AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, N.E./Atlanta, GA 30329
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TC/TG/TRG MINUTES COVER SHEET

(Minutes of all TC/TG/TRG Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG NO TC 8.5 DATE April 1, 2006

TC/TG/TRG TITLE Liquid to Refrigerant Heat Exchangers

DATE OF MEETING Monday, January 23, 2006 LOCATION Chicago, IL

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Jim Bogart	2003	Parviz Payvar	2005	Ralph Breisch
Axel Kreigsmann	2004	Art Fovargue	2005	Adnan Ayub
Steve Eckels	2004			M. Neshan
Mahesh Valiya-Naduvath	2004			Yi Jia
Kash Oza	2004			Dan Kihm
John Thome	2003	*Corresponding Members:*		Gerhardt Ribatski
Ben Dingel	2002	Keith Starner	1999	Gary Zyhowski
Louay Chamra	2005	Michael Ohadi	2001	Stan Kistler
Jamal Yagoobi	2004	Olivier Pelletier	2004	Andreas Knoepfler
Samuel Yana-Motta	2005	John Judge	2004	Saunders Smith
Corresponding Members:		William McQuade	2002	Ron Bailey
Ken Schultz	2003	Josua Meyer	2005	
Joe Huber	2003	Allison Andrews	2005	
Satheesh Kulankara	2003	Ty Newell	2005	
James Bryan	2005			
Zahid Ayub	2005			
Petur Thors	2005			
Amir Jokar	2005			
Harry Li	2005			

DISTRIBUTION

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AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR-CONDITIONING ENGINEERS, INC.

Minutes
Technical Committee 8.5
Liquid-to-Refrigerant Heat Exchangers
January 23, 2006
2006 ASHRAE Winter Meeting, Chicago, IL, January 21-25, 2006

1. Call to Order and Reading of TC8.5 Scope

Chairman Jim Bogart called the meeting to order at 4:18 pm. The scope of TC 8.5 was read: "TC8.5 is concerned with the thermal and mechanical design, performance, and application of devices for accomplishing heat transfer between refrigerants (including secondary refrigerants) and liquids. Such devices include liquid cooled refrigerant condensers and refrigerant evaporators for cooling liquids".

An agenda for the meeting had been sent by email prior to the meeting.

2. Introduction of Members and Guests (Sign attendance sheet)

Members and guests introduced themselves. The following were present:

Jim Bogart (chairman)	FlatPlate, Inc. 2161 Pennsylvania Ave York, PA 17404
Ben Dingel	Trane 3600 Pammel Creek Road La Crosse, WI 54601
Ken Schultz	Trane 3600 Pammel Creek Rd La Crosse, WI 54601
Steve Eckels	Kansas State University 64 Seaton Hall Manhattan, KS 66506
Zahid Ayub	Isotherm, Inc. 3305 Thorntree Ct. Arlington, TX 76016
Satheesh Kulankara	York International 631 S. Richland Ave. 191A York, PA 17403
Petur Thors	Wolverine Tube, Inc. 2100 Market St. NE Decatur, AL 35601
Mahesh Valiya-Naduvath	York International 631 S. Richland Ave. 191A York, PA 17403

Joe Huber	Ketema LP 2300 W. Marshall Grand Prairie, TX 75051
John Thome	Swiss Federal Institute of Technology (EPFL) Lausanne, Switzerland 1015
Louay Chamra	Mississippi State University 210 Carpenter Eng. Bldg. Mississippi State, MS 39762
James Bryan	University of Missouri Dept. of Mech. & Aero. Engineering Columbia, MO 65211
Kash Oza	Standard Refrigeration Company 2050 N. Ruby Street Melrose Park, IL 60160
Amir Jokar	Washington State University WSUV, ENCS Vancouver, WA 98686
Ralph Breisch	SWEP North America 3483 Satellite Blvd. Suite 210 Duluth, GA 30096
Harry Li	Carrier Corporation 6304 Thompson Road Syracuse, NY 13093
Samuel Yana Motta	Honeywell 20 Peabody St. Buffalo, NY 14210
Axel Kriegsmann	Wieland-Werke AG Seidlheck 7 Ulm, Germany D-89081
Jamal Yagoobi	Illinois Institute of Technology Chicago, IL 60564
Adnan Ayub	Isotherm 3305 Thorntree Ct. Arlington, TX 76016
M. Neshan	1700 Rockridge Cir Huntsville, AL 35802
Yi Jia	Climatemaster/Koax 7300 SW 44th SE Oklahoma City, OK 74074
Dan Kihm	SWEP North America 3483 Satellite Blvd. Suite 210 Duluth, GA 30096

Gherhardt Ribatski	LTCM – EPFL Station 9 Lausanne, Switzerland CH-1015
Gary Zyhowski	Honeywell 20 Peabody St. Buffalo, NY 14210
Andreas Knoepfler	Wieland-Werke AG Graf-Arco Str. 36 Ulm, Germany D-89079
Sauders Smith	ARI 4100 N. Fairfax Drive Suite 200 Arlington, VA 22203
Stan Kistler	HTRI 150 Venture Drive College Station, TX 77845
Ron Bailey	Research Liaison

3. Establish Quorum Requirements

Voting members present were: Jim Bogart, Ben Dingel, Louay Chamra, Kash Oza, Jamal Yagoobi, John Thome, Steve Eckels, Axel Kriegsmann, Mahesh Valiya-Naduvath, and Samuel Yanna Motta. Members absent were: Parvis Payvar and Art Fovargue. With ten of twelve voting members present, the quorum was satisfied.

Votes below are listed as [for-against-abstain] and should add up to ten.

4. Review/Approve Previous Meeting Minutes

Minutes from the previous meeting were circulated prior to the meeting. The committee voted unanimously [10-0-0] to approve the minutes as circulated. Meeting minutes will become official and re-circulated.

5. Chairman's Comments

A request for participation in a study on building performance monitoring was circulated to the committee. A document titled "Scoping Study: Protocols for Measuring and Reporting the On-Site Performance of Buildings Except Low-Rise Residential Buildings – Jeff S. Haberl, Chair" was circulated and is available from ASHRAE.

Program Schedules and guidelines are being adjusted. There will be 7:45 AM sessions at the next meeting in Quebec City. Also, ASHRAE is recommending 3 speakers maximum for a Program Seminar. The deadline for Quebec City Programs is February 10.

6. Section Head Comments

None.

7. Comments from Liasons (Handbook, Standards, Journal, Research, Program, TEGA, Technical Services, Refrigeration)

None.

8. Handbook Subcommittee Report

Subcommittee chair Louay Chamra is waiting for comments from reviewers of both IP and SI versions of Systems and Equipment chapters 35 (Condensers) and 37 (Liquid Coolers). A password-protected area has been set up on the TC 8.5 website for this purpose. Modifications, review, and approval are needed by summer of 2006.

9. Program Subcommittee Report

Subcommittee chair Amir Jokar reported that a seminar titled "Design and Application of Brazed and Welded Plate-Type Heat Exchangers in the HVAC&R Industries" was set up for the Chicago Meeting (Tuesday, January 24, 10:15 AM). It was noted that ASHRAE now allows for the uploading of presentations before meetings (speakers take special note), which streamlines the commercialism review by ASHRAE. Upcoming program deadlines are February 10 for Quebec City and August 4 for Dallas, Texas.

A motion was made by Steve Eckels to co-sponsor (with TC 1.3) a Seminar in Quebec City on Flow Maldistribution in Heat Exchangers. The motion was seconded by Mahesh Valiya-Naduvath and passed unanimously [10-0-0].

10. Membership Subcommittee Report

Subcommittee chair Kash Oza reviewed the list of current members. The 12 voting members for the current Society year (through end of June 2006) are: Jim Bogart, Ben Dingel, Louay Chamra, Kash Oza, Jamal Yagoobi, John Thome (Int'l), Steve Eckels, Art Fovargue, Axel Kriegsmann (Int'l), Parvis Payvar, Mahesh Valiya-Naduvath, and Samuel Yanamotta.

Kash also reported that Allison Andrews (ARI), Harry Li (Carrier) and Ty Newell (UIUC) will be added as corresponding members. Nabil Hanna and Jim Larson will be removed from the membership list.

11. Standards Subcommittee Report

In reporting on standards related activities, Standards Subcommittee chair James Bryan made a motion that TC8.5 re-affirm Standard 22-2003, "Methods of Testing for Rating Water-Cooled Refrigerant Condensers", following an update of 4 of the 5 listed references. This motion was seconded by John Thome and passed unanimously [10-0-0].

James also reported that an assignment of a committee chair for Standard 181 Method of Test (MOT) that will accompany ARI Standard 400-2001, "Liquid-to-Liquid Heat Exchangers" had not been made as of the TC8.5 committee meeting.

ARI is asking ASHRAE to take on responsibility for the method of test to support ARI standard 470: Desuperheater/Water Heaters. James Bryan circulated a TPS (Title, Purpose, and Scope) that was written for the accompanying MOT standard. James made a motion that the committee accept the TPS that was written for a MOT accompanying ARI 470-2001, and that the TPS be forwarded to the standards committee. This motion was seconded by Louay Chamra and passed unanimously [10-0-0].

12. Journal/Insights/Webmaster Subcommittee Report

Webmaster Joe Huber reported no new updates to the website, but requested to please contact him with any errors or omissions. The URL for TC 8.5's website is: http://www.tc85.ashraetcs.org/.

13. Research Subcommittee Report

Following the discussion of specific research projects (see below), Ken Schultz reported that RAC has new guidance related to procedures for committee selection of other than the lowest cost bid on research projects and for dealing with conflicts of interest related to selecting research project contractors. *[Secretary's Note: Due to lack of time in the committee meeting, details of these procedures are included as an attachment to these meeting minutes.]* Ken also reported that the 2005-2006 Service to ASHRAE Research Award was given to John Mitchell, who spearheaded the development of the new ASHRAE Strategic Plan for Research. Finally, Ken reported that an "electronic" version of the ASHRAE Research Manual is under development and is to be online by the Quebec City meeting.

Following is a summary of research projects and the status of each project.

1205-RP – Water-side Fouling Inside Smooth and Augmented Copper Alloy Condenser Tubes in Cooling Tower Water Applications
Current Status: Active (end date extended to 31-May-06)

Since the Denver meeting (Jun 2005), difficulties have arisen between the PI and the PMS working on this project. Because of the situation, no report was given at the TC8.5/1.3 Joint Sunday research subcommittee meeting. The situation was discussed in an "executive" session (voting and corresponding members only). The PI (Louay Chamra) and several members of the PMS were present (James Bryan, Kash Oza, Axel Kriegsmann); the PMS chair (Art Fovargue) and several other members (Keith Starner, Amanda Meitz) were not present. Mike Vaughn (MORTS) was also present for the discussion. Points of contention between the PMS and PI involve the direction and length of time taken to solidify the various water chemistries to be used for testing, the quality and test conditions of the initial data taken at "low" fouling potential conditions, and the general level of PMS involvement necessary to facilitate a successful project.

Although there continues to be some concern as to the quality of the data being generated in this project, it was the consensus of the committee members present that the work should be allowed to continue but that the direct line of communication between the PMS and the PI was no longer appropriate. After much discussion, the following motion was approved by a vote of 6-0-4 and documents the direction of TC8.5 with respect to this research project (abstentions by project PI, PMS members, and one member leaving prior to meeting end):

"The Principal Investigator is asked to proceed with tests using medium and high fouling potential water chemistries that have been previously agreed upon. The Principal Investigator is asked to review all data weekly. A graph of fouling versus time should be provided by the PI on a biweekly basis. All communication is to be handled through the TC8.5 Research subcommittee chair who will act as a liaison between the PMS, PI, and Committee at large."

1316-TRP – Experimental Evaluation of the Heat Transfer Impacts of Tube Pitch in a Highly Enhanced Surface Tube Bundle
Current Status: Active

The contract for this project was initiated on December 1, 2005. So, work had just begun as of this meeting. At the research review meeting, the PI (Bruce Babin, Kansas State)

presented an overview of the project along with a conceptual description of the test rig design. A question about what tubes should be used was raised. It was recommended that tube surfaces designed for the specific refrigerants (one for R134a and one for R123) be used. The PI will need to factor this into the test vessel design. Although the presentation focused on the "global" tube bundle operating conditions, the contractors were reminded that the objective of the project was to obtain local heat transfer performance data – not just bundle average.

The range of tube pitches to be investigated was also specifically discussed. The PI showed that covering the full range of tube pitch to diameter (P/D) ratios listed in the work statement would require an excessive capacity range. Establishment of the final test matrix needs further discussion, although the initial judgement of the PMS was that limiting maximum P/D to ~1.75 would be acceptable.

1324-RP – Study of Single-Phase Flow-Induced Tube Vibration in Shell and Tube Heat Exchangers
Current Status: Modifying work statement after non-responsive bid process

Bids received last spring were reviewed prior to the Denver (June 2005) meeting and judged to not meet the scope of the work statement. At the direction of the committee, Mahesh has modified the work statement. The work statement now includes the application to two-phase flow as part of the literature survey. The work statement also now allows the use of alternate fluids (e.g., air/water in place of refrigerant), but the bidder must explain how to interpret results relative to refrigeration applications. Finally, the bidder is asked to make an assessment of the necessity to perform additional experiments (both single and two-phase flow) with a halocarbon refrigerant.

The revised work statement was circulated to committee members just prior to the meeting. There was not time during the main meeting for further discussion. The research chair will send out a schedule for review and email ballot.

1345-WS: Waterside Fouling Performance of Brazed-Plate Type Condensers in Cooling Tower Applications
Current Status: Work statement conditionally approved.

Time was limited for discussion of this project by the entire committee. The work statement was conditionally approved by RAC in November of 2005. Jim Bogart will work with our research liaison to resolve the questions and comments. It was suggested that the table of "high", "medium" and "low" fouling potential water constituents that are finally agreed to on RP-1205 may be added to the final version of the work statement. This project has co-funding from ARI.

1394-RTAR -- Study of Carbon Dioxide Condensation in a Chevron Angle Plate Geometry Exchanger
Current Status: Priority Status on RIP, waiting for work statement.
Zahid Ayub has prepared a draft work statement for committee review. The research chair will circulate the work statement by email following the meeting.

Fouling of Tube-in-Tube Type Condensers
This topic was put on the research plan at a previous meeting (Orlando); see those minutes for background information. These products see applications similar to BPHE's. Co-funding from ARI is likely. Jim Bogart reported no progress on drafting an RTAR.

14. New Business

Chairman Jim Bogart reported that this meeting is his next to last as TC8.5 chairman. James Bryan, current Vice Chair, will become chairman following the June meeting. Nominations were taken to succeed James as Vice Chair when he assumes the role of chairman. Louay Chamra volunteered to accept this role. This nomination was approved unanimously [10-0-0].

Chairman Jim Bogart reported that Joe Huber was nominated by the committee for the George Hightower Award for service to ASHRAE. Although deserving, this award was not given to Joe.

15. Schedule Next Meeting

The next meeting will be held on June 26, 2006 at 4:15 PM in Quebec City, Quebec.

16. Adjourn

The meeting was adjourned by unanimous vote, with two abstentions due to early departures, [8-0-2] at 7:17 pm (!).

Attachment:
Text describing procedures mentioned during the Research portion of the committee meeting. Text was provided by Ken Schultz (TC8.5 Research Subcommittee Chair) following the meeting.

- Procedure if the lowest priced responsive bid is NOT selected:
(written and documented, approved by Tech Council)

1. It is intended that ASHRAE obtain the best value for its research funds expended.
2. In general, it is expected that the TC PES will recommend the lowest priced responsive bidder. To be responsive, a bidder must receive an average score of 70 or above.
3. A PES may recommend for selection a contractor other than the lowest priced responsive bidder in cases where all three of the following conditions are met:
    - Two-thirds of the individual PES members score the higher priced proposal higher in points than the lower priced proposal.
    - The average PES score of the higher priced proposal is 5.0 or more points above the lower priced bid.
    - The $/point ratio of the higher priced bid is less than the ratio for the lower priced bid.

- Procedure for avoiding actual or perceived conflicts of interest:
(proposal – waiting for approval by Tech Council)

1. It is the intention of ASHRAE that there are no actual or perceived conflicts of interest in the research bid process.
2. In general, it is expected that the PES will recommend a bidder who was without involvement in the development of the work statement.
3. A PES may recommend a bidder who participated in the development of the work statement in those cases where all four of the following conditions are met:
    - There were a minimum of three (3) authors who actively participated in the development of the work statement.
    - At least three responsive bids were received.
    - The work statement author's bid attractiveness is not the result of his/her having a unique facility, equipment, or capability that is not explained and/or identified in the work statement and reasonably available to other bidders.
    - The work statement author's bid total cost is within 10% of the TC cost estimate provided in the work statement

ASHRAE TC/TG/TRG ACTIVITIES SHEET

DATE: January 23, 2005

TC/TG/TRG NO.: TC 8.5 TC/TG/TRG TITLE: Liquid-to-Refrigerant Heat Exchangers

CHAIRMAN: Jim Bogart VICE CHAIRMAN: James Bryan SECRETARY: Ben Dingel

TC/TG/TRG MEETING SCHEDULE

Location-Past 12 Months	Date	Location-Planned Next 12 Months	Date
Chicago	Jan 2006	Quebec City, Canada	June 2006
Denver	June 2005	Dallas	Jan 2007

TC/TG/TRG SUBCOMMITTEES

Function	Chairman
Program	Amir Jokar
Membership	Kash Oza
Research	Ken Schultz
Handbook	Louay Chamra
Standards	James Bryan
Journal/Web/Insights	Joe Huber

RESEARCH PROJECTS-CURRENT

Project Title	Contractor	Monitoring Comm. Chpt.	Report Made At Meeting
RP 1205 Waterside Fouling Inside Smooth and Augmented Copper-Alloy Condenser Tubes in Cooling Tower Water Applications.	Mississippi State University	Art Fovargue	No
1316-TRP Experimental Evaluation of the Heat Transfer Impacts of Tube Pitch in a Highly Enhanced Surface Tube Bundle	Kansas State University	Petur Thors	Yes
1324-TRP Study of Single-Phase Flow-Induced Tube Vibration in Shell and Tube Heat Exchangers	Proposals submitted were voted non-responsive by TC 8.5 - Work Statement being rewritten	N/A	N/A

LONG RANGE RESEARCH PLAN

Rank Title	W/S Written	Apprv.	To R&T
1. Waterside Fouling Performance of Brazed-Plate Type Condensers in Cooling Tower Water Applications (1345-WS)	Yes	Yes	Yes
2. Study of Carbon Dioxide Condensation in a Chevron Angle Plate Geometry Exchanger (1394-RTAR)	No	No	No
3. Fouling of Tube-in-Tube Type Condensers	No	No	No

(OVER PLEASE)

HANDBOOK RESPONSIBILITIES

Year & Volume	Chapter Title	No.	Deadline	Handbook Subcom Liaison
2008 Systems	Chapter 37: Liquid Coolers		7/31/07	William Walter
2008 Systems	Chapter 35: Condensers		7/31/07	William Walter

STANDARDS ACTIVITIES-List and Describe Subjects

Standard 22: Re-affirmed by committee on January 23, 2005.

Standard 24: No current activity

Standard 181: Create new standard for Method of Testing for Liquid to Liquid Heat Exchangers (to accompany ARI standard 400). TPS approved.

Standard ??: Create new standard for Method of Testing for Desuperheater/Waters (to accompany ARI standard 470). TPS approved by TC8.5 and being forwarded to standards committee.

TECHNICAL PAPERS from Sponsored Research-Title, when presented (past 3 yrs. present & planned)

TC/TG Sponsored Symposia-Title, when presented (past 3 yrs. present & planned)

TC/TG Sponsored Seminars-Title when present (past 3 yrs. present & planned)

Recent ASHRAE Research in Thermal and Fluid Flow Characteristics of HVAC, Refrigeration and A/C Processes
Denver, 2005

Design and Application of Brazed and Welded Plate-Type Heat Exchangers in the HVAC&R Industries
Chicago, 2006

Flow Maldistribution in Heat Exchangers
Quebec City, 2006

TC/TG Sponsored Forums-Title, when presented (past 3 yrs. present & planned)

JOURNAL PUBLICATIONS, when published (past 3 yrs. present & planned)

RP-984
An Investigation of Condensation Heat Transfer Performance of HFC-134a on Single Enhanced Tubes
HVAC&R Research Volume 9, Number 1/January 2003

Effect of Inundation Upon the Condensation Heat Transfer Performance of R-134a: Part I—Facility Overview and Data Analysis
HVAC&R Research Volume 11, Number 4/October 2005

Effect of Inundation Upon the Condensation Heat Transfer Performance of R-134a: Part II—Results
HVAC&R Research Volume 11, Number 4/October 2005

RP-1089
Local Bundle Boiling Heat Transfer Coefficients on a Plain Tube Bundle
HVAC&R Research Volume 10, Number 1/January 2004

Local Bundle Boiling Heat Transfer Coefficients on an Integral Finned Tube Bundle
HVAC&R Research Volume 10, Number 3/July 2004

Local Bundle Boiling Heat Transfer Coefficients on a Turbo-BII HP Tube Bundle
HVAC&R Research Volume 10, Number 4/October 2004

Void Fraction and Two-Phase Pressure Drops for Evaporating Flow over Horizontal Tube Bundles
Heat Transfer Engineering Volume 27, Number 3/April 2006

Submitted By: Ben Dingel