc.
- Gallert Johnson Corp.
- CCI Mechanical Inc.
- Central Iowa Chapter of Sheet Metal Contractors Inc.
- Central Power & Light Co.
- Central Trane
- Certified Service Company Inc.
- CH2M Hill Central Inc.
- Charmplain Valley ASHRAE Chapter
- Charles D. Jones & Co.
- Cherrington's Inc.
- Stephen A. Chittenden
- Circo System Balance Inc.
- Earl M. Clark
- Kenneth L. Clark
- Cleaver Brooks of Canada Ltd.
- Clemco Pacific
- Climatic Master Inc.
- CLP Management Ltd.
- James E. Cohen
- Colorado Sandront Inc.
- Colorado Interstate Gas
- Columbus & Southern Ohio
- Comfort Control Inc.
- Comfort Zone Systems
- Commercial Sheetmetal Company Inc.
- Computer Service Group Inc.
- Computer Conditioning Corp.
- Conditioned Air Inc.
- Connecticut Natural Gas Corp.
- Conservation Mechanical & Air Inc.
- Continental Mechanical of the Pacific
- Control Management Inc.
- Control Technologies Inc.-Manchester
- Robert E. Cook
- Cook Trane Service Agency
- Carl L. Connally
- Coupland Moran Engineers Inc.-EI Paso
- Howard-Eastman Inc.
- Robert L. Cox
- D.J. Conley Associates Inc.
- DMF Associates Inc.
- DWG Engineering
- D.W. Thomson Consultants Ltd.
- Dan McNeil Co.
- Daniels Calledge Corp.
- John I. Daniels
- Data Power Technology Corp.-Iowa
- Dayton Trane
- Depron Inc.
- Delhi Industries Ltd.
- Delhi Industries Ltd.
- Densand Inc.
- Design Controls Inc.
- Dick Starkard Inc.
- DMG North Inc.
- Donlee Technologies Inc.
- Dorgan Associates Inc.
- Drake Plumbing & Heating Inc.
- Drennan Refrigeration Inc.
- William E. Duke
- Dunham Enterprises Inc.
- Dunham Bush Inc.
- Dunn Lees Smith Klein & Associates
- E.A. Engineering Science & Technology Inc.
- E.K. Strahan Inc.
- E&S Mechanical Services Inc.
- East Texas ASHRAE Chapter
- Eastern Consultants Inc.
- Eastern Michigan ASHRAE Chapter
- EDS-Energy Development Services Inc.
- Ed's Supply Company Inc.-Little Rock

**Investors of \$250 to \$499 (continued)**

- Ed's Supply Co.-Nashville
- Edward B. Ward & Co.
- Egan & Sons Co.
- Empire Gas & Electric Equipment Co.
- Engert Plumbing & Heating Inc.
- Engineered Air Balance Co.-Dallas
- Engineered Comfort Systems Inc.
- Engineered Products Co.-Hato Rey
- Engineering Resource Group Inc.
- Envirocon Associates Inc.-Monkton
- Epsco Houston SME Inc.
- Edwin W. Evans
- Evapco Inc.
- E.B. O'Reilly & Associates
- F.C. O'Neill Scriven & Associates Ltd.
- F.W. Sales Co.-Seattle
- F&P Associates Inc.-Willowbrook
- Farris Engineering Inc.-Omaha
- William C. Ferguson, Sr.
- James R. Fields
- Fitzgerald Contractors Inc.
- Five Star Electric Motors Inc.
- Flatt Plumbing Company Inc.
- Fluor Daniel Inc.
- Fluid Handling Inc.
- Fluid Systems Inc.
- Freer Mechanical Contractors Inc.
- Friberg Associates Inc.
- Friedman Fisher Associates
- Samuel T. Fujikawa
- G.M. Lim & Associates
- G.R. Spornagle & Sons Inc.
- Lawrence Harry Gaffney
- Gaffney & Associates
- Milton W. Garland
- Gartner & Associates Company Inc.
- Gas Co. of New Mexico
- Gene Payne Associates Inc.
- General Heating & Cooling
- General Mechanical Contractors Inc.
- George A. Israel, Jr. Inc.
- George Tucker & Associates
- George Warren Co.
- Gershon Meckler Associates PC
- Giftle's Hoyem Basso Inc.
- Glover Hill Inc.
- Harrison D. Goodman
- Gorham Schaffler Inc.
- Graco Mechanical Inc.
- Graves Mechanical Contractors-Houston
- Greene Engineers
- Greenheck Fan Corp.
- GRG Vanderwell Engineers Inc.
- Gary H. Griffin
- Griswold Controls
- Diana R. Grundmann
- H.F. Lanz Co. Consulting Engineers
- HVAC-Hawaii
- Haakon Industries Canada
- Hahn-Mason Air Systems Inc.
- Haines Lundberg Waehler
- James M. Hale
- Hallix Developments Ltd.
- Hambrick-Ferguson Inc.
- Haning Sikkema Heaton & Associates
- Hansen Mechanical Contractors Inc.-Las Vegas
- Hardcast Inc.
- Harding Mechanical Inc.
- Harold James Inc.
- Harry M. Will Inc.
- Hawaiian Electric Company Inc.
- Hayes Seay Mattern & Mattern Inc.
- Haynes Trane Services
- Richard B. Hayler
- Ken Hazell
- Heat Transfer Sales Inc.-Greensboro
- Heath Engineering Co.
- Henry Adams Inc.
- Henry Vogt Machine Co.
- Robert D. Heym
- Hicks & Ingie Corp.-Knoxville
- Higgins & May Inc.
- Robert M. Hildenbrand
- Hill York Corp.
- Hinds County Assn. of Plumbing Heating & Cooling
- HIMG & Associates Inc.
- Honolulu Shipyard Inc.
- Bryan B. Hooker
- Hooker Engineering Ltd.
- Houston Sheet Metal Contractors Assn.
- Michael Earl Humphreys
- Huron Valley Sales Corp.-Dearborn
- Hussmann Store Equipment Ltd.
- Scotty M. Hutto
- Hydro Quebec
- Hydro Technologies Inc.
- I.D. Griffith Inc.
- Illingworth Corp.
- Independent Life & Accident Insurance Co.
- Indiana Michigan Power Co.
- Industrial Air Conditioning Co.
- Robert E. Innes
- Integrated Mechanical Systems Inc.
- Inter City Products (Canada)
- Interstate Mechanical Contractors Inc.
- Interstate Mechanical Corp.
- Iowa ASHRAE Chapter
- Stephen W. Ivesdal
- J.D. Higgins Company Inc.-Arlington
- J.H. Lang Associates Inc.
- JK Mechanical Products Inc.
- J.L. Richards & Associates Ltd.
- J.M. Bean & Company Ltd.
- J.M. Boyer Inc.
- J. Wilcox Sales Co.
- Jacco & Associates Inc.
- Jack T. Carter Company Inc.
- Harold James
- James Cooke & Hobson Inc.-Albuquerque
- James L. Lewis Inc.
- James M. Pleasants Company Inc.-Greensboro
- James P. Sheldon Company Inc.
- James Posey Associates Inc.
- Richard E. Jameson
- Jenkins Engineering Co.
- Johnson Controls Ltd.-Vancouver
- Johnson Controls-Sparks
- Johnson Heating Supply Co.
- Johnson Paterson Inc.
- Jones Trane Service Co.
- Joseph F. O'Hara & Sons Inc.
- JSI/Trane
- JWP Trautman & Shreve Inc.
- K.D. Engineering Co.
- Kallen & Lemelson-New York
- Jim Y. Kanomata
- Paul J. Katlich
- Firoz Kelikavousi
- Kelly Trane Service Agency
- Kiron Breco Inc.
- William E. Kirwan
- Henry W. Klassen
- KLW Inc.
- John F. Krawczyk
- Krier & Blain Inc.
- Kristal Fleet Inc.
- Kuempel Engineering Co.
- Leon L. Kuempel
- William J. Kusnierz
- L.J. Early Company Inc.
- La Ville de Quebec ASHRAE Chapter
- Lance Uchida Mechanical Engineers Ltd.
- Landis Gyr & Powers-Buffalo Grove
- Landry Gauthier & Associates
- Gary S. Larkin
- Wayne Trane
- Sy Levander
- Lawrence Perry & Associates Inc.
- Leach Wallace Associates Inc.
- Leggett Michaels Co.
- Leonhardt Company Inc.
- Rodney H. Lewis
- Lincolne Scott & Kohloss Inc.
- Lockberrie & Hole Company Ltd.-Edmonton
- Lockwood Greene Engineers Inc.-Oak Ridge
- Paul M. Lodes
- Lone Star Energy Co.
- Lone Star Gas Co.-Dallas
- Long Island ASHRAE Chapter
- Long & Associates Inc.-Englewood
- Loren Cook Co.-North Ogden
- Michael D. Lotspeich
- Louisiana Power & Light Co.
- M.V. Shore Associates Ltd.
- M&M Engineering Ltd.
- Maddock Mechanical Industries Inc.
- Malone Finkie & Associates Inc.
- Mammouth-A Nortek Co.
- Ted Maranda
- Marshall Erdman & Associates Inc.
- Martin Rogers Associates
- Mastron Mechanical Contractors
- Sukhdev S. Matthaodhu
- Matthaodhu Engineering Inc.
- Matthaodhu Mechanical Contractors Inc.
- McAdam Air Associates Inc.
- McCartian Gaudet & Associates Ltd.
- McFall Konkel & Kimball
- McHenry & Associates Inc.
- McKnight Smith Engineers Inc.
- Terence W. McLorg
- McNevin Co.
- McKinstry Co.
- Hugh D. McMillan
- MCW Consultants Ltd.
- Mead & Hunt Inc.
- Mechanical Contractors Assn. of Northern California
- Mechanical Contractors Assn.-Central Iowa Chapter
- Mechanical Contractors Assn.-Poughkeepsie
- Mechanical Contractors Assn. of Towson
- Mechanical Contractors Assn.-Western Ohio
- Mechanical Contractors Industry Funds-Northeast PA
- Mechanical Heat & Cold Inc.
- Mechanical Inc.
- Mechanical Representatives Inc.-San Antonio
- Mechanical Repts Inc.-Austin
- Mechanical Service & Systems Inc.
- Mechanical & Industrial Sales Inc.
- MecoLaSalle Manufacturing
- Bernard John Metz
- Miami ASHRAE Chapter
- Michael Hattori & Assn. Inc.
- Michael R. Dove Sales Co.
- Midwest Component Sales Inc.
- Midwest Machinery Co.
- Miller Proctor Nickolas Inc.
- Stan Milross
- Minnegasco Inc.-Lincoln
- Monadnock Technical Services
- Monsen Engineering Co.
- W. Bruce Morrison
- Mountain Mechanical Contractors Inc.
- Mulimer Co.
- Eric S. Nakagawa
- Steven Y. Nakagawa
- Lester T. Nakata
- William F. Nelheiser
- New England Air Systems Inc.
- New England Mechanical Services
- New Mexico ASHRAE Chapter
- Newbern Trane Equipment Sales
- Newcomb & Boyd
- Donald E. Nichols
- Noland Co.
- Nordyne
- Norman S. Wright Co.
- Norman Wright Mechanical Equipment
- Nortec Air Conditioning Industries Ltd.
- North American Mechanical Inc.
- North Carolina Natural Gas Co.
- Northeast Wisconsin ASHRAE Chapter
- Northern States Power Co.-Sioux Falls
- Otto J. Nussbaum
- Oahu Air Conditioning Co.
- Oahu Sales Inc.
- O'Connor Robertson & Associates Inc.
- O'Connor Co.-Piller Foundation
- O'Connor Oklahoma Company Inc
- Thomas E. Oelschlaeger
- Office of Griffith C. Burr
- Ohio Power Co.-Canton
- Okaloosa County Gas District
- Omni Mechanical Services-Tulsa
- Oregon ASHRAE Chapter
- Oscar Mayer Foods Corp.
- Pacific Resources Inc.
- Pagau Morel & Associates
- Paragon Engineering Corp.
- Parker Hamflin Corp.
- Parra Soitys Engineering Inc.
- Paschal Harper Inc.
- Paul Mueller Co.
- PBK Engineering Ltd.
- Tom Brown
- Peritus Engineers & Associates Inc.
- Perry Engineering Ltd.
- Peters Engineering
- Patterson Associates Inc.
- Pippin Brothers Inc.
- Plumbers And Pipefitters Local 344
- Plumbing Heating Cooling Industry Promotion Fund
- Plumbing & Heating Industry of Detroit
- Clayton H. Preble
- Joseph P. Previtt
- Prime Mechanical Contractors
- Process Equipment Company Inc.-Oklahoma City
- Process Equipment Company Inc.-Tulsa
- Progressive Architects Engineers Planners Inc.
- PSI Engineers Inc.
- Public Service Co. of New Mexico
- Quality Air Heating & Cooling Company Inc.
- Quality Water & Air Inc.
- R.B. Akins Co.
- R.F. MacDonald Co.
- R.G. Anderson Company Inc.
- R.J. McKee Engineering Ltd.
- R.L. Deppmann Co.
- R.L. Kisler Inc.-Rochester
- R.L. Tenney & Sons Inc.
- R.M. Thornton Inc.
- R. Plazibat & Associates Inc.

**Investors of \$25,000 and more**  
**The Trane Company-La Crosse**

**Investors of \$10,000 to \$24,999**

- Carrier Corporation-Syracuse
- Honeywell Incorporated-Minneapolis
- International Institute of Ammonia Refrigeration
- Johnson Controls Foundation
- Landis & Gyr Powers Inc.
- North American Insulation Manufacturers Association
- Pacific Gas & Electric
- Sheet Metal and Air Conditioning Contractors National Association
- Snyder General Corporation
- Spiral Duct Manufacturers Association
- Toronto ASHRAE Chapter
- York International-York
- American Gas Assn.
- Arkansas ASHRAE Chapter
- Atlanta ASHRAE Chapter
- Central Oklahoma ASHRAE Chapter
- Charles H. & Alberta B. Randolf Trust
- Dallas ASHRAE Chapter
- Duke Power Co.
- Gulfstream ASHRAE Chapter
- Jacksonville ASHRAE Chapter
- Philip Morris USA
- Sacramento Valley ASHRAE Chapter
- Smoke Control Assn.
- Alabama Power Co.
- Alamo ASHRAE Chapter
- Atlanta Gas Light Co.
- Baltimore ASHRAE Chapter
- Baltimore Gas & Electric Co.
- Barber Colman/Robertshaw
- BC Hydro & Power Authority
- Bonnevillie Power Administration
- British Columbia Buildings Corp.
- Control Systems International
- Copeland Corp.
- Delaware ASHRAE Chapter
- R.B. Akins Co.
- R.F. MacDonald Co.
- R.G. Anderson Company Inc.
- R.J. McKee Engineering Ltd.
- R.L. Deppmann Co.
- R.L. Kisler Inc.-Rochester
- R.L. Tenney & Sons Inc.
- R.M. Thornton Inc.
- Mechanical Contractors Assn.-Birmingham
- Illinois ASHRAE Chapter
- Kansas City ASHRAE Chapter
- Mechanical Contractors Assn.-Birmingham
- Illinois ASHRAE Chapter
- Kansas City ASHRAE Chapter
- Mechanical Contractors Assn.-Birmingham
- Virginia Power/North Carolina Power (VEPCO)
- Willco Inc.
- Wisconsin Electric Power Co.

- Fritz Honerkamp**  
Anthracle ASHRAE Chapter
- Cornell A. Imming**  
Dennis D. Kisselbach Ltd.
- Mary Francis James**  
Applied Mechanical Equipment Inc.
- Edwin W. Johnson**  
Halliwell Associates Inc.
- Gail D. Katz**  
Oregon ASHRAE Chapter
- Otto M. Kerstock**  
Gustave W. Anderson
- K.L. Lamm**  
Harold E. Straub
- Dan Langford**  
Able Products Co. Mechanical Contractor  
Affiliated Engineers Inc.  
Andrews Filter & Supply Corp.  
Apperson Chemicals Inc.  
Applied Mechanical Equipment Inc.  
Atlantic Engineering and Equipment Inc.  
Baker Brothers Inc.  
Allyn J. Barr  
Allen B. Blair  
Steven J. Blau  
David D. Boree  
Brooks Air Systems Inc.  
David J. Clark  
Paul M. Clark  
Conditioned Air & Power Inc.  
Carl L. Connealy  
Michael E. Cumliff  
Eubanks Sales Co.  
William T. Evans  
Arthur H. Fox  
Daniel N. Frey  
Lynne E. Galbraith  
Richard E. Goetting  
Garry Control Systems  
Gray's Guard Service Inc.  
Edward R. Grey  
Steven A. Griffin  
Bradley W. Gross  
Heat Pipe Technology Inc.  
Curtis J. Humphrey  
Independent Life & Accident Insurance Co.  
Jacksonville ASHRAE Chapter  
George W. Jenkins Foundation Inc.  
Siddhartha P. Kamath
- Paul J. Kalich  
Ronald J. Kessner  
William Harvey Kilma  
Monte Alan Korb  
Lieblag Robinson & Wingfield Inc.  
Suzanne Le Visaur  
Dennis L. Mahin  
Markair Inc.  
Mechanical Air Products  
James F. Melvin Jr.  
Anton B. Mogilevsky  
Robert M. Myers Jr.  
Packaged Refrigeration Systems  
Thomas E. Peeples  
Steve Phillips  
Robert Stephen Pollock  
National Sheet Metal Co.  
R.M. Myers & Company Inc.  
Tom G. Reagor  
Royal Services Inc.  
Paul E. Stewart  
Sunbelt Engineering Inc.-Jacksonville  
T&B Metal Works  
H. Raymond Tool  
The Masury Paint Store Inc.  
Barney von Herrmann  
W.W. Gay Mechanical  
Fred H. Wheeler  
James D. Worth
- Clifford J. Roberts**  
Robert F. Logsdon
- William Rudoj**  
Simeone & Andrews Corp.
- Harry R. Smith**  
John H. Smith
- Edward G. Spall**  
Heid Maybank
- William C. Sundberg**  
Minnesota ASHRAE Chapter
- Jack W. Thompson**  
William J. Collins  
Pattit & Pattit Consulting Engineers Inc.
- Tasso George Tsakir**  
Engineered Mechanical Equipment Inc.  
Memphis ASHRAE Chapter
- Donald W. Tucker**  
Hurley & David Inc.
- John C. Turley**  
Glicrist & Associates  
Walter C. Van Wagenen  
Applied Mechanical Equipment Inc.  
Van Wagenen & Beavers Inc.
- Ronald F. Levine**  
Gayle King Carr & Lynch Inc.
- Charles Logan**  
Charles Logan Estate
- Albert H. Lucas**  
Central Oklahoma ASHRAE Chapter
- Sydney M. Miner**  
William P. Chapman
- Alvin B. Newton**  
Jalima Holdings Ltd.
- Alan W. Oakes**  
Jalima Holdings Ltd.
- Don Pfeifer**  
Oregon ASHRAE Chapter
- Richard W. Wolf**  
Carl R. Wolf  
Service Unlimited Inc.
- Luther A. Yarbrough**  
Oregon ASHRAE Chapter

- RSES Telephone City Chapter  
R.V. Stover Co.  
R.V. Money Inc.  
R&S Balancing Co.  
Randolph H. Murayama & Associates Inc.  
Ray Martin Co. of Omaha  
Raypak Canada Ltd.  
Regional Electric Systems  
Regulvar Inc.  
Reid Crowther & Partners  
Reliance Mechanical Corp.  
Renninger Trane Service  
Resource Distributing Inc.  
Richardson's Plumbing & Heating Inc.  
David B. Righthouse  
Daniel Robert  
Robicon Corp.  
Robinson Mechanical System Ltd.  
Rody Quinjal & Everson Consulting Engineers  
Rodney H. Lewis Associates Inc.  
Rome Eddleman & Associates Inc.-  
Knoxville  
Roto Air Filter Sales & Service  
RTKL Associates Inc.  
Raymond E. Rul  
Russell Plumbing Co.-Tulsa  
Rust International Corp.  
S&J Mechanical Contractors Inc.  
Joseph R. Sacra  
Saguenay Lac St. Jean ASHRAE Chapter  
Sanders Brothers Inc.  
Sargent & Lundy  
Saskatoon ASHRAE Chapter  
Scan Air Balance 1990 Ltd.  
Schlenger Pitz Inc.  
Schwab Vollhaber Lubralt Inc.  
Servidyne Inc.  
Shanahan Mechanical & Electrical Inc.  
Baker L. Shannon  
Sheet Metal Contractors Industry Fund-Salt Lake City
- Sheel Metal Industry Fund of Western Oklahoma  
Shelby Skipwith Inc.  
Shockey Lane Inc.  
James C. Shuster  
Sleier & Reeves  
Randy D. Sikkema  
Sinclear Community College  
Slack Buckner Systems Inc.-Dallas  
SMACNA-Long Island  
SMACNA-North Texas  
SMACNA-Rochester  
SMACNA-Springfield  
SMACNA-Stockton  
SMARCA Inc.-Minnesota  
H. Brad Smith  
Wayne C. Smith  
J. Thomas Sobieski  
Societe D'Habitation de Quebec  
South Dakota ASHRAE Chapter  
Southern Building Code Congress International  
Southwest Florida ASHRAE Chapter  
Southwind Ltd.  
Spauschus Associates  
Spears Votta & Associates Inc.  
Wynne F. Speil  
Spirax Sarco Canada Ltd.  
Spirax Sarco Inc.  
Square M Engineering Ltd.  
Stan Weaver & Company Inc.  
Stanley Jones Corp.  
Star Service Inc.-Baton Rouge  
Stebbins Duffly Inc.  
Steele Engineering Associates Inc.  
Steffens Schultz Inc.  
Richard M. Stern  
Storer Equipment Company Inc.  
Summer Consultants Inc.  
Sunbelt Mechanical Inc.  
Super Valu Stores Inc.  
Superior Boiler Works Inc.  
Superior Plumbing & Heating Inc.  
Superior Supply Company Inc.  
Svanda Brothers Inc.  
Swygert & Associates Ltd.
- System Inc.  
TFA Architecture Engineering  
Tampa Bay Trane Service-Tampa  
John H. Teague  
Teague Mechanical Inc.  
Technical Engineering Group Inc.  
Temperature Systems Inc.  
Terry Equipment Company Inc.  
Tessier's Inc.  
Texaco Chemical Co.  
Texas Air Products Inc.  
Texas Energy Engineers-Houston  
The Ballard Group Inc.  
The Bernham Group Inc.-Oklahoma City  
The Cromwell Firm  
The Dominion Co.  
The Johnston Co.  
The Kieffer Group Inc.  
The Phoenix Agency Inc.  
The Poole & Kent Foundation Inc.  
The Schemmer Associates Inc.  
The Trane Co.-Brookfield  
The Trane Co.-Cupertino  
The Trane Company-Hillside  
The Trane Co.-Oklahoma City  
The Trane Company-Rancho Cordo  
The Waldinger Corp.  
The Werninger Co. Mechanical Contractors  
Thermal Mechanics Inc.  
Thermal Recovery Systems  
Thermatics Inc.  
Thorpe Insulation Co.  
Robert W. Timberlake  
TMS Inc.  
Tolin Mechanical Systems Co.  
Tom Barrow Co.-Atlanta  
Jan Van Den Top  
Trane Commercial Sales-Memphis  
Trane Pacific Service  
Trane Penn Service Co.  
Truelsen & Company Inc.  
Tri State Insulation Co.  
Tulsa Air Specialists Inc.  
Tulco Inc.
- Twin Tiers ASHRAE Chapter  
Underwood Air Systems Inc.  
Union Control Inc.  
United Electric Co.  
United McGill Corp.-Groveport  
United Mechanical Contractors Inc.-Oklahoma City  
United Services Automobile Assn.  
Urbandale Realty Corp. Ltd.  
Uran ASHRAE Chapter  
Vansant & Guster Inc.  
Vel Engineering  
Verne Sirmmons Co.  
M. Yves Vezina  
Gabriel F. Vidal  
W.A. Botting Plumbing & Heating Co.  
WHB Associates Inc.  
W.H. Sullivan Company Inc.  
Wade & Associates  
Wallace Earnace Associates Inc.-Plainview  
Ward Boland Associates Inc.  
Watts Engineering Sales Inc.  
WeatherTech Distributing Company Inc.
- Albert Weiss  
Frederick P. Waldin PE Inc.  
Frederick P. Waldin  
Weldon F. Kite Co.  
Werner's Wholesale Group Inc.  
West Plains Engineering  
Western Sheet Metal Inc.  
Fred H. Wheeler  
Whitescaver Rodas & Associates Inc.  
Wichita Area Builders Assn.  
Wick Fisher & White  
Wiedebe Sales Co.  
Wiedebe Forest Group Ltd.  
Willard Inc.  
Carl R. Wolf  
YMC Inc.  
York International-Houston  
York International-Las Vegas
- International**  
Investments of \$125 or more
- Helmi M. Badawyah  
Thomas Canales  
Celiat  
Climatrol Ltda.  
Valens F. D'Silva  
EA Technology Ltd.  
Frederick J. Whyte & Partners  
Aisuzu Ishida  
L. Lynch & Company Ltd.  
Mapco  
Jose C. Montes  
Olympus Refrigeration Works  
John Reuter  
Schindler Haerter AG  
Schindler Ingenieurgesellschaft MBH  
Shimizu Corp.  
Pablo M. Suarez  
Takishta Ltd. Osaka Office  
Tefrica Refrigeration  
The Schwarz Partnership  
Vlessmann Werke GMBH & Co.  
James S. Were
- Aero Tech Industries Inc.-N. Andover  
Aero Tech Industries Inc.-Brunswick  
Air Balancing Service Co.  
Air Systems Balancing & Testing Services  
Air Temp Heating & Air Conditioning Inc.  
William F. Albert  
Albert Weiss Air Conditioning Products Inc.  
Ambrosino DiPinto & Schmieder Consulting Engineers PC  
Ancora Mechanical Contractors Inc.  
Armstrong Pumps Inc.  
Arnold Edwards Corp.  
Herbert P. Becker  
Belino Aircontrols (USA) Inc.  
David W. Birkinbine  
BJLL Engineers & Architects PC  
Boston Gas Co.  
Francis D. Boto  
Boto Mechanical Corp.  
BPM Planning & Consulting Inc.  
Broome County NY Assn. of Plumbing Heating & Cooling  
Roger V. Brown  
Buckley Associates Inc.  
Building Controls & Services  
Bulter Enterprises Inc.  
Ralph H. Butler  
CDE Air Conditioning Co.  
CFM Equipment Corp.  
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C.T. Vogel PE  
C&M Associates  
Calmac Manufacturing Corp.
- Carrier Corporation-Syracuse  
Central Hudson Gas & Electric Corp.  
Central New York ASHRAE Chapter  
Centrifugal Associates  
Champlain Valley ASHRAE Chapter  
Alvin D. Clark  
Cox Edison  
Connecticut ASHRAE Chapter  
Connecticut Natural Gas Corp.  
Control Technologies Inc.-Manchester  
Control Technologies Inc.-Burlington  
Cosentini Associates  
Cox Engineering Co.  
Crosby-Brownlie Inc.  
D.R. Whipple Company Inc.  
Design Day Mechanicals  
John S. Desmond  
E.A. Milbrandt Inc.  
E.G. Hirst Co.  
Francis D. Boto  
E.W. Hoffmann Inc.  
Eastman Kodak Co.  
Edwards & Zuck PC Consulting Engineers  
David M. Elovitz  
EMJ McFarland Johnson Engineers Inc.  
Emtec Consultants Inc.  
Energy North Natural Gas  
Epic Mechanical Inc.  
Farr Co.-El Segundo  
Flack & Kurtz-New York  
Fluid Industrial Associates Inc.  
Friedman Fisher Associates  
Fulton Boiler Works Inc.  
Gary O. Holland Inc.
- Gayle King Carr & Lynch Inc.  
Genesee Refrigeration Supply Inc.  
Gent Engineering PC  
Gensir Sales & Service Inc.  
Harrison D. Goodman  
Granite State ASHRAE Chapter  
Gray Metal Products Inc.  
Daniel D. Greene  
Greiner Inc.  
Guy De Feo Company Inc.  
GWR Engineering  
HVAC Controls Inc.  
Haines Lunderberg Waehler  
Hallam Associates Inc.  
Halliwell Associates Inc.  
Hastings Air Control Inc.  
Hilton Mechanical Contractors Inc.  
Ed W. Hoffmann  
Howard Z. Lieb & Company Inc.  
Hurley & David Inc.  
J.T. Falk & Company Inc.  
J&J Sheet Metal  
J&K Plumbing & Heating Company Inc.-Binghamton  
John M. Jacobs  
James L. Lewis Inc.  
Janazzo Heating & A/C  
Jaros Baum & Bolles Consulting Engineers  
J.W. Dantroph Foundation  
Raymond F. Johnson II  
Joseph Davis Inc.  
Joseph R. Loring & Associates Inc.  
JWP Mechanical Services  
KTC Sales Corp.  
Kallen & Lemelson-New York

Investors of \$125 or more (continued)

- Kelly Trane Service Agency
- Kristal Fleet Inc.
- L.J. Early Company Inc.
- L.V. Appleyby Inc.
- Sy Levander
- Valentine A. Lehr
- Leonhardt Company Inc.
- Lizards Engineering Associates Inc.
- Evans Lizards
- Long Island ASHRAE Chapter
- Morris L. Markel
- Charles Martin
- Mechanical Building Services Inc.
- Mechanical Contractors Assn.
- Poughkeepsie
- Mechanical Marketing Inc.
- Meier Supply Company Inc.
- Edward A. Milbrandt
- Miller Proctor Nicholas Inc.
- Monadnock Technical Services
- Monroe Piping Sheet Metal Inc.
- Monson Engineering Co.
- Murry Turbo Machinery Co.
- Anthony K. Musumeci
- New England Air Systems Inc.
- New England Mechanical Services
- New York ASHRAE Chapter
- New York State Electric & Gas Corp.
- Niagara Frontier ASHRAE Chapter
- Niagara Mohawk Power Corp.
- North Jersey ASHRAE Chapter
- Northeast ASHRAE Chapter
- Northeast Utilities
- Northland Corp.
- Timothy W. O'Connor
- Ovellette Plumbing & Heating Corp.
- Pacesetter Steel
- Panasonic Industrial Co.
- Robert F. Peck, Jr.
- William E. Phillips
- Picotte Property Management Inc.
- Plumbers & Pipefitters Local
- 112-Binghamton
- Quackenbush Company Inc.
- R.F. Peck Company Inc.
- R.K. Chase Company Inc.-Albany
- R.L. Kistler Inc.-Syracuse
- R.L. Kistler Inc.-Rochester
- R.P.O'Connell Inc.
- Rainbow Sheet Metal Inc.
- Charles P. Reagan
- Rhode Island ASHRAE Chapter
- Donald G. Rich
- Robert C. Ritchie
- Robert Director Consulting
- Rochester ASHRAE Chapter
- Rochester Gas & Electric
- Rodgers & Associates Inc.
- Samuel L. Root
- Sarracco Heating & Air Conditioning Inc.
- Savage Engineering Inc.
- George A. Sechrist
- Sed Associates Inc.
- Shen Milson & Wilke Inc.
- Slater Equipment Co.
- SMACNA-Long Island
- SMACNA-Rochester
- Walter A. Stark
- Steamfitting Industry Fund of New York
- Stebbins Duffly Inc.
- Stellmack Air Conditioning & Refrigeration Corp.
- Richard Sullo
- Syracuse Thermal Products Inc.
- T.C. Roche Associates Inc.
- T.P. Woodside Inc.
- Elven M. Tangel
- Teledyne Laars
- M. Denis Dufour
- Electrical & Refrigeration Services Ltd.
- Enerplan Consultants Ltd.-Moncton
- F.C. O'Neill Scriven & Associates Ltd.
- Bryce Fisher
- Adam S. Folk
- Edward S. Fox
- Garland Commercial Ranges Ltd.
- Gaz Metropolitan Inc.
- Glover Hill Inc.
- Goodkey Weedmark & Associates (1985) Ltd.
- Roland Guillemette
- H.E. Rieckelmann (Canada)
- Halifax Developments Ltd.
- Ken Hazel
- Honeywell Ltd.-Hamilton
- Hussmann Store Equipment Ltd.
- Hydraflux R&O Services Inc.
- Hydro Quebec
- Inter City Products (Canada)
- Isotherm Engineering Ltd.-Mississauga
- J.L. Richards & Associates Ltd.
- J. Lunde & Associates Ltd.
- Jo Ad Industries Ltd.
- Norman W. Johnson
- Johnson Controls Ltd.-Markham
- Johnson Controls Ltd.-Ottawa
- Johnson Controls-Bedford
- Johnson Paterson Inc.
- Kilmer Environmental Inc.
- La Compagnie Jess Lee.
- La Ville de Quebec ASHRAE Chapter
- Lalonde Girouard Letendre & Associates Ltée.
- Landis & Gyr Powers Ltd.-Bedford
- Landis & Gyr Powers Ltd.-Ottawa
- Landry Gauthier & Associates
- Le Groupe Master Ltée.
- Lennox Industries Ltd.
- Leo Groulx Plumbing & Heating Ltd
- Les Consultants D.D.A. Ltée.
- Les Entreprises Turbo Vac Inc.
- Seymour Levine
- London Canada ASHRAE Chapter
- M.S. Thompson & Associates Ltd.
- M.V. Shore Associates Ltd
- M&M Engineering Ltd.
- F. Robert MacMichael
- Mesiron Mechanical Contractors
- Herb Maybank
- McIntyre Engineering Services
- Tom McPherson
- Mechanical Contractors Assn.-London
- Mechanical Contractors Assn.-New Brunswick
- M. Jean-Marie Michaud
- Michelin Financial Ltd.
- Stan Milross
- Ministere De L'Industrie Et Du Commerce Québec
- Minto Development Inc.
- Moncion Plumbing & Supply
- Montreal ASHRAE Chapter
- M. Jean-Luc Morin
- Mulvey & Banani International Inc.
- Nailor Hart Industries Inc.
- Arne Naess
- New Brunswick ASHRAE Chapter
- Nortec Air Conditioning Industries Ltd.
- Ontario Hydro
- James D. Owens
- Pageau Morel & Associates
- Paquet Dutil & Associates Ltd.
- Parson Refrigeration 1985
- Patrick Durkin & Associates Ltd.
- Paul Conrad HVAC Ltd.
- Power Vac Services
- Preston Phipps Inc. (1986)
- Principal Heating
- R.J. McKee Engineering Ltd.
- RSES Telephone City Chapter
- Raypak Canada Ltd.
- Regulvar Inc.
- Rheem Canada Ltd.
- Daniel Robert
- Roche Lee.
- Groupe Conseil-Sté Foy
- Roland Guillemette Inc.
- M. Jean Luc Roy
- Saguway Lac St. Jean ASHRAE Chapter
- Sayers & Associates Ltd.-Mississauga
- Scan Air Balance 1990 Ltd.
- Smith Stockley Ltd.
- Smith & Andersen Consulting Engineering
- Smylie & Crow Associates Inc.
- Societe D'Habitation de Quebec
- Spirax Sarco Canada Ltd.
- Steen Contractors Ltd
- William D. Stevens
- Teledyne Laars Canada
- Arl H. Thorarinson
- Toronto ASHRAE Chapter
- Trane Ventie Et Service-Quebec
- Ultramair Canada Inc.
- Union Gas Ltd.
- Urbandale Realty Corp. Ltd.
- M. Yves Vazina
- Walmar Ventilation Products
- York Air Conditioning Ltd.

Region II

Investments of \$125 or more

- A.H. Roy & Associates Ltd.
- Airwaco Ltd.
- Armon Development Corp. Ltd.-1981
- Jean Paul Arsenault
- Barber Colman Co.-Mississauga
- Base Controls Ltd.
- Baymar Air Conditioning Supply Ltd.
- Beaver Engineering Ltd.-Hamilton
- Roland Bouthillier
- Bowman & McLean Mechanical
- Bramalea Ltd.
- Beck Mar Sales Ltd.
- Doug Breckenridge
- Bryant Heating & Cooling
- M. Jean Bundoek
- C.W. O'Dell Associates
- C&S Heating Ltd.
- Cadillac Fairview Corp. Ltd.
- Canadian Blower/Canadian Pumps Ltd.
- Canadian Fishery Consultants Ltd.
- Carrier Eastern
- Chorley & Bisset Ltd.
- Cleaver Brooks of Canada Ltd.
- CLP Management Ltd.
- L. Conrad
- Paul Conrad
- Consumers Gas Co.
- Crane Supply-Ottawa
- Criq
- James W. Dawson
- Dectron Inc.
- Delcan Corp.
- Delhi Industries Ltd.
- Diamond Mechanical Distributors Ltd.
- Dillo Mechanical Ltd.
- Distribution Revac Inc.
- Drennan Refrigeration Inc.
- The Connecticut Air Conditioning Corp.
- The Hartford Steam Boiler Inspection & Insurance Co.
- The Nalimor Corp.
- The Prudential Realty Group
- The Seabrown Group
- The Slant Fin Foundation Inc.
- The Trane Co.-Livingston
- Tower Equipment Company Inc.
- Traulsen & Company Inc.
- Traulman Associates
- Triangle Sheet Metal Works
- TSBA Controls Inc.
- Twin Tiers ASHRAE Chapter
- United Assn. Local #13-Rochester
- United Illuminating Co.
- Van Zeim Heywood & Shadford Inc.
- Vermont Gas Systems Inc.
- Vermont Mechanical Inc.
- Vico Inc.
- Viking Controls Inc.
- W.D. Griffin Company Inc.
- W.W. Rothmann Company Inc.
- Evan C. Walden
- George A. Wallace
- Wallace Eannace Associates Inc.-Plainville
- Weickert Sheet Metal Inc.
- Albert Weiss
- William Jacobs & Sons Inc.
- Richard Anthony Wing
- Wing's Testing & Balancing Company Inc.
- WPC Consulting Engineers PC
- Randy Edward Wright
- Xerox Corp.
- Yankee Gas Services Co.

Region III

Investments of \$125 or more

- A.R. Scalise Inc.
- A-Air Company Inc.
- Bernie D. Abel PE
- Aerotherm Inc.
- Air Conditioning Equipment Sales Inc.
- Air Conditioning Suppliers Inc.
- Air Conditioning & Refrigeration Institute
- Air Distribution Sales of Virginia
- Air Excellence
- Air Products & Chemicals Inc.
- Alleghany Engineering Co.
- Allied Refrigeration Inc.
- American Gas Assn.
- M. Kent Anderson
- Anthracite ASHRAE Chapter
- Appalachian Power Co.
- ARC Welder Sales & Rental
- Bud Arnold
- Astorino Branch Architects
- Engineers Inc.
- Automatic Equipment Sales of Roanoke Inc.
- Automatic Equipment Sales of Virginia Inc.
- B&M Sheet Metal Shop Inc.
- Baltimore Air Balance Co.
- Baltimore Aircoil Company Inc.
- Baltimore ASHRAE Chapter
- Baltimore Gas & Electric Co.
- Charles Barry
- Beltmen & Huyett Inc.
- Harry Bennear
- Bennard C. Benson
- Blankin Equipment Corp.
- Andrew T. Boggs
- Patrick Branch
- Brijinac Kambic & Associates
- James R. Bruce

# HONOR ROLL

of

## 1991-92 ASHRAE RESEARCH INVESTORS

ASHRAE has achieved a distinctive and important position within the heating, ventilation, air-conditioning and refrigeration industry through its technical research program. Major financial commitments from our membership and the corporate community have been key factors in this development. Because of the support of our investors, ASHRAE Research can answer the urgent questions facing the industry and ensure that today's standards of environmental safety and quality will apply for generations to come.

The HONOR ROLL lists those who have made special investments in ASHRAE Research during the 1991-92 fiscal year which closed June 30, 1992. These contributions to the research fund were made through local chapters or directly to Society headquarters. Contributions from individuals, chapters, companies and organizations totaled more than \$1,300,000. These contributions are the result of enthusiastic, voluntary efforts of the Society's Research Promotion Committee and chapter Research Promotion Committees which organize fund-raising programs.

Special recognition is extended to companies that permitted employees to solicit research funds during company business hours. To each company, THANK YOU for this invaluable contribution.

This Honor Roll of 1991-92 investors has four sections. The first section recognizes the special contributions made by individuals, chapters and organizations as ASHRAE research memorials to deceased individuals. The second section is a listing by contribution amount ranging from \$250 to more than \$10,000. The third section lists all contributors of \$125 or more by region. The fourth section lists individual contributors of \$75 or less than \$125 who are not listed. The size of the list of contributors of \$125 or more demonstrates the monumental task it would be to name every contributor.

Your name is important to us. ASHRAE is proud of the interest and investment of each individual, company and organization listed in this Honor Roll of Investors. We strive to be accurate and complete. Still, in a listing of this length, errors may occur. Please accept our apology for any errors.

### ASHRAE RESEARCH MEMORIALS

Many contributions to ASHRAE Research are made to honor deceased Members, business associates or friends. Individuals, chapters, companies and industry organizations contributed to such memorials during 1991-92. These gestures honor the Members by continuing the work of the Society that they supported. Those being honored are listed in bold type. Contributors' names follow.

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| <b>Joseph F. Azara Sr.</b><br>CDE Air Conditioning Co.      | <b>Jeffrey C. Fisher</b><br>Minnesota ASHRAE Chapter   | <b>Dave Hartman</b><br>Freeze Pro Inc.-Orange Park             |
| <b>W.L. Cassell</b><br>Kansas City ASHRAE Chapter           | <b>Carl J. Forve</b><br>Carl J. Forve Estate           | <b>Floyd Hayes</b><br>William W. Seaton                        |
| <b>Billy Joe Cooper</b><br>Central Oklahoma ASHRAE Chapter  | <b>Sidney L. Gayle</b><br>Gayle King Carr & Lynch Inc. | <b>Floyd W. Hendrix</b><br>Tombigbee ASHRAE Chapter            |
| <b>Bill M. Davenport</b><br>Central Oklahoma ASHRAE Chapter | <b>William G. (Bill) Gebbie</b><br>DMG Corp.-Whittier  | <b>Quentin C. Hesemann</b><br>Mary June Hesemann               |
| <b>Rudy N. Ferguson</b><br>Ferguson Sullivan Inc.-Charlotte | <b>Walter A. Grant</b><br>Jallima Holdings Ltd.        | <b>Walter J.T. Heywood</b><br>Van Zeim Heywood & Shadford Inc. |
| Tri Meck Mechanical Inc.                                    | <b>John E. Haines</b><br>Jallima Holdings Ltd.         | <b>Bert Hiller</b><br>Paul A. Hood                             |

# GOLDEN CIRCLE

Financial leadership to advance the arts and sciences of heating, refrigeration and air conditioning through research

**Carrier Corporation**  
**Honeywell Incorporated**

**International Institute of Ammonia Refrigeration**

**Johnson Controls Foundation**  
**Landis & Gyr Powers Inc.**

**North American Insulation Manufacturers Association**  
**Pacific Gas & Electric**

**Sheet Metal and Air Conditioning Contractors National Association**  
**Snyder General Corporation**  
**Spiral Duct Manufacturers Association**  
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**York International**



Sculpture presented to "Golden Circle" members during the President's Luncheon at the ASHRAE Winter Meeting

## INVESTORS OF \$125 AND MORE

- Capron Company Inc.  
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Charles Logan Estate  
Earl M. Clark  
Colonial Mechanical Corp.-  
Richmond  
Combustion Service & Equipment  
Inc.  
Commonwealth Kinetics Company  
Inc.  
Lauritz P. Cornhaski  
Consolidated Engineers  
Kenneth W. Cooper  
Coward-Eastman Inc.  
DMR Associates Inc.  
Dale Oxygen & Acetylene Service  
Inc.  
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G. Robert Davidson  
George C. De Frenn  
Thomas E. Deardoff  
Deckman Co.  
Delaware ASHRAE Chapter  
Delaware Engineering & Design  
Corp.  
Delaware Valley Lebert Inc.  
Delmarva Power  
Dodson Engineering Inc.  
Donlee Technologies Inc.  
Dresher Mechanical Contractor Inc.  
Joseph A. Driscoll  
Herbert L. Duffield  
Dunham Bush Inc.  
John Frank Dunlap  
Duquesne Light Co.  
EA Engineering Science &  
Technology Inc.  
E&S Mechanical Services Inc.  
East Hills Engineering Associates  
Eastern Consultants Inc.  
Efective Controls Inc.  
Eif Alotech North America Inc.  
Elliot Lewis Corp.  
Energy Systems Engineering Inc.  
Envirocon Associates Inc.-Monkton  
Equitable Gas Co.  
Ernest J. Menold Inc.  
Evapco Inc.  
E. B. O'Reilly & Associates  
Fador White Associates Inc.  
Flood & Sterling Inc.  
Kerry D. Freeman  
G. F. Morth Co.  
GHT Limited Consulting Engineers  
G. J. Hopkins Inc.  
G. R. Spoungle & Sons Inc.  
G. Robert Davidson & Associates  
G. Weinberger Co.  
Ronald F. Gaster  
Gershon Meckler Associates PC  
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Highland Associates One Ltd.  
Hirsch Arkin Pinherst Inc.
- Hoffman & Hoffman Inc.-Roanoke  
Honeywell Inc.-Hunt Valley  
Hungerford Mechanical Corp.  
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Industrial Air Conditioning Co.  
Robert E. Innes  
International Institute of Ammonia  
Refrigeration  
JK Mechanical Products Inc.  
J. L. Turner Co.  
James Posey Associates Inc.  
James R. McGuire Inc.  
JCM Control Systems Inc.  
Johnson Controls-Spartan  
Johnstown Chapter ASHRAE  
Warren R. Jones  
Joseph F. O'Hara & Sons Inc.  
Joseph M. Zimmer Inc.  
Kircon Braeco Inc.  
William E. Kirwan  
Lawrence Perry & Spriggs  
Leach Wallace Associates Inc.  
Leigh Valley ASHRAE Chapter  
Isaac Gordon Lilienfeld  
J. T. Lindeberger  
Robert S. Lovelace  
W. Nelson Barnes & Sons Inc.  
Tom Mariano  
Mark Elder & Associates  
Martin Rogers Associates  
Mayes Engineering Inc.  
McArdle & Walsh Inc.  
MDK Engineering Corp.  
Mechanical Contractors Assn. of  
Western Pennsylvania  
Mechanical Contractors Assn. of  
America Inc.  
Mechanical Contractors Assn. of  
Towson  
Mechanical Contractors Industry  
Funds-Northeast PA  
Mechanical Equipment  
Representative  
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Miller-Picking Corp.  
Monumental Supply Company Inc.  
Mullmer Co.  
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National Capital ASHRAE Chapter  
Newbern Trane Equipment Sales  
Noland Co.  
North American Insulation  
Manufacturers Association  
Ohio J. Nussbaum  
Thomas E. Oelschlaeger  
Paragon Engineering Corp.  
Pascoe Engineering Consultants Inc.  
Frederick J. Pearson  
Tom Brown  
Penn Ventilator Company Inc.  
Pennsylvania Power & Light Co.  
Peoples Natural Gas Co.  
Philadelphia ASHRAE Chapter  
Philadelphia Electric Co.  
Phillip Morris USA  
Pittsburgh ASHRAE Chapter  
Pittsburgh Trane Sales Agency  
Poliomack Electric Power  
Joseph P. Previtt  
Thomas W. Price  
R. M. Thornton Inc.  
RCF Engineers Inc.  
Reames & Moyer Inc.  
Refrigeration Service Engineers  
Society  
Jose A. Haig  
Renninger Trane Service
- Reynolds Metals Co.  
Richard C. Sokoloski Consulting  
Engineer  
Richmond ASHRAE Chapter  
Engineering Club  
Rite Temp Associates Inc.  
Roanoke ASHRAE Chapter  
Roanoke Gas  
Robicon Corp.  
Rogers Mechanical Co.-Fairview  
Villa  
Richard D. Romagnoli  
Ron Air Sales Co.  
Roofing & Sheet Metal Contractors  
Associates  
RTKL Associates Inc.  
Raymond E. Ruff  
Franklin W. Ruff  
Mark Scalise  
Schlenger Pitz Inc.  
Arthur C. Schock  
Glenn E. Seeman  
Bassam E. Shadid  
Sheet Metal and Air Conditioning  
Contractors National Association  
Sheet Metal Contracting Industry  
Advancement Fund of NE Penn.  
Sheet Metal Contractors Industry  
Fund Delaware Local #9  
Sile Technology Inc.  
SMACNA-Western Pennsylvania Inc.  
D. Mark Smith  
Smoke Control Assn.  
J. Thomas Sobieski  
Southworth Mechanical Corp.  
Spears Voita & Associates Inc.  
Spectrum Engineers PC-Roanoke  
Walter F. Spiegel  
Spraxx Sarco Inc.  
John L. Stasiak  
St. Orge Ruff & Associates  
Summer Consultants Inc.  
Sumnerell Company Inc.  
Superior Boiler Service & Supply  
Corp.  
Superior Valve Co.  
T.A. Gorman Inc.  
Taza & Hewitt Inc.  
The C&P Telephone Co.  
The Dexter Corp.  
The Garing Corp.  
The Harshay Foods Corp. Fund  
The Hille Co.  
The Poole & Kent Foundation Inc.-  
Baltimore  
The Trane Co.-Allentown  
Thermatics Inc.  
Thermo Trol Corp. of Richmond  
Bruce W. Tibbets  
Edwin J. Tolter  
Tozour-Trane  
Trane Penn Service Co.  
Triangle Tech Inc.  
Twin City Fan & Blower Co.  
Ukrop's Super Markets Inc.  
United Cities Gas Co.  
Vansant & Gussler Inc.  
Virginia Power/North Carolina Power  
(VEPCO)  
Von Otto & Bilecky  
Bruce T. Votta  
J. Richard Wagner  
Walter F. Spiegel Inc.  
Ward Boland Associates Inc.  
Warwick Plumbing & Heating  
Washington Gas Light Co.  
Weisman Inc.  
Welch & Rushe Inc.  
Frederick P. Weidin PE Inc.  
Reames & Moyer Inc.  
George E. Weills III  
West Penn Power Co.  
Whitescarver Engineering Company  
Inc.
- Whitescarver Rodas & Associates Inc.  
Wick Fisher & White  
Wiley & Wilson A Professional Corp  
Wilkins & Watson Inc.  
Harry M. Will  
William D. Shellady Inc.  
William J. Donovan Co.  
Willard Inc.  
Wisch & Jackson Company Inc.  
Carl R. Wolf  
James E. Wolf  
Francis E. Woods  
York International/York

## Region IV

Investments of \$125 or more

- AC Corp.  
Acculio Services Inc.  
Air Balance Corp.-Greensboro  
American Express Travel Related  
Services Company Inc.  
American Industrial Contractors Inc.  
Atlanta ASHRAE Chapter  
Atlanta Gas Light Co.  
Banner & Fields Inc.  
Beverage Air  
Bolton Corp. Mechanical Contractor  
Benjamin T. Boothe  
Boole Enterprises Inc.  
Brady Sales & Service Inc.  
Brady Trane Sales  
Frank M. Brewer & Associates Inc.  
Flex Brown  
Carl J. Bruchart  
Burford Golf & Associates Inc.  
Burlington Industries Inc.  
Harris D. Bynum  
Joe T. Cain  
Captive Aire Systems Inc.  
Carrolla Consulting Group  
Carrolla Power & Light Co.  
Charleston ASHRAE Chapter  
Chiller Services Inc.  
Clifford M. Tuck Company Inc.  
Conservatrol Corp.  
Control Management Inc.  
Dan McNeil Co.  
Dixie Filters Inc.  
DSA Group of North Carolina Inc.  
Duke Power Co.  
E. Smith Heating & Air Conditioning  
Inc.  
East Coast Technologies Inc.  
James C. Edmondson  
Environmental Air Systems Inc.  
Edwin W. Evans  
Faulkner Baker & Associates-Cayce  
Faulkner Baker & Associates-  
Greenville  
Faulkner Baker & Associates Inc.-  
Greensboro  
Faulkner Baker & Associates Inc.-  
Raleigh  
Felkel & Hastings Consulting  
Engineers  
Ferguson Sullivan Inc.-Charlotte  
James R. Fields  
Donald P. Galey  
Howell M. Gentry  
George B. Highower PE  
George Holden & Associates Inc.  
Georgia Power Co.  
Georgia Trane Equipment Co.  
Robert L. Gribble  
Richard W. Hahn  
Hahn-Mason Air Systems Inc.  
Heat Transfer Sales Inc.-Greensboro  
Heery International Inc.  
David F. Hershenderson  
Hickory Plumbing & Heating  
Company Inc.

Investors of \$125 or more (continued)

- Louis B. Hoffman, Jr. - Hoffman & Hoffman Inc.-Charlotte
- Hoffman & Hoffman Inc.-Greensboro
- Hoffman & Hoffman Inc.-Mt. Pleasant
- Hudson Everett Simonson Mullis & Associates Inc.
- D.F. Huttenlocher - Hydro Air Associates Inc.
- Industrial Air Inc.-Greensboro
- J.H. Lang Associates Inc.
- J.M. Wood Division Morehouse Supply Inc.
- Jack Walters Inc.
- James M. Pleasants Company Inc.-Greensboro
- Joe Powell & Associates Inc.
- Randal R. Johnson - Johnson Spillman & Associates Inc.
- Dwight H. Jones
- Jones Nall & Davis
- T. Randall Jones - Jordan Jones & Goulding Inc.
- Paul Kinneman
- Knott & Roberts PA Engineers
- John F. Krawczyk
- Kru Kel Company Inc.
- Alfred T. Kuhnemann
- L.R. Gorrell Co.-Greensboro
- Layne Trane
- Lowe Bahnsen Inc.
- Lewis B. Mallory
- Maloney & Associates
- Backy McDonald
- McKannery's Inc.
- McKnight Smith Engineers Inc.
- Mechanical Contractors Assn.-Charlotte
- Mechanical Engineering Consulting Associates
- George H. Meier
- Metro Refrigeration
- Mingledorff's Inc.
- Samuel C. Minnich
- Morris & Associates-Raleigh
- Morrison & Associates PA
- Murray Supply Co.
- Newcomb & Boyd
- North Carolina Natural Gas Co.
- North Piedmont ASHRAE Chapter
- O'Neal Engineering Architects
- P.C. Godfrey Inc.
- R. Harry Page
- Page/Lincoln Associates
- Parsons Brinckerhoff Guade & Douglas Inc.
- Partek North America Inc.
- George N. Payne
- Perilus Engineers & Associates Inc.
- Philip Morris USA
- Piedmont Natural Gas Co.
- Piedmont Olsen Inc.
- William M. Poe
- Ira G. Poston
- Joseph Powell
- Clydon H. Preble
- Process & Air Conditioning Equipment Inc.
- Public Service of North Carolina Inc.
- RS&H Inc.
- David Rickleton
- Rosser Fabrap International-Atlanta
- William T. Royster
- Sanders Brothers Inc.
- Servidyne Inc.
- Sifco Mechanical Inc.
- H. Brad Smith
- South Carolina ASHRAE Chapter
- South Carolina Electric & Gas Co.
- Southern Comfort of Charlotte Inc.
- Southern Piedmont ASHRAE Chapter
- Southwind Ltd.
- Columbus Temperature Control
- Columbus & Southern Ohio
- Consumers Power Co.
- Cottech Design Inc.
- Control Specialists Inc.
- Bruce A. Cook
- Cook Trane Service Agency
- Cooney Engineering Co.
- Copeland Corp.
- Corporate Equipment Co.-Cincinnati
- D.J. Conley Associates Inc.
- James C. Davidson
- Dayton ASHRAE Chapter
- Dayton Trane
- Dean Boiler Sales Inc.
- Dee Cramer Inc.
- Detroit ASHRAE Chapter
- Diclemeis Siegel Engineering Inc.-Southfield
- Eastern Michigan ASHRAE Chapter
- Enerch Systems Inc.
- Environmental Air Products Inc.
- Evansville ASHRAE Chapter
- Everett I. Brown Co.
- Fontanesi & Kann Co.
- Ford Motor Co.-Dearborn
- Frank & Fric Inc.
- Frank Messer & Sons Construction Co.
- George Lynch Controls Inc.
- Giffels Associates Inc.-Southfield
- Giffels Hoyem Basso Inc.
- Gerald V. Gragg
- Clifford H. Greive
- Fred Habegger
- Thomas L. Habegger
- Richard J. Hall
- Harley Ellington Pierce Yee Associates Inc.
- Healy Engineering
- Helwig Lenasch & Associates
- Herrman & Goetz Inc.
- James P. Hicks
- Jack D. Hinton
- Hume Snow Melling Systems Inc.
- Huron Valley Sales Corp.-Dearborn
- Hurst Facility Services Inc.
- Indiana Michigan Power Co.
- Industrial Contractors
- Industrial Sales Company Inc.
- J.E. Shekell Inc.
- J. Pappas Associates Inc.
- Jacco & Associates Inc.
- Robert W. Johnson
- Julian Speer Co.
- Lorraine A. Kapka
- Michael J. Karplinski
- Kenneth R. Kuentz & Associates
- Jerry F. Keyes
- Kays/Hicks Engineering
- Kuempel Engineering Co.
- Leon L. Kuempel
- KZF Inc.
- Leggette Michaels Co.
- Limbach Co.
- Lorenz & Williams Inc.
- George R. Lynch
- McHenry & Associates Inc.
- Carl A. McMullen
- Edward McHenry
- Mechanical Contractors Assn.-Industry Fund-Akron
- Mechanical Contractors Assn.-Central Ohio
- Mechanical Contractors Assn.-Western Ohio
- Mechanical Design Associates Inc.
- Mechanical Heat & Cold Inc.
- Norbert J. Menke
- Merio Steam Equipment Co.
- Michigan Control Systems Inc.
- Columbus Plumbing & Heating Co.

Region V

Investments of \$125 or more

- ABI Mechanical Contractor
- A.O. Smith Electrical Products Co.
- Aerovent Inc.
- Air Conditioning Contractors Assn.-Mt. Clemens
- Air Engineers & Conditioning Co.
- Air Enterprises Inc.-Akron
- Air Filtration Concepts
- Akron Equipment Inc.
- Akron Canton ASHRAE Chapter
- Albert Kahn Associates Inc.
- Allied Supply Company Inc.-Dayton
- Geoffrey L. Andres
- Anonymous
- Armstrong Bud Co.
- Bacik Karpinski Associates
- Donald R. Bahnfleth
- Bar D. Bale
- David M. Barwacz
- Bennett Holland & Associates Inc.
- Blagi Chance Cummins London Titzer Inc.
- John S. Blossom
- Edward W. Bolttum
- Bryant-Haggger Co.
- Bumier Heating & Specialties Inc.
- Caumet Region ASHRAE
- Carrier Corp.-Cincinnati
- Carrier Corp.-Indianapolis
- Central Indiana ASHRAE Chapter
- Central Michigan ASHRAE Chapter
- Chrystler Corp.
- Cin-Fab
- Cincinnati ASHRAE Chapter
- Cincinnati Sub Zero
- Circle R. Mechanical Inc.
- Cleveland ASHRAE Chapter
- Cleveland Thermal Energy Corp.
- Cochrane Supply & Engineering Inc.
- James E. Cohen
- Columbia Gas of Ohio
- Columbus ASHRAE Chapter
- Columbus Southern Power Co.
- Motz Consulting Engineers Inc.
- Joseph C. Nader
- William F. Nelheiser
- Jay N. Nelson
- Nelson Trane Co.
- O.J. Shoemaker Inc.
- Olio Power Co.-Canton
- Osterfeld Chapman Service
- Ronald W. Otiney
- David M. Patterson
- Jeffrey L. Persons
- Peter Basso Associates Inc.
- Pfizenmaler & Jablonski
- Plumbing & Heating Industry of Detroit
- Precision Airflow Control Systems
- Robert E. Price
- Process Engineering & Equipment Company Inc.
- Progressive Architects Engineers Planners Inc.
- Project Associates Inc.
- Qsource Engineering Inc.
- Quality Air Heating & Cooling Company Inc.
- Quality Water & Air Inc.
- R.G. Anderson Company Inc.
- R.L. Deppmann Co.-Grand Rapids
- R.L. Deppmann Co.-Southfield
- R.L. Millies Associates Inc.
- R. Plazibat & Associates Inc.
- R.T. Patterson Co.
- Ramsay Cotron
- Refrigeration Research Inc.
- Refrigeration Sales Corp.
- William R. Reid
- Reliance Mechanical Corp.
- Rich Housh Services Inc.
- Robert H. Fuller & Associates Inc.
- Scheerer Buckley Mayfield Inc.
- David A. Schmenk
- William P. Schriener
- George R. Shilling
- James C. Shuster
- Sindair Community College
- Donald Skala
- SMACNA-Metro Detroit
- Smith Hinchman & Grylls Associates Inc.
- Steele Engineering Associates Inc.
- Sterfens Schultz Inc.
- Systecon Inc.
- Temperature Engineering Corp.
- The Detroit Edison Co.
- The East Ohio Gas Co.
- The Osborn Engineering Co.-Cleveland
- The Peck Hamalord & Briggs Service Corp.
- Thermaltech Engineering Inc.
- Thermodyne Mechanical Equipment Inc.
- Thomas J. Dyer Co.
- Toledo ASHRAE Chapter
- The Trane Co.-Cincinnati
- United McGill Corp.-Groveport
- Uptime Solutions Associates Inc.
- Vadakin Refrigeration & Air Conditioning
- Philip I. Van Styn
- WHB Associates Inc.
- W.R. Bradley Co.
- Weber Huff Inc.
- Dennis J. Wessel
- Western Michigan ASHRAE Chapter
- Whirpool Corp.
- Zimpher Sales Inc.

744-RP

DIRECT DIGITAL CONTROL SYSTEM DOCUMENTATION PRACTICES

September 1992—September 1994  
Pennsylvania State University  
Principal Investigator: Stanley A. Mumma  
TC 1.4, Control Theory and Application

It is currently difficult for the design engineer to concisely specify control system logic for the control tractor to correctly bid and install the system, for the commissioning agent to verify proper system performance and for the building operator to understand how the control system is designed to operate. Errors and omissions can occur during the design, installation, commissioning, operation and maintenance of HVAC systems that utilize direct digital control (DDC) systems. This is because of a lack of standard DDC documentation.

The objective of this research will be to develop an ASHRAE standard method for documenting software-based control systems. This standard documentation method will become a design tool for manufacturers, specifying agents and building operators.

747-RP

LABORATORY EVALUATIONS OF OZONE AS A CORROSION INHIBITOR FOR USE IN OPEN RECIRCULATING COOLING SYSTEMS

September 1992—September 1993  
Clarkson University  
Principal Investigator: Der T. Chih  
TC 3.6, Corrosion and Water Treatment

Extending the use of ozone from potable water systems to cooling water systems for control of microorganisms is a logical step. The claim that ozone is an effective corrosion inhibitor should be evaluated and the range of circumstances where this chemical works for these purposes needs to be defined. Controlled laboratory studies with adequate documentation of water chemistry conditions (pH, hardness, alkalinity and conductivity), temperature, ozone concentrations and corrosion rates for various metals are not in the published literature.

The objectives of this proposed study are to evaluate the effectiveness of ozone as a corrosion inhibitor on materials commonly used in recirculating cooling water systems. The synergistic effect of ozone on common corrosion inhibitors will be examined. The tests will be performed over a range of water flow velocities of 1 to 10 ft/s and temperatures of 75° to 120°F.

756-RP

MODELING OF REFLECTED SOLAR HEAT GAIN FROM NEIGHBORING STRUCTURES IN BUILDING ENERGY-SIMULATION PROGRAMS

September 1992—September 1993  
Enermodal Engineering Inc.  
Principal Investigator: Susan Reilly  
TC 4.7, Energy Calculations

Solar heat gain constitutes a major component of the cooling loads of a building, and correct modeling of this load is essential for proper HVAC sizing and accurate simulations of building energy use. Under certain conditions, a building in a dense downtown area can be significantly affected by secondary sources of solar gain through reflection, both specular and diffuse, from neighboring structures and ground surfaces. Failure to account for these secondary sources of solar heat gain can lead to incorrect system sizing and, in the worst case, overheated and uncomfortable perimeter zones.

The objective of this project is the development of an approach to compute the amount of reflected solar radiation with reasonable accuracy both spatially as well as temporally. The approach must be simple enough not to require disproportionate amounts of modeling effort or computation.

754-RP

DESIGN DATA FOR THE 1% 2-1/2% AND 5% OCCURRENCES OF EXTREME DEWPOINT TEMPERATURE, WITH MEAN COINCIDENT DRY-BULB TEMPERATURE

September 1992—July 1994  
University of Kentucky  
Principal Investigator: Donald G. Coliver and Tom Priddy  
TC 3.5, Sorption

The sizing and design of dehumidification equipment that uses sorbents are extremely sensitive to the humidity ratio of water vapor in the air. Two sets of summer design data currently appear in the ASHRAE Handbook—Fundamentals. These two sets of data cannot be used to size or design dehumidification equipment for applications in buildings. An absence of this information in the public domain hinders the potential application of sorption based equipment for dehumidifying and cooling buildings. The proposed new data is needed to avoid the significant mistaken impression currently created by sensible heat design data in the ASHRAE Handbook—Fundamentals that is not intended for use in humid-

760-RP

INVESTIGATE AND IDENTIFY INDOOR ALLERGENS AND BIOLOGICAL TOXINS THAT CAN BE REMOVED BY FILTRATION

September 1992—September 1993  
Research Triangle Institute  
Principal Investigator: Karin K. Foarde  
TC 2.4, Particulate Air Contaminants and Particulate Contaminant Removal Equipment

Physicians or their assistants who practice allergy diagnostics commonly advise patients regarding the need for air filtration and/or climate control in their home or workplace, the types of units, preferable and even brand names of units. Their information usually comes from advertising in allergy journals from specific manufacturers and from manufacturers' exhibits at national medical meetings. Because of the technical jargon found in the HVAC journals and textbooks, these are not read nor understood by physicians. Alternatively, the HVAC manufacturers and engineers are not fully aware of the needs of these physicians and their patients for similar reasons.

The objective of this project is the development of accurately described indoor particulate allergens (nature, size, concentrations and clinical effects on humans) and an explanation of current methods to quantitatively sample and identify these particles. Clinical effect information will be referenced to accepted medical literature. Relevant articles from many different disciplines (medical, botanical, aerobiological, mycological, microbiological and environmental, etc.) will also be reviewed and referenced.



690-RP "Laboratory Study to Determine the Flow Resistance of Oval Duct and Filtrations" will provide engineering data on duct design for the ASHRAE Handbook, Fundamentals Volume.

743-RP

PRESSURE-ENTHALPY GRAPHS FOR THE ALTERNATIVE REFRIGERANTS R-32, R-123, R-124, R-125, R-134a AND R-141b

April 1992—October 1992  
University of Idaho  
Principal Investigator: Steve G. Penoncello  
TC 3.1, Refrigerants and Brines

The 1989 Handbook—Fundamentals contains equations of state graphs of commonly used refrigerants that were produced by the University of Idaho's Center for Applied Thermodynamic Studies. The 1993 Handbook—Fundamentals should be updated to contain graphs of the newer alternative refrigerants. The objective of this project is to produce pressure-enthalpy graphs for six new alternative refrigerants that are coming into wider use.





Investors of \$125 or more (continued)

- Alabama Gas Corp.
- Alabama Power Co.
- Albert F.G. Bedinger Consulting Engineer
- Allen & Hoshall Inc.
- AMCA International Construction Corp.
- Thomas Anderson
- Andrews Distributing Co.-Chattanooga
- Andrews Distributing Company Inc.-Knoxville
- Andrews Distributing Company Inc.-Nashville
- Archer Air Conditioning Service Co.
- Alherton Consulting Engineers Bar Con Inc.
- Barge Waggoner Sumner & Cannon Inc.-Knoxville
- Barge Waggoner Sumner & Cannon Inc.-Nashville
- Batchelor's Mechanical Contractors
- BCM Converse Inc.
- Ned W. Bell
- Bendall & Company Inc.
- Bernard Mechanical Contractors Inc.
- Boiler Supply Company Inc.-Nashville
- Douglas E. Brown
- Bulford Plumbing Company Inc.
- David S. Butler
- Campbell & Associates Inc.
- Capco Mechanical Inc.
- Charles Cattedge Company Inc.
- Chattanooga Gas Co.
- Chastain Corp.
- Coastal Supply Company Inc.-Knoxville
- Comfort Control Inc.
- Computer Conditioning Corp.
- Computer Environment Inc.
- Computer Site Technology Inc.
- Consolidated Air Inc.
- Consolidated Air Conditioning Inc.
- Control Applications
- Corzine & Hawkins Company Inc.
- D.F. Shoofner Mechanical Contractors Inc.
- Keith A. Derrington
- Lernes P. Deshautes
- Ivan W. Doane
- William E. Duke
- E.K. Strahan Inc.
- Ed's Supply Co.-Nashville
- Ellers Oakley Chester & Rike Inc.
- Engert Plumbing & Heating Inc.
- Engineered Mechanical Equipment Inc.
- Engineered Refrigeration Systems Inc.
- Engineering Resource Group Inc.
- Engineering Services Group
- Environmental Engineering Consultants
- Environmental Testing Service Inc.
- Fabric Enclosures Inc.
- Ferguson Equipment Co.-Knoxville
- Fischer Engineering Ltd.-New Orleans
- Flatt Plumbing Company Inc.
- Peter D. Gebarowski
- Gene Payne Associates Inc.
- General Electric Co.
- George Tucker & Associates
- Gortam Schaffler Inc.
- Greeley & Associates Inc.
- Gresham Smith & Partners
- Gulf Power Co.
- James M. Hale
- Henry B. Hardy
- Matt R. Hargan
- Haltner Hornsby Bailey & Associates PC
- Henry Vogt Machine Co.
- Hicks & Ingle Corp.-Knoxville
- Robert M. Hildenbrand
- Hinds County Assn. of Plumbing Heating & Cooling
- Hinkle Supply Co.
- Hughes Mechanical Contractors Inc.
- Scotty M. Hutto
- Hydro Technologies Inc.
- I.C. Thomason & Associates Inc.-Inland Air Systems Inc.
- Integrated Mechanical Contractors Inc.
- Ivey Mechanical Co.
- J.M. Ballard, Jr. Sales Co.
- Lawrence A. Johnson
- Johnson & Scott Inc.-Nashville
- Jones Trane Service Co.
- Jorden Associates Inc.
- Kelle & Associates Inc.
- Kelley & Associates Inc.
- Kelso Regen Associates Inc.
- Kentucky Utilities Co.
- Keyes Mechanical Inc.
- Kocke McLaughlin & Associates Inc.
- Charles R. Knights
- Koch Filter Corp.
- Lee Co.
- L. Stuart Lindamood
- Lockwood Greene Engineers Inc.-Oak Ridge
- Robert F. Logsdon
- James T. Longrier
- Louisiana Gas Service Co.
- Louisiana Power & Light Co.
- Louisville ASHRAE Chapter
- LSE Engineering Inc.
- Mackinnon Engineering Inc.
- Magnolia Air Conditioning & Supply Company Inc.
- Malone Engineering Co.
- Billy R. Manning
- McAdam Air Associates Inc.
- McKay Mechanical
- John P. McLarty
- Terence W. McLog
- McWilliams Associates PC
- MCA of Memphis Promotion Fund
- Mechanical Contractors Assn.-Birmingham
- Mechanical Equipment Company Inc.-Nashville
- Mechanical & Industrial Sales Inc.
- Memphis ASHRAE Chapter
- Mid South Equipment Engineering Inc.
- Miller & Weaver Inc.
- Mills Wilson George Inc.
- Mississippi Power Co.
- Mississippi Power & Light Co.
- Mississippi Valley Gas Co.
- Mobile Gas Service Corp.
- Mobile Mechanical Contractors Assn.
- Montgomery ASHRAE Chapter
- Mountain Mechanical Contractors Inc.
- Mountaineer ASHRAE Chapter
- Nashville ASHRAE Chapter
- New & Associates
- Donald E. Nichols
- Northwest Florida ASHRAE Chapter
- Office of Griffith C. Burr
- Okaloosa County Gas District
- Louis P. Orth, Jr.
- Owens Engineering Company Inc.
- Peterson & Associates
- Phoenix Design Group
- Power Equipment Co.
- Process & Power Inc.
- Alamo ASHRAE Chapter
- Allen Consulting Inc.
- Allied Supply Company Inc.-Little Rock
- Alpha Mechanical Contractors Inc.
- Ameco Inc.
- John L. Anderson
- Arkansas ASHRAE Chapter
- Arkansas Industrial Insulators Inc.
- Arkansas Louisiana Gas Co.-Shreveport
- Arkansas Louisiana Gas Co.-Altus
- Arkansas Mechanical Contractors Inc.
- Armstrong Mechanical Co.
- Ashcraft Company Inc.-Ft. Worth
- Ashcraft Company Inc.-Dallas
- Austin Air Balancing Corp.
- Austin ASHRAE Operations
- Jeffrey W. Austin
- Austin Pannell Associates Inc.
- Austin Plumbing & Piping
- Industry Fund
- Austin Sheet Metal Industry Fund
- Automated Building Systems Inc.
- Timothy J. Baker
- Barry Engineering Inc.
- Robert W. Barry
- Bartos Inc.
- Batson Engineering PA
- BCI Mechanical Inc.
- Michael F. Beda
- Beeson Mechanical Contractors Inc.
- Charles M. Benson
- Berger Engineering Co.
- Blake Mechanical
- Larry R. Bloomquist
- Bloxom & Associates Inc.
- William G. Boone
- Boone & Boone Sales Co.-Tulsa
- Chan B. Borkar
- Randy L. Bosworth
- Bradford Industrial Supply Co.
- Bradford Plumbing Inc.
- Brandt Engineering Company Inc.-San Antonio
- Brandt Engineering Company Inc.-Dallas
- David J. Branson
- Michael R. Bregenzler
- Paul E. Briscoe
- Jeffrey D. Brouillette
- Conny R. Brown
- Brown & Root Inc.
- William H. Brydson
- Jack B. Buckley
- James A. Buckner
- Building Automation Systems Inc.
- Bullard Roberson Co.
- David J. Buxton
- CBS Mechanical Inc.
- C.C. Cooke Co.
- CHE Inc.
- C.H. Guernsey & Co.
- Jim Hicks Co.
- Charles D. Callahan
- Carrier Bock Co.-Ft. Worth
- Carrier Bock Co.-Irving
- Carrier Bock Co.-Shreveport
- Robert T. Carson
- Wendell O. Carter
- Carter & Burgess Inc.
- Dan P. Cason
- Central Oklahoma ASHRAE Chapter
- Central Power & Light Co.
- Ceramic Cooling Tower Co.
- David E. Clarridge
- Edward L. Clarke
- Giebume Mechanical
- Climate Master Inc.
- Climatic Corp.
- CMII
- Combined Refrigeration
- R&H Supply Co.
- Rademaker Corp.-Memphis
- Rademaker Corp.-Louisville
- Rebco Inc.
- Refrigeration Supply Company Inc.
- Richard D. Rivers
- Rogers & Morgan Inc.
- Rome Eddleman & Associates Inc.-Knoxville
- Rowan & Associates Inc.
- Rust International Corp.
- Sain Engineering Associates
- Scarborough Mechanical Service Inc.
- John K. Seely
- Sellers Engineering Co.
- Sentry Heating & Air Conditioning
- Shapley Design Consultants
- Shelby Skipwith Inc.
- Sibley Services Inc.
- Smith Seckman Reid Inc.
- Snyder General Corporation
- Southern Building Code Congress International
- Wayne F. Spell
- Stanley Jones Corp.
- Sklar Service Inc.-Baton Rouge
- Sтивен E. Stephens
- Systems Analysis Inc.
- Systems Corp.
- T.C. Bearden Co.
- T.J. O'Brien Engineering Co.
- Tennessee Valley ASHRAE Chapter
- Terry Equipment Company Inc.
- The Trane Co.-Clarksville
- Tillery Heating & Air Conditioning Inc.
- Tom Michaels & Associates Inc.
- Trane Commercial Sales-Memphis
- Tri State Insulation Co.
- Tudor Trane
- Union Control Inc.
- United Air Products Corp.
- United Cities Gas Co.
- Ronald Vinson
- Wade & Associates
- Ward Mechanical Equipment Inc.
- Watts Engineering Sales Inc.
- Weatherch Distributing Company Inc.
- West Miller Welch Engineers Inc.
- Robert D. Weiler

Considerable amounts of money have been spent by various agencies to develop meaningful criteria for the assessment of exterior environmental and interior industrial noise and its effect on people. Very little work has addressed the question of how people react to indoor noise levels in less extreme situations, where the background sound is established by the noise level of operating HVAC systems. Technical literature does not deal adequately with the measurement, rating and evaluation of low-frequency HVAC noise. The widely used Noise Criteria (NC) curves do not evaluate the potential for low-frequency rumble and the acceptability of other low-frequency noise components from HVAC equipment. Hence, there is an urgent need to determine improved techniques for measurement and descriptors for evaluation of low-frequency noise. Without these descriptors, it will be very difficult to establish reliable low-frequency design criteria and methods for the evaluation of low-frequency sound in occupied spaces.

The objective of this project is to derive a practical metric or assessment method for evaluation of the acceptability of low-frequency HVAC sound. The scope includes a literature review, measurement of neutral and rumble HVAC sounds and recommendation of appropriate metrics/assessment methods for use in a later separate subjective phase of this investigation.

716-RP  
MEASUREMENT OF SOLUBILITY, VISCOSITY AND DENSITY OF SYNTHETIC LUBRICANTS/HFC-134a MIXTURES

September 1991 - October 1992  
Imagination Resources Inc.  
Principal Investigator: Richard C. Cavestri  
TC 3.4, Lubrication  
TC 8.1, Positive Displacement Compressors

Recent research has identified the use of HFC-134a as an alternative refrigerant for ORC-12 in refrigeration and air-conditioning systems, but HFC-134a is insoluble in the mineral oils used in our industry. Much effort is being expended in the development of synthetic lubricants for use in conjunction with HFC-134a. There are no solubility and viscosity data on HFC-134a and only limited data for a synthetic lubricant, alkylbenzene, which is also insoluble in HFC-134a.

The objective of this project is to produce property data that will show the gas solubility (refrigerant concentration), density and viscosity of HFC-134a solutions at pressure and temperature with synthetic lubricants. The pressures and temperatures for these determinations will range from 10 to 500 psia and -25° to 125°C.



678-RP "Development of Time-Temperature-Humidity Relations for Commodity Storage" will develop guidelines for the food distribution network to economically provide fresh produce throughout the year.

713-RP  
EVALUATION OF SOLAR HEAT GAIN TEST METHODS

September 1991 - October 1992  
Queen's University at Kingston  
Principal Investigator: Stephen J. Harrison  
TC 4.5, Fenestration

Unsubstantiated shading coefficient test results, often leading to exaggerated shading performance claims, are regularly included in some of the product literature. New or extended methods of characterizing instantaneous or time-averaged performance are prerequisites to the development of industry standard test procedures, and necessary to the development of accurate and reliable methods of characterizing the performance of glazing and shades.

The objectives of this project are to identify test methods and facility standards that could form the basis of an industry standard on solar heat gain measurement. Because such a standard would ultimately be used by the window industry, the options and concerns of various industry groups will be considered during all phases of the program. Industry input will ensure that resulting standards are acceptable to and ultimately used by manufacturers and designers and will provide a comprehensive list of the range of products that are currently available, and those planned for the future.

714-RP  
DETERMINATION OF THE RELATIONSHIP BETWEEN LOW-FREQUENCY HVAC NOISE AND COMFORT IN OCCUPIED SPACES - OBJECTIVE PHASE

September 1992 - July 1993  
Vipac Engineers & Scientists Ltd.  
Principal Investigator: Norman Broner  
TC 2.6, Sound and Vibration Control

There is a need for data that will provide ASHRAE members with an important tool for identifying and local existing sources of measured data on energy performance in residential and nonresidential buildings and at the whole building, system and equipment (or component) levels. Access to such data will provide a better empirical basis for engineering design and operating decisions. This, in turn, will help ASHRAE members and their clients to save energy, reduce

717-RP  
AN ENERGY CALCULATION MODEL FOR ATTICS, INCLUDING RADIANT BARRIERS

September 1992 - September 1993  
Holometrix Inc.  
Principal Investigator: David G. Ober  
TC 4.7, Energy Calculations

Attic radiant barrier systems (RBS) are receiving a great deal of promotion by their manufacturers as significant reducers of attic heat gains in summer and as reducers of heat loss in the winter. Some claims for energy savings are as high as 45% of the entire utility bill, while others feel the potential savings of RBS are probably closer to 10% to 20% of the annual cooling energy (or 3% to 8% of the annual utility bill). The manufacturers of RBS have lobbied certain states and municipalities to endorse RBS for consideration in local and state energy codes. However, code officials do not have any rational basis for judging the effectiveness of RBS in the range of climates in the United States.

The objective of this project is to develop reliable methodologies to perform hourly energy calculations for attics with and without RBS.

718-RP  
DEVELOP A DESIGN PROCEDURE FOR THERMAL ENERGY STORAGE TANKS THAT SEPARATE THE MANUFACTURE OF ICE FROM THE STORAGE OF ICE

September 1991 - September 1993  
University of Missouri Kansas City  
Principal Investigator: William E. Stewart Jr.  
TC 6.9, Thermal Storage

The absence of data on sizing thermal energy storage tanks for systems that separate the manufacture of ice from the storage of ice results in improper sizing of the storage tank and in thermal energy storage systems that do not work. Oversizing of ice storage tanks usually does not interfere with the design intent, but it is undesirable. Undersizing storage tanks can be catastrophic. Increased exit water temperatures usually at the hottest time of the day can cause significant unmet cooling loads.

The objectives of this work are to define the parameters and to use the parameters to develop a design procedure for thermal energy storage tanks utilizing technologies that separate the manufacture of ice from the storage of ice. The basic two questions to be answered are: how much ice is in the tank? and, what is the exit water temperature?

719-RP  
INVENTORY AND ASSESSMENT OF SOURCES AND MEASURED DATA ON WHOLE BUILDING, SYSTEM AND EQUIPMENT ENERGY PERFORMANCE

April 1992 - October 1993  
ADM Associates Inc.  
Principal Investigator: Taghi Akereza  
TC 9.6, Systems Energy Utilization

There is a need for data that will provide ASHRAE members with an important tool for identifying and local existing sources of measured data on energy performance in residential and nonresidential buildings and at the whole building, system and equipment (or component) levels. Access to such data will provide a better empirical basis for engineering design and operating decisions. This, in turn, will help ASHRAE members and their clients to save energy, reduce

**690-RP  
TESTING FIRE DAMPERS AT VARYING AIR FLOWS AND TEMPERATURES**

July 1992-April 1993  
Central Technical Services Ltd.  
Principal Investigator: Pasad Bhatt  
TC 5.6, Control of Fire and Smoke

There is concern that fire dampers may not perform as intended in dynamic systems that are operational in the event of a fire (smoke control system) and in static systems where fans continue to operate. Airflow occasionally has prevented fire dampers from closing completely.

The objective of this project is to investigate UL 555 dynamic rated fire damper performance under airflow and duct pressure at elevated temperature conditions to assure life safety. Information from this test project may be used to revise codes and standards.

**692-RP  
COMBUSTION OF AMMONIA—WITH AND WITHOUT OIL VAPOR**

September 1991—September 1993  
Kansas State University  
Principal Investigator: Donald L. Fenton

TC 10.1, Custom Engineered Refrigeration Systems  
Although the future of ammonia is beginning to appear brighter, progressively tighter restrictions are being imposed on the use of ammonia by the EPA, OSHA and other regulating agencies. The need for more knowledge about the combustion of ammonia in air has intensified in the past several years. The impetus has been provided by two different motives: To enhance the combustion of ammonia being released from refrigeration systems and burned in a flare, and to prevent the combustion of ammonia combined with oil vapor unintentionally released in a confined space, such as a machine room.

The objective of this project is to develop and operate an experimental facility where the flammability limits, combustion performance (proportion of ammonia burned) and minimum ignition energy of the ammonia-methane-air mixture are measured. The flammability limits of ammonia-air mixtures will be determined in both an open vertical tube and continuous flow burner to establish reliable experimental procedures. The influence of lubricating oil (mineral and synthetic) vapor, oil liquid spray droplets and liquid ammonia on the flammability limits of ammonia-air mixtures will be determined in separate experiments using the continuous flow burner.

**690-RP  
LABORATORY STUDY TO DETERMINE THE FLOW RESISTANCE OF OVAL DUCT AND FITTINGS**

September 1991—March 1993  
Tennessee Technological University  
Principal Investigators: Farhooz Khodabakhsh-Sharibad and Stephen Idem  
TC 5.2, Duct Design

Oval fitting loss coefficient data is limited and needs to be confirmed, expanded and included in the "Duct Design" chapter of the ASHRAE Handbook—Fundamentals. The need was emphasized at a meeting of the Serial Duct Manufacturers Association (SPDA) and by inquiries by consulting engineers. Engineers need the data because the spiral duct market, including spiral flat oval, has significantly increased in recent years.

The objectives of this project are to experimentally measure the pressure loss with air flow in oval ducts and fittings, to determine the loss coefficients for the fittings tested and to verify the oval duct equivalent round equation used in the ASHRAE Handbook.

**698-RP  
DEVELOP AIR DENSITY CORRECTION PROCEDURES FOR COMMON VELOCITY MEASUREMENT INSTRUMENTS**

April 1992—August 1993  
University of Missouri-Rolla  
Principal Investigators: Faith Frantz and Harry J. Sauer  
TC 9.7, Testing and Balancing

It is noted that system design specifications, fan curves and other air handling equipment specifications are normally defined in terms of air quantity or flow rates at standard density conditions. In extreme situations such as in Denver and other cities with high elevations, the air density may vary as much as 17% from standard conditions because of the decreased ambient pressure. Errors of these magnitudes are significant factors in the overall measurement and balancing uncertainties by today's standards. Chapter 13 of the ASHRAE Handbook—Fundamentals does not address the density correction of air velocity measurements to standard conditions.

The objectives are to establish the correct method for the air-density correction from test conditions to standard conditions for velocity measurements when using a rotating vane anemometer, deflected vane anemometer and a thermal anemometer, and to develop the theoretical relationship for the air density correction for each instrument as a function of temperature, pressure and humidity, as well as to validate the theory with measured data.

**699-RP  
DEVELOPMENT OF ALGORITHMS TO PREDICT THE PERFORMANCE OF ICE-ON-PIPE BRINE STORAGE SYSTEMS**

June 1991—June 1993  
Virginia Polytechnic Institute and State University  
Principal Investigator: Douglas J. Nelson  
TC 6.9, Thermal Storage

The absence of modeling tools to properly characterize the charging and discharging cycles of this type of thermal energy storage system can allow the improper design of the system. Exit water temperature variation during the discharge cycle may cause unacceptable cooling coil performance in the building. Annual energy simulation as well as sizing requires a detailed knowledge of the balance between the chiller, the storage device and the load. Absence of this detailed modeling technique causes simplifying assumptions to be made in the analysis, which can cause erroneous results.

The primary objective of this research is to develop a theoretical model and computational algorithm to predict the dynamic thermal response of an ice-on-pipe brine thermal energy storage system. The model for the thermal energy storage component will be coupled to chiller and load component models.

**701-RP  
DEVELOPMENT OF A SOIL THERMAL PROPERTY DATABASE**

April 1991—January 1993  
University of Minnesota  
Principal Investigator: Raymond L. Stelling  
TC 4.4, Thermal Insulation and Moisture Retainers

Heat transfer calculation procedures are only as good as the input data. The prime inputs required to estimate building heat loss and gain through the ground are the soil thermal properties. Existing soil property data are not adequate because they are ambiguous and not comprehensive.

The objective of this study is to develop an improved thermal property database and methodology for the estimation of site-specific soil thermal properties for inclusion in the ASHRAE Handbook—Fundamentals.

**702-RP  
FIELD STUDY OF OCCUPANT COMFORT AND OFFICE THERMAL ENVIRONMENTS IN A HOT, HUMID CLIMATE**

April 1992—October 1993  
Macquarie Park Research Ltd.  
Principal Investigator: Richard de Dear  
TC 2.1, Physiology and Human Environment

ASHRAE Standard 55 is based almost entirely on data from test-chamber studies performed in temperate climates. This poses potential problems when the standard is applied to working populations living in the hot, humid climates found in the southern United States and in many tropical countries. There is a great deal of construction going on in such locales, perhaps most notably in the rapidly industrializing countries of southeast Asia and the Pacific Rim. There is persistent questioning in the professional community of how applicable ASHRAE thermal standards are for the populations in these regions, and the questions cannot be answered with the data now in the literature.

The objective of this project is a detailed study of office worker comfort in a hot, humid climate in which both environmental variables and subjective responses are measured with laboratory-grade accuracy.

**703-RP  
ROOM AIR MOVEMENT DATA FOR VALIDATING NUMERICAL MODELS**

April 1992—February 1994  
Kansas State University  
Principal Investigators: M. Hosen and B.W. Jones  
TC 4.10, Indoor Environmental Modeling

Modeling room air movement is critical for predicting thermal comfort, the transport of indoor air contaminants, smoke movement in the event of fire and numerous problems important to HVAC design engineers. Currently, ASHRAE is sponsoring research to develop a practical computer model to predict room air movement, and the researchers have concluded that the available data for validating the numerical program they have developed are insufficient. The results from the proposed room air motion measurements will be useful for evaluating and improving this and other numerical models.

The objective of this project is to generate experimental data that can be used to develop and validate numerical models of room air diffusion. A two-phase program is planned. In the first phase, a detailed experimental plan will be developed. In the second phase, a test room will be constructed and experimental data collected.

**705-RP  
LOW TEMPERATURE AIR DISTRIBUTION: JETS OF LOW TEMPERATURE AIR**

April 1992—April 1994  
University of Illinois  
Principal Investigator: Leslie L. Christianson  
TC 6.9, Thermal Storage

The successful application of cost-effective cool storage systems is essential in view of the impending electrical generation/transmission capacity shortage. Cool storage, with the application of cold air distribution, provides the potential for reduced capital cost and improved efficiency. It would be desirable to introduce the cold air directly to the space. However, our understanding of this application is limited.

The objectives of this project are to review background information, including existing throw, spread, separation and thermal comfort models for nonisothermal jets, and develop a test plan for measurement of cold air jets, as well as a subsequent analysis of throw, spread and separation constants. It will extend design guidelines for the application of air distribution systems that directly introduce cold air of 38° to 40°F by incorporating results into existing models.

- Compliance Service Group Inc.
- Computer Environmental Systems Inc.—Shreveport
- Consulting Engineers Inc.—Tulsa
- Control Systems International
- Hugh G. Corcoran
- Richard L. Cyr
- DFW Industry Fund
- DWG Engineering
- Dallas ASHRAE Chapter
- Charles B. Darr
- Michael J. Davidson
- DeJerman Scheinman Inc.
- Dick Shankard Inc.
- Donohue Service Company Inc.
- Duct Fab Company Inc.
- Dyna Ten Corp.
- Dynamic Systems Inc.
- Dynasotics Inc.
- E.O. Wood Co.
- East Texas ASHRAE Chapter
- Ed's Supply Company Inc.—Little Rock
- Richard R. Ellis
- Energy Engineering Associates Inc.
- Energy Testing & Balance Inc.
- Engineered Air Balance Co.—Houston
- Engineered Air Balance Co.—Dallas
- Enrich Sales & Service
- Entex Inc.
- Enviro Tax
- Espary Houston SME Inc.
- Doug E. Estep
- Fanning Farming & Associates Inc.
- Norris L. Fanning
- Federal Corp.
- William C. Ferguson, Sr.
- Fields & Co. of Oklahoma
- Robert W. Fitzgerald
- Fitzgerald Contractors Inc.
- Five Star Electric Motors Inc.
- Flow Design Inc.
- Fort Worth ASHRAE Chapter
- Melwyn E. Foster
- Frankfort Short Bruza Associates
- Freer Mechanical Contractors Inc.
- Frees Inc.
- Emil E. Friberg
- Friberg Associates Inc.
- Fritch Inc.
- F. Worth Plumbing & Pipefitting
- Industry Fund
- GM Sheet Metal Inc.
- Lawrence Henry Galfrey
- Galfrey & Associates
- General Engineering Corp.
- General Mechanical Contractors Inc.
- George B. Allen & Co.
- George Warren Co.
- Gibbs Service Company Inc.
- Walter P. Glancy
- Governair Corp.
- A. Damon Gowan
- Gowan Inc.
- Graco Mechanical Inc.
- Graves Mechanical Contractors—Houston
- John R. Gray
- Gruenwald Engineering Inc.
- Diana R. Grundmann
- H.A. Gray & Associates Inc.
- H.E. Burt Grocery Co.
- H.G. Angle Company Inc.
- H.V.R. Capers Co.
- HVAC Mechanical Services—Houston
- H.W. Goodman, Jr. Engineers Inc.
- Hall Mechanical Contractors Inc.
- Hambrick-Ferguson Inc.—Oklahoma City
- Hambrick-Ferguson Inc.—Tulsa
- Robert B. Hamn
- Hammer Engineering
- Hardcast Inc.
- Robert R. Harden
- Hardt James Inc.
- Harrison Orr Air Conditioning Inc.
- John L. Harrod
- Michael N. Hart
- Hellmuth Oatka & Kassebaum Inc.—Dallas
- Hendrix & Myers Consulting Engineers
- Higgins & May Inc.
- HMG & Associates Inc.
- Holiste & Associates Inc.
- Honeywell Inc.—Memphis
- Houston ASHRAE Chapter
- Houston Sheet Metal Contractors Assn.
- Houston Trane
- Michael Earl Humphreys
- Bruce D. Hurn
- Ronald L. Huntley
- Richard O. Hunton
- R.W. Hultenhower
- Illuminating Engineering Society
- Industrial Heating & Plumbing Insult Pipe Systems Division of S.W. Insulators Inc.
- J.C. Environmental Sales
- J.D. Higgins Company Inc.—Arlington
- J.L. Boyer & Associates
- J.M. Boyer Inc.
- Jack T. Carter Company Inc.
- Ronald L. Jackson
- Jaco Sales Inc.
- Stephen Jaeger
- Harold James
- James Johnson & Associates
- James T. Rodriguez Consulting Engineer
- John R. Neal & Associates Inc.
- Michael Roy Johnson
- Johnson Controls Inc.—Irving
- Johnson Supply
- Johnson & Scott Inc.—Little Rock
- William O. Kelly
- James P. Kersey
- Freer Mechanical Contractors Inc.
- Charles D. Kiefler
- L. Nick King
- Krisman & Associates
- KLW Inc.
- Koldaire Supply Company Inc.
- Lampe Spack & Associates Inc.
- Landis & Gyr Powers Inc.—Dallas
- Lynn E. Laurence
- Lee & Browne Consulting Engineers Inc.
- Lennox Industries
- Rodney H. Lewis
- Lewis & Lambert Metal Contractors
- Little Rock Mechanical Inc.
- Paul M. Lodes
- Lone Star Energy Co.
- Lone Star Gas Co.—Dallas
- Joseph D. Lowke
- Richard P. Lowe
- Lubbock Power & Light
- Malek Inc.
- Marmon Barclay Sauter Foster Heys Architects
- Mason-Dallas Inc.
- Matherly Mechanical Contractors Inc.
- Jimmy D. May
- Bob A. McAlister
- Robert G. McDonough
- McIntosh Services Inc.
- Faye C. McQuislin
- MCD Co.
- McMillan and Associates Inc.
- McMillan
- Hugh D. McMillan
- Mechanical Contractors Assn. of Dallas
- Mechanical Contractors Industry Fund of Houston
- Mechanical Representatives Inc.—San Antonio
- Mechanical Reps Inc.—Austin
- Mechanical Systems Balance Inc.
- Mecc-LaSalle Manufacturing
- Julio Meiger
- Merdian Sheet Metal Inc.
- Daniel F. Moffitt
- Ermel Moody
- Charles L. Morse
- Louis C. Mosel
- Nabholz Construction Corp.
- Natkin Service Co.—Oklahoma City
- Natkin & Co.—Dallas
- John R. Neal
- Dayton O. Nooner
- Northwestern Oklahoma ASHRAE Chapter
- O'Connell Robertson & Associates Inc.
- O'Connor Oklahoma Company Inc.
- Oklahoma Air Filter Sales & Service Co.
- Oklahoma Gas & Electric
- Oklahoma Natural Gas Co.
- Omnir Mechanical Services—Tulsa
- Oslin Nation Co.—Dallas
- P&S Associates Inc.
- August F. Pachatzina
- Palmer Plumbing Heating & Air Conditioning
- Paschal Harper Inc.
- Persons Howell Engineering Inc.
- Pettit & Pettit Consulting Engineers Inc.
- Phi Service Agency Inc.
- Pickens Mechanical Contractors Inc.
- Pipkin Brothers Inc.
- Pitts Engineering Co.
- Plumbing And Pipefitters Local 944
- Pumping Heating Cooling Industry Promotion Fund
- Powers of Arkansas
- Powers of Oklahoma
- Prime Mechanical Contractors
- Process Equipment Company Inc.—Oklahoma City
- Process Equipment Company Inc.—Tulsa
- Public Service Co. of Oklahoma
- Robert C. Pumpelly
- Pumps Unlimited
- R.B. Atkins Co.
- Lynn "Bob" Austin Inc.
- R&B Enterprises Inc.
- R&B Equipment Co.—Tulsa
- R&M Mechanical Contractors Inc.
- Richard K. Ramsey
- Red Bud Service Inc.
- Red Wells Benson & Co.
- Refrigeration & Electric Supply Co.
- Regional Electric Systems
- Republic Contractors Inc.
- Resource Distributing Inc.
- Richardson's Plumbing & Heating Inc.
- Riddick Engineering Corp.
- David B. Righthouse
- Riley & Associates Inc.
- River City Mechanical Inc.
- Herschel P. Roberts
- Jack F. Roberts
- Rodney H. Lewis Associates Inc.
- Roger R. Rohe
- Romine Romine & Burgess Inc.
- Roth Manufacturing Co.
- Russell Plumbing Co.—Tulsa
- S&J Mechanical Contractors Inc.
- Joseph R. Sacra
- Victor R. Schuelein
- Schuelein & Halpain Engineering Inc.
- Scott Systems Inc.
- Baker L. Shannon
- Sheet Metal Industry Fund of Western Oklahoma
- Sheet Metal Service Co.—Oklahoma City
- Shreveport ASHRAE Chapter
- Sigler Sales & Service Inc.
- SKI HI Enterprises Inc.
- Slack Buchner Systems Inc.—Dallas
- SMACNA-North Texas
- Wayne C. Smith
- Snyder/General Corporation
- Soder Mechanical Inc.
- Southern Texas ASHRAE Chapter
- Natkin & Co.—Dallas
- Southern Union Gas Co.
- Warren A. Spoford
- State Distributors Inc.
- Stearmatic of Austin Inc.
- B. Fritz Stinson
- Storer Equipment Company Inc.
- Streets Inc. Mechanical Contractor
- Sunbelt Mechanical Inc.
- Robert J. Survil
- John L. Sutter
- Swarida Brothers Inc.
- T.J. Botsimer Company Inc.
- TD Industries
- Tempset Controls Inc.
- Temrol Inc.
- Texasaco Chemical Co.
- Texas Air Products Inc.
- Texas Air Systems—Irving
- Texas Air Systems Inc.—Dallas
- Texas Energy Engineers—Houston
- Texas Trane
- The Benham Group Inc.—Oklahoma City
- The Bosworth Co.
- The Cromwell Firm
- The Kiefler Firm
- The Trane Co.—Fr. Worth
- The Trane Co.—Oklahoma City
- The Trane Co.—Tulsa
- The University of Texas at Austin
- Robert W. Timberlake
- Tom Green & Co. Engineers Inc.
- Samuel G. Toub
- Trane Dealer Products Group
- Trane Little Rock Sales
- Trinity Contractors Inc.
- Tulsa Air Specialists Inc.
- U.S. Power Climate Control Inc.
- United Electric Co.
- United Mechanical Contractors Inc.—Oklahoma City
- United Services Automobile Assn. Valquest Inc.
- Vicon Equipment Inc.
- James P. von Woelke
- Vasinas Construction Co.
- Wade Co.
- Herbert F. Walkers
- William E. Walker
- Carl W. Wampler
- Aaron T. Waugh
- Waugh Engineering
- Weathertron Inc.
- Weidon Mechanical Corp.
- West Texas ASHRAE Chapter
- Curtis W. White
- Wickline Sales Co.
- Williams Tippett & Associates Inc.
- Ron D. Yeasley
- York International—Dallas
- York International—Houston
- Young & Pratt Service Inc.

Investors of \$125 or more (continued)

Region IX

Investments of \$125 or more

- A-1 Heating & Air Conditioning
- A.A. Maycock Company Inc.
- AR Company Inc.
- A&B Plumbing & Heating Co.
- A-1 Heating & Air Conditioning
- ABS Consultants Inc.
- Action Air Inc.
- Action Mechanical
- Air Purification Co.
- Air Side Components Inc.
- Aircad Inc.
- Allison Engineering Inc.
- Alvine & Associates Inc.
- Applied Automation Inc.
- Associated Air Products Inc.-Lenexa
- Associated Consulting Engineers Inc.
- Aikinson Electronics
- John C. Austin
- B.G. Peterson Co.
- Baile Foreath Inc.
- Barnhart Taylor Engineering Company Inc.-Albuquerque
- Barnett & Co.
- Barrett Refrigeration Co.
- Beardslee Holland Associates Inc.
- Bennion Associates Engineers
- Bernard Engineering Co.
- Black Hills Area ASHRAE Chapter
- Black & Veitch Engineers
- Blue Flame Gas Assn. of Nebraska
- Bonded Plumbing & Heating Company Inc.
- Boyd Engineering Company Inc.
- Bridgers & Paxton Consulting Engineers Inc.
- Briggs Inc. of Omaha
- Bryant Heating & Air Conditioning Building Controls & Services Inc.
- Burch Associates Inc.
- Cantor Ruma & Associates Co.
- Carrier West Inc.
- CBA Co.
- CCI Mechanical Inc.
- Central Air Conditioning Company Inc.
- Central Mechanical Wichita Inc.
- CFM Co.
- CH2M Hill Central Inc.
- Charles D. Jones Company Inc.-Colorado Springs
- Charles D. Jones & Co.-Denver
- Cherrington's Inc.
- Richard Michael Chiles
- Climate Systems Inc.
- Cobb Mechanical Contractors
- Colorado Interstate Gas
- Colvin Engineering Associates Inc.
- Comfort Products Distributing-Kansas City
- Commercial Air Management Inc.
- Control Services Inc.
- Control & Equipment Co. of El Paso
- Coupland Moran Engineers Inc.-Albuquerque
- Coupland Moran Engineers Inc.-El Paso
- Coziahr Heating & A/C Inc.
- D&M Sales Inc.
- Dana Larson Roubal & Associates
- Data Power Technology-Omaha
- Bruce G. Davis
- Davis Engineered Equipment Co.
- Den Management Company Inc.
- Densand Inc.
- Don Vaughn Inc.
- Drake Plumbing & Heating Inc.
- Randall A. Drake
- Dunham Associates Inc.
- Empire Gas & Electric Equipment Co.
- Energy Tech Automated Control Systems Inc.
- Energy Balance Inc.
- Energy Control Inc.
- Energy Savings Products of New Mexico Inc.
- Engineered Mechanical Inc.
- Engineering Products Co.
- Environmental Mechanical Contractors
- Equipment Service Professionals FM Inc.
- Farris Engineering Inc.-Omaha
- Farris Engineering-Colorado Springs
- Feltis House Engineering Inc.
- Flour Daniel Inc.
- Fluid Systems Inc.
- Brent N. Fodness
- Foy Engineering & Energy Consultants
- Gagon Brothers Mechanical Contractors Inc.
- Garner & Associates Company Inc.
- Gas Co. of New Mexico
- General Heating & Cooling
- Ginton Adams Heating Equipment
- Goodwin Engineering Inc.
- J. Barrie Graham
- Great Western Mechanical
- Daniel H. Grider
- Grider Robinson & Associates
- Griffith Engineering Service
- Gritton & Associates Inc.
- Fred L. Gronvall
- Robert E. Hahn
- Hanna Plumbing & Heating Co.
- Harding Mechanical Inc.
- Haynes Trane Services
- Health Engineering Co.
- Heating & Cooling Distributors Inc.
- Hemco Plumbing & Heating Inc.
- Henningson Durham & Richardson Inc.
- Herlin Equipment Co. of El Paso
- Honeywell Inc.-Omaha
- Honeywell Inc.-Sioux Falls
- Howe Heating & Plumbing Inc.
- Ronald R. Howe
- Hughes Machinery Co.
- Hutchison Engineering Products
- Idaho ASHRAE Chapter
- Ideaho Power Co.
- Industrial Refrigeration Company Inc.
- Insulation Enterprises Inc.
- Integrated Mechanical Systems Inc.
- Intermountain Gas Co.
- Interstate Mechanical Corp.
- Stephen W. Ivesdal
- JB Sheet Metal Inc.
- J.D. Steward Air Conditioning Inc.
- J.H. Bowman Company Inc.
- J.L. Hermon & Associates Inc.
- J. Wilcox Sales Co.
- James Cooke & Hobson Inc.-Albuquerque
- James Cooke & Hobson Inc.-El Paso
- Richard E. Jameson
- Jenkins Engineering Co.
- Jordan Riscoe Associates Inc.
- JSI/Trane
- JWP Trautman & Shreve Inc.
- Kansas City ASHRAE Chapter
- Kansas City Power & Light Co.
- King Scoopers
- Richardson Equipment Co.
- Ro Bar Technical Services
- Robinson Mechanical System Ltd.
- William F. Robinson
- Roby Quintal & Everson Consulting Engineers
- Rocky Mountain ASHRAE Chapter
- Robt Air Filter Sales & Service
- Sabol & Rice Inc.-Salt Lake City
- Sabol & Rice of Idaho Inc.
- Sandoz Pharmaceuticals Corp.
- Schaefer Johnson Cox Frey & Associates
- Shanahan Mechanical & Electrical Inc.
- Sheet Metal Contractors Industry Fund-Salt Lake City
- Shockey Lane Inc.
- Sieler & Reeves
- SMACNA-Kansas City
- South Dakota ASHRAE Chapter
- Southwest Trane
- Spec Air Co.
- Superior Boiler Works Inc.
- Superior Supply Company Inc.
- Ted R. Brown & Associates Inc.
- Temperature Control Inc.-Albuquerque
- Phil P. Terrell
- Tessier's Inc.
- The Ballard Group Inc.
- The Johnston Co.
- The RMH Group Inc.
- The Schemmer Associates Inc.
- The Trane Co.-Salt Lake City
- Thermal Equipment Co.
- Thermodyn Mechanical Contractors Inc.
- TML Inc.
- TMS Inc.
- Tolin Mechanical Systems Co.
- Triangle Sales Inc.
- US Engineering Co.-Kansas City
- Utah ASHRAE Chapter
- Utah Mechanical Contractors Assn.
- Utah Pipe Trades Industry Fund
- Van Boerum & Frank Associates Inc.
- Verne Simmonds Co.
- W.M. Carroll & Co.
- Webco Engineering Co.
- Weldon F. Kille Co.
- West Plains Engineering-Rapid City
- West Plains Engineering-Sioux Falls
- Western Engineering & Supply Co.
- Western Sheet Metal Inc.
- Wichita Area Builders Assn.
- Wichita ASHRAE Chapter
- Wilco Inc.
- Wolf's Plumbing & Heating Inc.
- YMC Inc.
- Glenn M. Zeiler

related to HVAC design and analysis. However, there is a need for a compendium of models for the components found in HVAC systems to help those developing codes with capabilities not included in the packaged programs.

At present, there is no consolidated source of information documenting the mathematical models and calculation algorithms required to analyze HVAC systems. This deficiency makes it very time-consuming for engineers to develop ad hoc programs to investigate project-specific problems or analyze novel designs that are not within the capabilities of packaged programs. The lack of consistency between the models used by different engineers often clouds the results. It can prevent a clear understanding of the performance of given systems, which may lead to energy-inefficient designs.

This project will collect those algorithms that are established in the literature and provide a consistent base for HVAC system analysis.

The objectives of this project are to prepare a set of specifications describing simulation models of most common primary HVAC components, provide FORTRAN subroutines (it is proposed to produce TRNSYS types) for application of the models and illustrate models and use of subroutines on self-supporting examples and on four HVAC realistic applications.

666-RP ENERGY CALCULATIONS FOR BASEMENT, SLABS AND CRAWL SPACES

June 1991—March 1993  
Steven Winter Associates  
Principal Investigator: Moncef Krarti  
TC 4.7, Energy Calculations

Because of the recent advances in ground heat transfer calculation techniques, the methods embodied in standard energy calculation computer codes are out of date. Practicing engineers do not have ready access to the current techniques. This can lead to sub-optimal design and incorrect energy conservation decisions.

The objectives of this project are to propose a ground heat transfer calculation method, develop Fortran-77 coded algorithms, validate the proposed method against empirical data and detailed numerical models, and implement and demonstrate the proposed method with an hourly simulation program.

668-RP HEAT TRANSFER AND FLUID FLOW IN SPRAY EVAPORATORS WITH APPLICATION TO REDUCING REFRIGERANT INVENTORY

June 1991—December 1993  
Iowa State University  
Principal Investigator: Michael B. Pate  
TC 1.3, Heat Transfer and Fluid Flow

In the past, refrigerant availability, cost and the ozone depletion rate were not limiting parameters in system design. Presently, with the CFC issue, these aspects of a system are considered to be important and result in the need for systems with low refrigerant inventory. To cope with these problems, ASHRAE is giving prime importance to the issue of alternate refrigerants. One viable route is to use the alternate refrigerants HCFC-123 and HFC-134a in spray chillers for air conditioning and refrigeration applications. Therefore, extensive research on fluid dynamics and heat transfer is necessary if engineers are to properly design these evaporators.

The objective of this research project is to investigate heat transfer and fluid flow in spray evaporators (i.e., falling-film evaporation), with applications to reducing refrigerant inventory. The investigation will include performing experiments on plain and enhanced tubes in both single tube and tube bundle arrangements for three different refrigerants: HCFC-123, HFC-134a and HCFC-22.

Region X Investments of \$125 or more

- ACSITCS
- AE Associates
- John P. Agular
- Air Conditioning Company Inc.
- Air Conditioning Specialists Company Inc.
- Air Filter/Control
- Air Reqs-Hawaii
- Armani & Associates Inc.
- Alexander Schello & Associates
- American Consulting Engineers-Santa Clara
- Applied Air Filters
- Knipp Equipment Inc.
- KOH Mechanical
- Krier & Blain Inc.
- LSC Inc.
- L.S. Staples Co.
- LCH Systems Inc.
- Leo A. Daly Co.
- Long & Associates Inc.-Salt Lake City
- Long & Associates Inc.-Englewood
- Loren Cook Co.-North Ogden
- Jack L. Loveland
- Lucas Company Inc.
- William M. Lynch
- ME Engineers Inc.
- Mainelli Mechanical Contractors Inc.
- Malone Finkla & Associates Inc.
- Manikata Associates PC
- Marley Cooling Tower Co.-Mission Woods
- McElroy's Inc.
- McFall Kontek & Kimball
- McNevin Co.
- Mechanical Contractors Assn.-Kansas City
- Mechanical Contractors Assn.-Omaha
- Mechanical Sales Inc.-Omaha
- Michael A. Mechtienberg
- Meilen & Associates Inc.
- Michael R. Dove Sales Co.
- Midgley Huber Inc.
- Midwest Insulation Contractors
- Minnegasco Inc.-Lincoln
- Minnegasco Inc.-Sioux Falls
- Missouri Public Service Co.
- Monick Pipe & Supply Inc.
- Montana Dakota Utilities-Rapid City
- Mooday Engineering Inc.
- Mountain Fuel Supply Co.
- Musgrove Engineering
- Naikin & Co.-Omaha
- Nebraska ASHRAE Chapter
- Nebraska Trane
- Nelson Refrigeration Inc.
- New Mexico ASHRAE Chapter
- Norbyrn Equipment Company Inc.
- Norman S. Wright Co.
- Northern States Power Co.-Sioux Falls
- N.W. Pipe Fittings
- Michael A. O'Connor
- Robert P. O'Connor
- O'Connor Co.
- O'Connor Co.-Pillar Foundation
- O'Connor Co.-Sioux Falls
- Office of Energy Conservation
- Olsen & Peterson Consulting Engineers
- Osaugh Miller Associates Inc.
- Pacific Power/Utah Power
- Parker & Sons Mechanical Inc.
- Parra Sollys Engineering Inc.
- Paul Mueller Co.
- Russell A. Peterson
- Peterson Associates Inc.
- Pikes Peak ASHRAE Chapter
- Pikes Peak Mechanical Contractors Assn. Inc.
- Pinon Mechanical Services
- Preston Refrigeration Company Inc.
- Professional Engineering Consultants PA
- Public Service Co. of Colorado
- Public Service Co. of New Mexico
- PVC Specialists Co.
- R.L. Tenney & Sons Inc.
- R.S. Slover Co.
- R&S Balancing Co.
- Ray Martin Co. of Omaha
- Redlinger Brothers

671-RP DEFINE A FRACTIONAL EFFICIENCY TEST METHOD THAT IS COMPATIBLE WITH PARTICULATE-REMOVAL AIR CLEANERS USED IN GENERAL VENTILATION

June 1991—February 1993  
Research Triangle Institute, Center for Aerosol Technology  
Principal Investigator: James T. Hanley  
TC 2.4, Particulate Air Contaminants and Particulate Contaminant Removal Equipment

It has been proven that indoor air quality can only be evaluated by identifying the material of the contaminant and its particle size. For health reasons alone, the industry must provide a standard that will identify air cleaning devices that can best perform efficiently when evaluated on a particle size basis because respirable sizes are regarded as being most harmful.

The objective of this project is to develop a test method, subject to evaluation and approval by SPC 52.2 and TC 2.4, to obtain particle size dependent removal efficiencies for all types of ducted air cleaners. This data will allow matching air cleaner performance to intended applications.

675-RP DETERMINATION OF AIR FILTER PERFORMANCE UNDER VARIABLE AIR VOLUME (VAV) CONDITIONS

June 1991—June 1993  
Air Filter Testing Laboratory  
Principal Investigator: David J. Murphy Jr.  
TC 2.4, Particulate Air Contaminants and Particulate Contaminant Removal Equipment

ASHRAE Standard 52.76 provides for testing of atmospheric dust spot efficiency and gravimetric efficiency during a dust loading procedure that uses a synthetic test dust. This is accomplished at one flow rate and flow of the unit. There are two facets to filter performance under variable volume conditions: filter collection efficiency and filter pressure drop as a function of flow as dust accumulates.

The objectives of this project are to determine algorithm(s) to predict resistance and efficiency of filters operating under VAV conditions, to establish atmospheric particle sizing and other methods for use the ASHRAE duct to measure parameters for these algorithms, to measure what particles lodge from air filters and to determine loss of integrity by filters.

676-RP DETERMINATION OF SHELL-SIDE CONDENSER BUNDLE HEAT TRANSFER DESIGN FACTORS FOR REFRIGERANTS R-123 AND R-134a

June 1991—December 1993  
Iowa State University  
Principal Investigator: Michael B. Pate  
TC 8.5, Liquid-to-Refrigerant Heat Exchangers

The HVAC industry is facing a phase-out of CFC refrigerants, such as R-11 and R-12. Heat transfer data to permit accurate design of water-cooled condensers using alternate refrigerants does not exist. Condenser data for alternative refrigerants will provide a basic rating for water-cooled condensers as a component and are necessary for rating a complete water chiller system.

The objective of this research project is to experimentally determine the shell-side condenser bundle heat transfer design factors for several alternative refrigerants, namely HCFC-123 and HFC-134a. To provide a reference, limited data will also be taken for conventional refrigerants CFC-11 and CFC-12. At least four different tube geometries (two finned tubes and two enhanced tubes) will be evaluated for shell-side condensation heat transfer.

677-RP "Effect of Automatic Sprinkler Protection on Smoke Control Systems" will verify danger levels of smoke in sprinkler-protected and non-sprinkler-protected fires.

677-RP EFFECT OF AUTOMATIC SPRINKLER PROTECTION ON SMOKE CONTROL SYSTEMS

June 1991—December 1992  
National Research Council Canada  
Principal Investigator: J.R. Mawhinney  
TC 5.6, Control of Fire and Smoke

Present information used for smoke control techniques is based primarily on research studies and field experience in non-sprinklered buildings. Anecdotal evidence and some limited research indicate that smoke in a fire protected by automatic sprinklers is less, or at least less dangerous, than smoke from a fire not protected by sprinklers. There is a need to verify if these suppositions are true.

The objectives of this research are to measure the effect that water spray from automatic sprinklers has on the conditions of temperature, pressure, oxygen and carbon monoxide levels in a building under fire conditions and to assess the effect that changes in these conditions might have on the performance of a zoned smoke control system.

677-RP EFFECT OF AUTOMATIC SPRINKLER PROTECTION ON SMOKE CONTROL SYSTEMS

June 1991—November 1992  
University of Florida  
Principal Investigator: Khe V. Chau  
TC 11.5, Fruits, Vegetables and Other Products

While information is available on recommended storage conditions for numerous fruits and vegetables, little information is available on the effect of varying storage conditions on the practical storage and shelf life of these commodities. It may be desirable to vary storage conditions for a variety of reasons. Without proper guidelines in this area, the prudent storage facility operator is limited in his ability to operate as efficiently as possible, which consequently limits his ability to analyze the potential for other cost saving measures, such as thermal energy storage.

The objectives of this project are to identify and evaluate existing data on the effect of storage time, temperature, humidity and atmosphere on the shelf life of fresh fruits and vegetables, and compile options for varying storage conditions to match desired storage life.

The principal objectives of this work are to assemble a knowledge base for HVAC system selection for small office buildings, to produce a working demonstration expert system (KBS) using this knowledge base and to validate the expert system. The effort and costs involved for each task of this project will be documented.

### 654-RP THERMODYNAMIC PROPERTIES OF REFRIGERANTS 125 AND 141b

September 1990—December 1992  
Texas A&M University  
Principal Investigator: James C. Holste  
TC 3.1. Refrigerants and Bines

A survey has shown that there is no tabulation or chart of the thermodynamic properties of R-141b. The survey indicates that R-141b is being considered mainly as a foaming agent. The little information available on the pressure-temperature characteristics of R-141b indicates it could possibly be used as a low-pressure refrigerant in the range of the ozone depleting refrigerants R-11 and R-113. However, it is not currently being evaluated as a refrigerant principally because of its vapor flammability.

While some preliminary and proprietary information has been obtained on R-125, which indicates it can be a replacement for R-502 (R-22/R-115 azeotrope) in food storage refrigeration, no published references on its thermodynamic properties have been found.

The objectives of this project are to make experimental measurements on R-125 and R-141b, to provide liquid densities accurate to better than  $\pm 0.01\%$ , vapor densities from  $\pm 0.01\%$  to  $\pm 0.05\%$ , and vapor pressure to  $\pm 0.05\%$ , and to derive from the PVT measurements enthalpies, entropies, specific heats and sound velocities accurate to  $\pm 1\%$  or better for R-125. Only vapor specific heats will be derived from the PVT and vapor pressure measurements for R-141b. The R-125 measurements will span temperatures from  $-50^\circ$  to  $400^\circ\text{F}$  and pressures from 0 to 550 psia; the liquid densities will be measured to 10,000 psia with no significant additional effort. The R-141b liquid density measurements will cover temperatures from  $0^\circ$  to  $250^\circ\text{F}$ , and the vapor pressure measurements will be extended to the critical point. Critical temperatures and pressures also will be determined for each substance.

### 656-RP HEAT PUMP/HEAT RECOVERY OPERATING EXPERIENCE

December 1991—December 1992  
Caneel Research Inc.  
Principal Investigator: Douglas Cane  
TC 9.4. Applied Heat Pump/Heat Recovery Systems

There are many heat recovery heat pump (HRHP) installations, but little documentation of operating performance experience exists. Identification and documentation of successful operations may indicate that HRHP systems are greatly underutilized and that it is economically feasible to use HRHP systems to recover substantial amounts of low-temperature energy that would otherwise be wasted (e.g., sewage effluent, chiller waste heat and waste heat from industrial processes). Companies operating HRHP systems usually have neither the time nor the funds to provide the needed information. Manufacturers' data are usually proprietary and, thus, unavailable.

The objective of this project is the identification of available written performance (cost or energy) data on current installations. Documentation of installations will identify situations where HRHP systems are beneficial and, thus provide guidance to consulting engineers and engineers in industries considering HRHP systems.

### 657-RP SIMPLIFIED METHOD TO FACTOR MEAN RADIANT TEMPERATURE (MRT) INTO BUILDING AND HVAC SYSTEM DESIGN

September 1991—January 1993  
Kansas State University  
Principal Investigator: Kirby S. Chapman  
TC 6.5. Radiant Space Heating and Cooling

The complete radiant heating literature search and sizing study completed earlier serves as the informational base for the key required elements essential to determining mean radiant temperature (MRT) measurement, thermal radiation balance, radiant asymmetry and measurement and related algorithms. However, those data have not been incorporated into a simplified method useful to ASHRAE members and the HVAC industry. This information is needed by building and HVAC design engineers in the continuing evolution of building design to reduce energy cost and increase comfort.

The purpose of this project is to develop simplified calculation techniques that will allow building and HVAC system designers to account for radiant energy exchange and to account for the effect of this exchange on required design conditions and system sizing. The techniques to be developed will address radiant heating systems specifically but may also be applicable to other types of systems as well.

### 658-RP ALGORITHM FOR DESIGN ANALYSIS OF AIRLUM SMOKE MANAGEMENT SYSTEMS

September 1990—October 1992  
University of Maryland  
Principal Investigator: James A. Milke  
TC 5.6. Control of Fire and Smoke

Airium smoke protection systems costing many millions of dollars are commonly designed by the simplest of techniques. The National Fire Protection Association (NFPA) has developed a draft document (NFPA 92B:1989) on the design of such airium systems. This method does not address the important factors of heat transfer, wind, stack effect and stratification. Therefore, the resulting designs must be conservative, and they result in expensive systems. Application of computer zone modeling techniques to the problem will result in much more realistic analysis and more cost-effective design. No zone model has been developed for the specific conditions of airium smoke control. The problem of smoke protection for shopping malls and other large spaces is similar.

The objective of this study is to develop an analytical approach to estimate the level of hazard posed by smoke generated from a fire in a building with an airium. In addition, calculations will be made to determine the performance requirements of the smoke management system, such as means of actuation, exhaust capacity to achieve stated objectives, or minimum airflow requirements to prevent smoke migration. The principal purpose of this project is to develop an algorithm to serve as the analytical approach that is capable of addressing the same issues included in NFPA 92B to establish the performance requirements of a smoke management system.

### 651-RP FIELD VERIFICATION OF PROBLEMS CAUSED BY STACK EFFECT IN TALL BUILDINGS

September 1991—November 1992  
Morrison Hirschfeld Ltd.  
Principal Investigator: A.G. Wilson  
Task Group on Tall Buildings

HVAC designers may be unaware of the extent of problems caused by stack effect in tall buildings. There is a need to verify the magnitude of stack effect in a

building of more than 40 stories on a cold day and to document the extent of pressure difference that can exist across elevator doors and often hinder their smooth operation. There is also a need to examine the degree of seasonal imbalance that can exist in simple systems, such as washroom exhaust fans, which can cease to exhaust and instead supply from lower washrooms.

The objective of this project is to field-verify the extent of pressure variations because of stack forces in at least one tall building and determine how these compare with theoretical values. It will also document how stack forces can cause operational problems with elevator doors and exhaust systems and make recommendations for HVAC design solutions to these problems.

### 662-RP AIR POLLUTION SOURCES IN HVAC SYSTEMS

September 1992—September 1994  
University of Michigan  
Principal Investigator: Stuart Batterman  
Environmental Health Committee

The fact that some HVAC systems have been identified as sources of indoor air pollution is affecting the industry and must be addressed on an urgent basis. Research is required to identify the most important pollutant sources in HVAC systems. Once the materials and components and design, operation and maintenance practices have been identified that cause HVAC systems to become sources of indoor air pollution, procedures can be developed to avoid or rectify them in the future.

The objectives of this project are to develop a microcomputer-based database containing information regarding pollution sources found in HVAC systems, and to identify and quantify sources of bioaerosols and volatile organic compounds using standard and innovative techniques.

### 664-RP ENERGY ESTIMATING METHODS FOR PREDICTING VENTILATIVE COOLING PERFORMANCE FOR MIXED CONVECTION

June 1991—May 1993  
University of Illinois  
Principal Investigator: Curtis O. Pedersen  
TC 4.7. Energy Calculations

Previous research has shown that more work is needed to fully understand ventilative cooling performance in the lower air change rates. The limited test done with furniture showed unexpectedly high transfer coefficients. There is a need to experimentally develop heat transfer relations for air change rates in the 5 to 20 ACH range.

The objectives of this project are to determine the lower limits of applicability of correlations developed under ASHRAE 52a-RP; develop new or modified correlations applicable down to lower air change rates in a manner that is consistent with existing correlations for still-air convection coefficients; and develop new correlations or provide modifications to existing procedures to extend their applicability to include air flow alterations and obstructions because of furniture.

### 665-RP PREPARATION OF A TOOL KIT FOR PRIMARY HVAC SYSTEM ENERGY

September 1990—October 1992  
University of Liege (Belgium)  
Principal Investigator: Jean Lebrun  
TC 4.7. Energy Calculations

Engineers now have ready access to powerful desktop computers and an ever-enlarging library of packaged software for performing many types of calculations

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|---|---|---|--|
| Edward A. Atrons<br>Arizona Public Service Co.<br>Arizona Trane Inc.<br>Associated Insulation Co.<br>AU's Plumbing & Metal Works Inc.<br>Automated Temperature Controls Inc.  | Hawaiian Electric Company Inc.<br>Hayakawa Associates<br>Heide & Cook Ltd.<br>Robert L. Heisler<br>James W. Henry<br>Hesco Inc.<br>Jerry Hill<br>William L. Holladay<br>D. Holt<br>Honolulu Shipyard Inc.<br>B. Lee Hutchinson<br>Institute of Heating & Air Conditioning<br>Island Air Filtration Co.<br>J.P. Lamborn Co.<br>J&B Sales Co.<br>JBA Consulting Engineers<br>Joseph H. Schaul Company Inc.<br>KJ&T Corp.  | Richard L. Pailon<br>Jack A. Palmer<br>Thomas H. Parry<br>Robert L. Pasqua<br>Peter A. Handegren Company Inc.<br>Peters Engineering<br>Kent W. Peterson<br>Claude Roger Polinski<br>Polycold Systems Inc.<br>Prepco Air Systems Inc.<br>Prepose Engineering Systems<br>Prime Air Inc.<br>PSI Engineers Inc.<br>R.F. MacDonald Co.<br>R.J. Ghan Engineering Inc.<br>Randolph H. Murayama & Associates Inc.   | W.D. Harrison & Associates<br>W. L. Donley & Associates<br>Mechanical Engineers<br>Western Nevada Supply Co.<br>Thomas J. White<br>Winare Inc.<br>Gerald Yaffe<br>Yehiku Associates Inc.<br>Kenneth Yehiku<br>York International-Las Vegas   |
| Mathew T. Baldy<br>Robert L. Beyer<br>Laurence K. Brink<br>Rick Brotherton<br>Elizabeth I. Brummitt<br>Joseph W. Butalin<br>Burgess Group Inc.<br>Cal Air Conditioning Co.<br>California Cooling Supply Company Inc.<br>California Energy Design Inc.<br>Capital Engineering Consultants<br>Carrier Building Services-Las Vegas<br>Carrier Hawaii<br>Cedric D.Q. Chong & Associates Inc.<br>Certified Service Company Inc.<br>Richard A. Charles<br>Charles H. & Albert B. Randolf Trust<br>Circo System Balance Inc.<br>Cienco Pacific<br>Control Zone Systems<br>Commercial Aire Services<br>Commercial Sheetmetal Company Inc. | Jim Y. Karamata<br>Keller & Gannon<br>Key Mechanical Industries<br>Fred Knackelien<br>Christie R. Kleinman<br>Malvin Kodmur<br>Frederick H. Kohoss<br>LA Department of Water & Power Systems<br>John P. Lamborn<br>Lance Uchida Mechanical Engineers Ltd.<br>Michael Bernhard Langer<br>Gary S. Larkin<br>Lawson Mechanical Contractors<br>Richard F. Leao<br>Glen R. Leggoe<br>Lencioni Associates<br>Levine Seegel Associates<br>Liebert Associates of Greater LA Inc.<br>Karl J. Lillie<br>Lincohe Scott & Kohoss Inc.<br>Robert G. Linford<br>Linford Air & Refrigeration Co.<br>Long & Associates<br>Michael D. Latspeich<br>Eric C. Lowjoy<br>LSW Engineers Inc.<br>Donald W. Mason<br>Mason West Inc.<br>Sukhrdev S. Mathaudhu<br>Mathaudhu Engineering Inc.<br>McLae Engineering<br>Mechanical Contractors Assn. of Northern California<br>Mechanical Engineers of Hawaii Corp. | Richard L. Pailon<br>Jack A. Palmer<br>Thomas H. Parry<br>Robert L. Pasqua<br>Peter A. Handegren Company Inc.<br>Peters Engineering<br>Kent W. Peterson<br>Claude Roger Polinski<br>Polycold Systems Inc.<br>Prepco Air Systems Inc.<br>Prepose Engineering Systems<br>Prime Air Inc.<br>PSI Engineers Inc.<br>R.F. MacDonald Co.<br>R.J. Ghan Engineering Inc.<br>Randolph H. Murayama & Associates Inc.<br>Ransco Industries<br>Bill Reagan<br>Redwood Mechanical<br>John Paul Rees<br>Thomas M. Reinharts<br>Richard A. Palmer & Associates<br>RHM Flame Air Inc.<br>Charles R. Roberts<br>Rollies Engineering Inc.<br>Roseberg & Associates<br>Sacramento Valley ASHRAE Chapter<br>Eliert T. Saito<br>Salt River Project<br>San Diego ASHRAE Chapter<br>San Diego Gas & Electric Co.<br>San Joaquin ASHRAE Chapter<br>San Jose ASHRAE Chapter<br>Janarvus L. Sanders<br>Richard E. Sasek<br>Alexander S. Schieffo<br>Frances N. Scholl<br>Schultz Contracting<br>Felizardo Q. Sebastian<br>William E. Segrinski<br>Marvin D. Shaler<br>Sheet Metal Contractors Assn.-Honolulu<br>Sigler & Raeres<br>Slakey Brothers Inc.<br>SMACNA-Los Angeles<br>SMACNA-Orange County-Long Beach<br>SMACNA-Stockton<br>Erwin Soloway<br>Robert C. Sonderegger<br>John R. Soska<br>Southern California Edison Co.<br>Southern California Gas Co.<br>Southland Industries<br>Sourthwest Gas Corp.<br>Store Malachuk & Wolfberg<br>Sunbelt Corp.<br>Michael William Suttle<br>T&M Mechanical Sales Company Inc. | Abacus Consultants<br>Accutemp Refrigeration Air Conditioning Ltd.<br>Adams Morigenthaler & Company Inc.<br>Aero Heat Exchanger Inc.<br>Air Conditioning Engineering Technology Program NAIT<br>Air Filter Sales & Service<br>Alaska ASHRAE Chapter<br>Alaska Mechanical Contractors Associates Inc.<br>Alaska Sheet Metal Inc.<br>Alaska Winner Inc.<br>Alexander Boone Consulting Engineering Ltd.<br>Anderson Plumbing & Heating<br>Aqua Air Systems Ltd.<br>Avaton Mechanical<br>BC Comfort Air Conditioning Ltd.<br>BC Hydro & Power Authority<br>Bird Archer Inc.<br>Bonneville Power Administration<br>Boyet Northwest Inc.<br>British Columbia ASHRAE Chapter<br>British Columbia Buildings Corp.<br>Brown Strachan Associates<br>Butler Engineering Ltd.<br>C.M. Hoskins Company Inc.<br>Canadian Aqualine Products Ltd.<br>Coffman Engineers Inc.-Anchorage<br>Coffman Engineers Inc.-Seattle<br>Consteel Canada-Regina<br>Control Contractors Inc.<br>D.W. Thomson Consultants Ltd.<br>Daniels Engineering Ltd.<br>John I. Daniels<br>James G. Dalaney<br>Dennis D. Kisselbach Ltd.<br>Donn R. Roberts & Associates<br>DORSE & Company Inc.<br>E&M Consultants Inc.<br>Ecco Heating Products Ltd.<br>FM Sales Co.-Seattle<br>Richard P. Fanske<br>Perry Fielder<br>Fleisch Mechanical Systems<br>Specialists<br>Flow Control Inc.<br>FPE/ROEN Engineers Inc.<br>G.J. Campbell & Associates-Seattle<br>Gateway Refrigeration<br>VI/Gerson<br>Delfel C. Goepfert<br>HK Mechanical Specialties Inc.-Regina<br>Haakon Industries Canada<br>John M. Hart<br>John D. Heym<br>Donald E. Hollie<br>Honeryell Ltd.-Calgary<br>Honeywell Ltd.-Saskatoon<br>Bryan B. Hooker<br>Hooker Engineering Ltd.<br>HVAC Balancing Ltd.<br>Wayne M. Hydenan<br>Island Temperature Controls Ltd.<br>Isotec Ltd.-Calgary |

## Region XI

Investments of \$125 or more

Investors of \$125 or more (concluded)

- JB Sheet Metal Ltd.
- J.M. Bean & Company Ltd.
- J.R. Kowalishin Sales Corp.
- Julima Holdings Inc.
- James P. Sheldon Company Inc.
- John Hoyle Sales Ltd.
- Johnson Barrow Inc.
- Johnson Controls Ltd.-Edmonton
- Johnson Controls Ltd.-Vancouver
- Johnson Controls Ltd.-Victoria
- Johnson Controls-Calgary
- Johnson Controls-Regina
- Johnson Controls-Saskatoon
- Johnson Heating Supply Co.
- K.D. Engineering Co.
- Keen Engineering Company Ltd.
- Kenec Equipment Ltd.
- Henry W. Klassen
- Lockerie & Hole Company Ltd.-Edmonton
- Lockerie & Hole Company Ltd.-Calgary
- Rick Lowen
- Luhn Shaler Wanless Associates Inc. Calgary
- M. Rogers Mechanical Contractors
- MacDonald-Miller Company Inc.
- Ronald MacDonald
- Marull Curtis Inc.
- Ted Maranda
- Mason Emanuel Co.
- McCarran Gaudet & Associates Ltd.
- McKinstry Co.
- MCW Consultants Ltd.
- Mechanical Contractors Assn.-Seattle
- Mechanical Sales Inc.-Seattle
- Brian John Miller
- W. Bruce Morrison
- Bobby A. Moskal
- Hayward G.S. Murray
- Murray Mechanical Ltd.
- David R. Naylor
- Robert E. Newman
- Norcoast Mechanical Inc. Division R2D2
- Northwest Natural Gas Co.
- Oregon ASHRAE Chapter
- Pace Mechanical Ltd.
- Pacific Power & Light Co.
- David Patterson
- PBK Engineering Ltd.
- Perry Engineering Ltd.
- Portland General Electric
- Prairie Controls Services Ltd.
- Pritec Systems Inc.
- Proctor Sales Inc.-Anchorage
- Progressive Air Products Ltd.
- Puget Sound ASHRAE Chapter
- Puget Sound Power & Light Co.
- R.H. Strong & Associates Ltd.
- Allan Reed
- Regina ASHRAE Chapter
- Reid Crowther & Partners
- Remdam Industries Ltd.
- Saskatoon ASHRAE Chapter
- Saskatoon Boiler Manufacturing Company Ltd.
- Hugh A. Clark
- Kenneth L. Clark
- David J. Clark
- Harvey A. Clark
- CMA
- Ehrazuddin Ahmed
- Feroze Ahmed
- Ibrahim A. Albaker
- Manuel Grajeda Alcantar
- Apollon M. Angelidis
- Douethi Antoine
- Silvio Balzanelli

Region XII

Investments of \$125 or more

- Able Products Co. Mechanical Contractor
- Affiliated Engineers Inc.
- Air Enterprises Inc.-Tampa
- Aireko Mechanical Contractors
- Andrews Filter & Supply Corp.
- Apperson Chemicals Inc.
- Applied Mechanical Equipment Inc.
- Aqua Air Products-Tampa
- Associated Air Products
- Atlantic Engineering & Equipment Inc.
- B&I Contractors Inc.
- Baker Brothers Inc.-Jacksonville
- BCH Mechanical Inc.
- Bermudez & Longo
- Emerson L. Besch
- Bill Williams Air Conditioning & Heating
- Cecil Boiling
- Brooks Air Systems Inc.
- Brophy Associates Inc.
- E.J. Burnett
- Carrier Puerto Rico Inc.
- Carroll Air Systems Inc.
- Central Florida ASHRAE Chapter
- Stephen A. Chittenden
- Hugh A. Clark
- Kenneth L. Clark
- David J. Clark
- Harvey A. Clark
- CMA
- John V. Barnes
- Jonas A. Barreira
- Ronnie Bergman
- Eiling Berner
- Fioriano P. Da Cunha
- Jean Buifet
- Julian Go Camacho
- Selim Eyyapan

There is a recognized need for a comprehensive evaluation and evaluation of available hot water usage information in residential and commercial installations. Various studies that have been conducted are different in nature, duration and region, which makes them difficult to compare. Many were completed prior to ASHRAE Standard 90 and do not reflect changing use patterns that may have resulted from energy conservation measures. The information derived from this research, and its analysis, will be used to update tables, graphs and design data in the "Service Water Heating" chapter of the ASHRAE Handbook and to prepare a new service water heating design manual.

The objectives of this project are to collect, compile and analyze existing data on hot-water usage patterns in commercial and large residential establishments (multi-family apartment buildings) and to conduct field monitored studies to confirm or correct existing data.

610-PP  
**ULTRAVIOLET LIGHT DISINFECTION OF A L. PNEUMOPHILA CONTAMINATION OF A HOSPITAL WATER DISTRIBUTION SYSTEM**

September 1990—September 1993  
 Iowa State University  
 Principal Investigator: Victor L. Yu  
 Environmental Health Committee  
 TC 13.3, Heat Transfer and Fluid Flow

Over 50,000 cases of Legionnaires disease occur each year, with an estimated case-fatality rate of 15%, which has not changed despite introduction of appropriate antibiotic treatment.

Cooling tower aerosols are a common source of Legionnaires disease. Nevertheless, other modes of transmission have been equally well documented, including potable water, contaminated shower water, humidifiers and respiratory therapy devices. Risk factors for the colonization of hospital and residential water systems include stagnant water, temperature, shape and age of hot water heaters and tanks, and mineral content of the water.

Currently, control strategies used in public buildings and heat treatment, in laboratories, treatment with ultraviolet radiation has been proven useful, but no field trials are available that evaluate the effectiveness of this procedure in real-world situations. Accumulated knowledge is currently the sole property of contractors obtaining the information and they are unlikely to collect or disseminate such information in a systematic way. This research project should provide useful information to the professional community to prevent the spread of the disease.

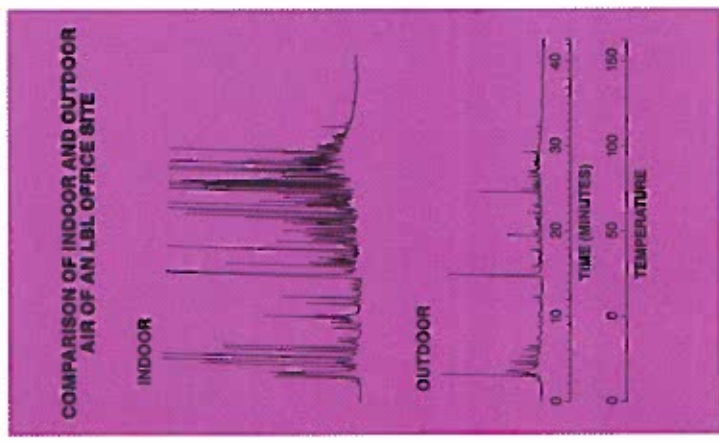
619-PP  
**CHARACTER OF THERMAL LOADS IMPOSED BY MASS TRANSIT PASSENGERS ON VEHICLES' ENVIRONMENT CONTROL SYSTEMS**

September 1991—March 1993  
 Kansas State University  
 Principal Investigator: Byron W. Jones  
 TC 9.3, Transportation Air Conditioning

Criteria regarding thermal loading generated by people is not available for situations such as transit vehicles, where passenger turnover is large and conditions much greater than normal living conditions. Designers, lacking data, have had to estimate design parameters. Estimates vary widely and a sound basis for design needs to be established for use in the ASHRAE Handbook—Fundamentals, HVAC Applications and HVAC Systems and Equipment volumes.

The purpose of this project is to evaluate the transient nature of the sensible and latent loads gener-

ated by people in mass transit vehicles. Computer modeling will be used to address a wide range of conditions. Experimental measurements with human subjects in a calorimeter chamber will be conducted for model validation.



Indoor air quality research mitigates health problems resulting from air pollutants which are significantly greater in occupied buildings than in outside air. Figure courtesy of Lawrence Berkeley Laboratory

622-PP  
**A STUDY TO DETERMINE HEAT LOADS DUE TO COIL-DEFROSTING**

April 1992—April 1994  
 University of Florida  
 Principal Investigator: Sheril A. Sheril  
 TC 10.8, Refrigeration Load Calculations

The heat loads, and the heat input required to defrost coils located within refrigerated spaces, are dependent upon mass of frost, defrosting method, defrosting temperature, coil selection, room temperature and nature of the frost accumulation. However, the quantities involved cannot be determined reliably from available data and often rules of thumb with poor results are used by industry instead. Adding coil-defrosting heat load data to the "Refrigeration Load" chapter of the ASHRAE Handbook—Refrigeration is the primary benefit to be derived from this study. Information for the "Psychrometrics" chapter of the ASHRAE Handbook—Fundamentals is another important benefit to be derived.

The objective of this project is to develop a practical, end-use set of design tools to be used by low temperature psychrometric application and design engineers.

625-PP  
**MATCHING FILTRATION TO HEALTH REQUIREMENTS**

December 1989—November 1993  
 University of Minnesota  
 Principal Investigator: Thomas H. Kuehn  
 TC 2.4, Particulate Air Contaminants and Particulate Contaminant Removal Equipment

The application selected for the proposed research is the selection of HVAC equipment types appropriate for small office buildings. This research will provide ASHRAE members with a well documented and tested case study of the KBS approach, as well as establishing a useful framework for HVAC equipment selection.

The effects of filtration on indoor air quality and the associated health impact, both in the workplace and residential environment, should be correlated with changes that take place on the type of pollutants and their concentrations. Studies have shown that specific types and levels of particle concentrations cause discomfort and/or health effects. This study will focus on dust and microbial levels with respect to matching filtration, a part of the overall problem. This information will provide the HVAC service person and user with a better knowledge of how to plan a healthier indoor air climate with regard to these common contaminants.

The objective of this study is to assemble a body of accurate data on the topic "Matching Filtration and Effectiveness of Filtration," in reducing indoor levels of dust and microbial (infectious and antigenic) particles and providing a comfortable and healthier environment.

630-PP  
**HEAT TRANSFER AND PRESSURE DROP DURING CONDENSATION AND EVAPORATION OF R-134a/OIL MIXTURES IN SMOOTH AND MICRO-FIN TUBES**

April 1990—November 1992  
 Iowa State University  
 Principal Investigator: Michael Pale  
 TC 1.3, Heat Transfer and Fluid Flow

Because of the CFC ozone issue, it is widely accepted that the refrigeration and air-conditioning industry will be shifting from the use of CFC refrigerants (e.g., R-12) to alternative refrigerants (e.g., R-134a). Presently, there are no available heat transfer data in the open literature on alternative refrigerants.

A recent ASHRAE research project (469-PP), which utilized R-22, showed that oil addition to a refrigerant can significantly affect heat transfer and pressure drop. This same study also showed that the use of enhanced tubes, such as micro-fin tubes, can improve heat transfer and increase pressure drop. Because oil is present in actual refrigeration systems and because micro-fin tubing is finding widespread usage, any future study of alternative refrigerants should include an investigation of oil and enhanced tube effects.

The objective of this research is to investigate heat transfer and pressure drop during in-tube condensation and evaporation of an alternative refrigerant, R-134a. The effects of in-tube augmentation and lubricating oil on heat transfer and pressure drop are to be emphasized. Existing correlations used for refrigerants will be evaluated and modified to extend their applicability to the alternative refrigerants.

642-PP  
**KNOWLEDGE-BASED SYSTEM FOR HVAC SYSTEM-TYPE SELECTION**

September 1990—October 1992  
 Iowa State University  
 Principal Investigators: Ron Nelson and Gregory Maxwell  
 TC 1.5, Computer Applications

Knowledge-based system (KBS) computer software packages offer an as yet undeveloped approach to assist in a variety of HVAC design and operation tasks. This research is intended to help ASHRAE members evaluate this type of technology. It conforms to ASHRAE objectives to develop guidelines for selecting HVAC equipment and, in particular, to consider expert systems as design tools.

The application selected for the proposed research is the selection of HVAC equipment types appropriate for small office buildings. This research will provide ASHRAE members with a well documented and tested case study of the KBS approach, as well as establishing a useful framework for HVAC equipment selection.



592-RP "Development of an ASHRAE Design Guide for Cooling Thermal Storage" will facilitate the creation of comfortable and energy-efficient indoor environments.

**475-RP INVESTIGATION OF CO-SORPTION OF GASES AND VAPORS AS A MEANS TO ENHANCE INDOOR AIR QUALITY**

September 1989—October 1992  
University of Missouri-Columbia  
Principal Investigator: Anthony Hines  
TC 3.5, Sorption

Many industrial processes utilize sorption dehumidification equipment to provide humidity control for the process area or process equipment. The return air from these industrial processing areas and equipment frequently contains a variety of organic or inorganic gases or vapors that can affect, and be affected by, sorption dehumidification equipment. Some materials can be co-sorbed along with water vapor and described in the regeneration/activation process. This can be beneficial by reducing the amount of diluted air required to control contamination levels in industrial process areas. In comfort conditioning applications, indoor pollution levels could be reduced while still maintaining low ventilation air volumes. Use of beneficial co-sorption could thus reduce energy consumption in both process and comfort HVAC applications and therefore need further study.

The objectives of the research are to search the literature and to analyze the available data and information related to co-sorption and desorption capabilities of both solid and liquid desiccant materials with respect to indoor air pollutants, including microbial contaminants. The findings from the literature will be used as a guideline to determine the specific indoor air pollutant/desiccant combinations to be bench-scale tested to determine their co-sorption/desorption capabilities. ASHRAE is co-sponsoring this project with the Gas Research Institute.

**548-RP DETERMINE THE SOLAR OPTICAL AND SOLAR HEAT GAIN PROPERTIES OF FENESTRATION SYSTEMS**

January 1988—November 1992  
Lawrence Berkeley Laboratory  
Principal Investigator: Stephen Selkowitz  
TC 4.5, Fenestration

using guarded or calibrated hot box facilities. The data to be developed shall address numerous parameters with respect to attic radiant barrier systems.

**578-RP DETERMINATION OF WINDOW SYSTEM U-VALUES**

September 1991—March 1993  
Enermodal Engineering Ltd.  
Principal Investigator: Stephen C. Carpenter  
TC 4.5, Fenestration

There is a need for data on fenestration units, because values for frame and edge-of-glass U-values are limited to generic designs for window frame materials, including aluminum (with and without thermal break), wood and vinyl, and for a single-spacer material (aluminum). The available frame and edge-of-glass U-value data have been provided by a major glass manufacturer and consist primarily of unpublished test data. However, the representativeness of the frame sections and spacer designs is not known. The information in the Handbook—Fundamentals has been calculated from one- and two-dimensional models, which include simplifying assumptions, and the errors introduced by these assumptions are not known. There has never been a systematic comparison done of the calculated values with research class experimental data.

ASHRAE (SPC 124) and the International Standards Organization (ISO 1999a,b) are both developing standardized methods for combining the separate contributions of the glazing, spacer and frame. However, there is not a sufficient body of accurate experimental data to provide a basis of comparison with computational models.

The objectives of this project are to improve and expand the table of frame U-values to cover the range of commercially available products, to improve and expand the information on edge-of-glass U-values to cover the range of edge conditions found commercially, and to develop procedures for adjusting winter-design window U-values to other conditions, including appropriate values for annual energy calculations.

**592-RP DEVELOPMENT OF AN ASHRAE DESIGN GUIDE FOR COOLING THERMAL STORAGE**

April 1991—March 1993  
Dorgan and Associates  
Principal Investigator: Charles E. Dorgan  
TC 6.9, Thermal Storage

The industry needs a comprehensive design guide for the design and application of thermal cool storage to buildings. Existing publications are only available on a limited basis, are generally out of date and, more importantly, are based to particular applications.

The objective of the proposed work is to develop a comprehensive design guide for cooling thermal storage. The guide will be a source of reference information for evaluating, comparing, selecting and designing thermal storage systems. The primary audience will be practicing design engineers.

**600-RP COMPARISON OF COLLECTED AND COMPILED EXISTING DATA ON SERVICE HOT WATER USE PATTERNS IN RESIDENTIAL AND COMMERCIAL ESTABLISHMENTS WITH NEW FIELD MONITORED EXPERIMENTS**

September 1989—July 1993  
American Gas Association Laboratories  
Principal Investigator: Douglas W. DeWether  
TC 6.6, Service Water Heating



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- |                |
|----------------|
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| Willis E. Bell |

Technical Committee by careful planning and oversight of the research program. ASHRAE utilizes an extensive unpaid volunteer network of technical committee and task group members to prepare work statements, select projects, select contractors and monitor research projects to ensure that maximum benefits accrue from ASHRAE sponsored research. Additionally, the Research and Technical Committee plans the research program, evaluates and approves the projects and ensures that results are properly presented. In summary, ASHRAE research gets a lot of bang for its bucks.

Research projects

Research projects were expanded during the 1991-92 fiscal year (ending June 30, 1992). ASHRAE, under the leadership of the Research and Technical Committee, initiated 25 new projects and completed 17 projects. The average cost of new projects was approximately \$80,000. New projects were initiated in each of the priority research categories and subjects. Sixteen technical papers based on research projects were presented at Society meetings during the year.

ASHRAE research projects result either from work statements initiated by the Society's technical committees and task groups or from unsolicited proposals submitted by organizations interested in conducting research for ASHRAE. Any research that advances the arts and sciences of heating, ventilation, refrigeration and air conditioning or the allied arts and sciences and related human factors is eligible for funding. This is ASHRAE's mission.

Work statements originating from technical committees or task groups, after approval by the Research and Technical Committee, are offered to prospective bidders for proposals. The bidders' list includes universities and agencies that have a history of cooperative research with ASHRAE or have indicated an interest in ASHRAE research.

Unsolicited proposals are accepted from organizations interested in conducting ASHRAE-related research from self-generated ideas. Whether the proposals are solicited from work statements or are unsolicited, they should include the

following information: precisely what is to be done, by whom and under whose personal supervision, with man hours, materials, instruments and apparatus required, and costs for each; information regarding the investigator's special expertise, experience and/or ability that especially qualifies the individual for the proposed research; and identified contribution from the research organization's resources for conducting the project.

Grants-in-aid

ASHRAE grants-in-aid provide up to \$7,500 for graduate students to conduct research in fields of interest to ASHRAE. The program has been expanded to encourage undergraduate students to prepare for service in the HVAC&R industry and to stimulate interest in research by providing up to \$2,500 to undergraduate students and \$500 for their faculty advisors.

In 1991-92, 14 graduate student grants-in-aid were awarded. These went to: Palamarevic Bojana, University of Belgrade; Benuti Casault, Technical University of Nova Scotia; William Delp, University of Missouri-Rolla; Stanley Galland, University of Massachusetts; Kamel Haddad, Pennsylvania State University; Gary Hughes, California State University; Yong Chan Kim, Texas A&M, Jorje Martinez, University of Puerto Rico; Bruce Morris, Purdue University; Homero Noboa, Texas A&M; Christopher Summers, University of South Florida; Edie Sutherland, Tennessee Technological University; Majd Tabrizi, University of Maryland; and James Jones, University of Michigan.

Four undergraduate students received grants-in-aid: Eric Foyd, University of Texas; Clayton Jones, University of Texas; Anthony Newlin, Trinity University; and Randy Roberts, University of Alabama.

The latest grants brought the total to \$951,800 awarded to 184 students during the 23 years the program has been in effect. Recipients have represented 74 different colleges and universities.

Grant-in-aid solicitations are mailed each September to appropriate universities. Applications for grants-in-aid are sent by faculty advisors to the Manager of Research, ASHRAE, 1791 Tullie Circle NE, Atlanta, GA 30329, by December 15 of each year. The application should provide the student's name, qualifications, his or her need for support, and a copy of his/her transcript; significance of the proposed research; an outline of the procedure; approximate budget; extent to which the institution will support the work; plans for seeking other funds for this or related work; anticipated plans for publication of research results; and faculty advisor's and institution's qualifications.

Research expenditures

Research project expenditures will increase for fiscal year 1992-93. The Board of Directors has approved \$2,313,000 for research projects and grants-in-aid. Of that total, \$2,149,000 is required for continuing and recently approved projects, and \$164,000 is available for new projects. Competing for new project funds are 24 proposed projects and many work statements in various stages of development, plus additional anticipated proposals.

Active projects are summarized in this report. The summaries include the title of the project, the expected duration of the project, the agency conducting the research, and the Society technical committees or task group monitoring the research.



392-RP (Phase II)

HEAT TRANSFER AND FLUID FLOW IN A FINNED TUBE FLOODED EVAPORATOR

September 1989 - October 1992

Pennsylvania State University

Principal Investigator: Ralph L. Webb

TC 8.5, Liquid-to-Refrigerant Heat Exchangers

Phase I of this project, a literature survey, and Phase II, modeling and simulation studies, have been successfully completed. The final phase will collect and analyze data on pool boiling and forced convection boiling, which will form the basis for predicting evaporator performance.

The objective of this project is to develop data that will improve flooded evaporator designs in regard to material and energy efficiency. It will yield a better understanding of the influence of refrigerant-side heat transfer performance variables and will permit appropriate finned tube flooded evaporator performance predictions to be made more accurately.

455-RP

INVESTIGATION OF DYNAMIC LATENT HEAT STORAGE EFFECTS OF BUILDING CONSTRUCTION AND FURNISHINGS

October 1990 - October 1992

Ontario Research Foundation

Principal Investigator: David Bailey

TC 4.4, Thermal Insulation and Moisture Retarders

One strategy for the management of the air conditioning systems in buildings is to operate the cooling system only during the day. At night, the air conditioning system may be shut down and the building ventilated with outside air. However, when the relative humidity of the nighttime air is high, as is frequently the case, the ventilation will introduce a significant quantity of moisture that may be absorbed by the building construction and furnishing materials.

When the air-conditioning system is restarted the next morning, the moisture absorbed by the building materials will be desorbed into the building airspace, and subsequently removed by the air-conditioning system, thereby representing a latent heat load.

The objectives of this project are to develop additional information on the dynamic latent heat storage effect of building construction and furnishing materials caused by cyclical exposure to changing relative humidity conditions and to develop additional material moisture sorption data that can be used to analytically determine the effective moisture diffusion rates within common building materials.



717-RP "An Energy Calculation Model for Attics, Including Radiant Barriers" will develop reliable testing methodologies to determine energy efficiency of attics with and without radiant barrier systems.



Annual Research Report from the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

## Individual and company contributions for projects and grants-in-aid reach new record level



# ASHRAE Research

Research contributions from individuals, chapters, companies and other organizations totals \$1,303,560 in 1991-92.

**William W. Seaton**  
Member ASHRAE  
Manager of Research

**Thomas Anderson**  
Manager of Research Promotion

ASHRAE Research looks to the future and sees unlimited possibilities for progress and innovation. The Society's vision of developing fundamental advances in engineering technology for heating, ventilating, air conditioning and refrigeration (HVAC&R) has led to continuous improvement in the quality of life.

A research plan carefully developed by an extensive network of volunteer experts participating in ASHRAE's technical committees and task groups guides the largest discretionary research program conducted by any technical society. This plan includes a priority listing of 182 potential research projects in the following categories:

- Environmentally safe materials (refrigerants, etc.)
- Indoor air quality, comfort and health
- Energy conservation
- Design and O&M tools
- Fire and safety
- Refrigeration systems
- Food processing and preservation
- Other

ASHRAE Research creates a constant stream of scientific results and conclusions. This research defines the fundamental concepts used by engineers and HVAC&R professionals to design and manage the technology that ensures the comfort, quality and energy efficiency of indoor environments. By sharing resources globally through ASHRAE publications and meetings, ASHRAE assists HVAC&R practitioners worldwide in providing quality products and services.

### Research funding

1991-92 was the best year ever for research contributions. With the leadership of K. David Michie, Research Promotion Committee Chairman, \$1,303,560 was invested in research by about 8,000 contributors. This represented a 10.4% gain over the previous year.

Research funding principally comes from voluntary contributions by ASHRAE members, their colleagues in the HVAC&R industry and other interested businesses and organizations. Every dollar contributed is spent on research and grants-in-aid. Additional costs for research and program administration are met by funding from the annual ASHRAE/ARI Exposition, a small share of member dues and investment of the fund balance.

In ASHRAE, research promotion is a grassroots effort involving volunteers from 154 chapter commi-

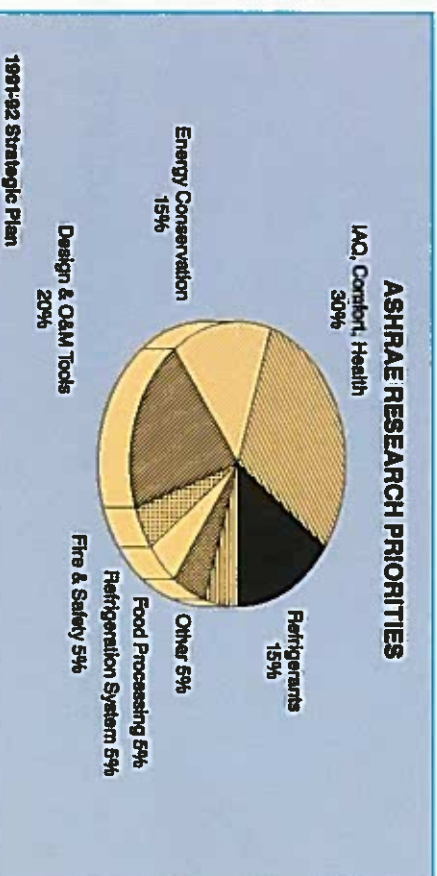
tees who commit time, effort and resources to raising money for ASHRAE Research. Every volunteer is commended for making the year a success.

### Golden Circle contributors

The ASHRAE Research Golden Circle has increased to 12 members, a 50% increase over the previous year. The Golden Circle consists of leadership contributors of \$10,000 or more who have been chosen to make significant investments in research. Each member will be a guest of ASHRAE at the Winter Meeting and honored during the President's Luncheon. ASHRAE appreciates their leadership and significant contributions.

### Stewardship

Stewardship of the funds entrusted to ASHRAE is maintained by the members of the Research and



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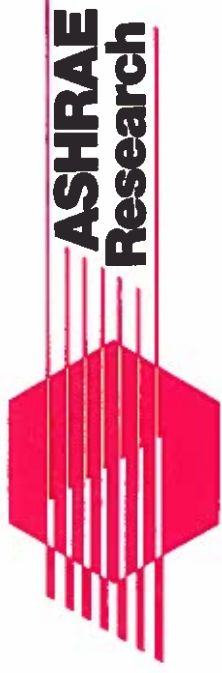
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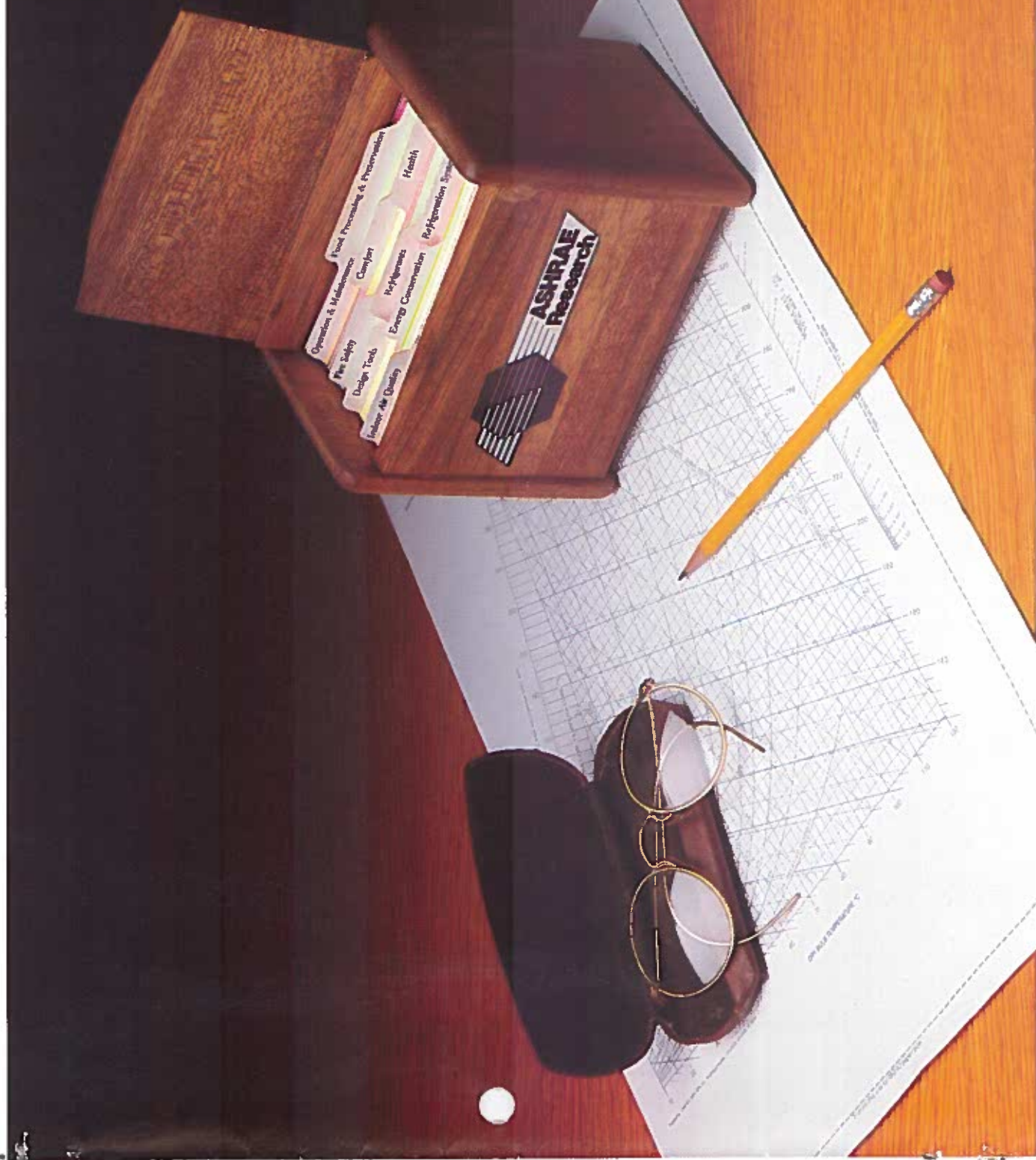


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*100% of every dollar contributed is invested in research*

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