TO:        Dr. Anthony Barnard  
        Dean and Co-Director  
        UAB Graduate School  

        Dr. William H. Macmillan  
        Dean - UA Graduate School  

FROM:    Raymond A. Buchanan and Marvin D. McKinley  

SUBJECT: RESOLUTION OF PRE-CONDITIONS TO IMPLEMENTATION OF  
        PhD IN MATERIALS/METALLURGICAL ENGINEERING  

In response to the memorandum of May 27, 1985 from Dean Macmillan, we  
have conferred, and the present memorandum constitutes our response to the  
seven conditions imposed by ACHE prior to the implementation of the joint  
PhD program in Materials/Metallurgical Engineering. We will key our  
responses to the ACHE pre-conditions, in each case first restating the  
condition, and then reporting the steps planned to satisfy the condition:  

1. "Establishment of a common Graduate Faculty for the program with  
   joint appointments in both institutions." Attached to this  
   memorandum you will find CV's on all faculty involved in the  
   program. Please regard the present memorandum, together with the  
   appropriate CV's, as our nomination of each UAB Graduate Faculty  
   member for an appointment to the Graduate Faculty of the  
   University of Alabama, and each University of Alabama Graduate  
   Faculty member for an appointment to the Graduate Faculty of UAB.  

2. "Establishment of identical entrance requirements for the program  
   at both institutions." We are agreed on the following identical  
   requirements for admission to the joint program, whether the  
   student seeks to enter through The University of Alabama or  
   through UAB.  
   (a) A bachelor's degree from an accredited college or university  
       in engineering or one of the physical sciences;  
   (b) Not less that B level scholarship overall or over the last  
       60-semester hours of undergraduate credit;  
   (c) A minimum combined score of 1100 on the verbal and  
       quantitative sections of the Graduate Record Examination  
       Aptitude Test; and  
   (d) Three letters of evaluation  

Students admitted into the program with a bachelor's degree in one  
of the engineering disciplines other than Materials Engineering or  
Metallurgical Engineering, or with a degree in one of the physical  
sciences, will be required to take a series of undergraduate
preparatory courses in Materials/Metallurgical Engineering (normally a minimum of 21 semester hours) in addition to the previous requirements. Furthermore, if the student's academic background did not include the development of proficiency in computer programming, an appropriate preparatory course will be required. It shall be the responsibility of the Graduate Program Director, with the assistance of the student's graduate committee, to review the student's academic background and impose the preparatory course requirements.

We would like to emphasize, however, that we expect admission to this program to be competitive, so that those students accepted to the joint program will have qualifications far in excess of those stated above.

3. "Development of identical qualifying examinations that would be given at both institutions and jointly graded." Qualifying examinations for all students in the program will be drawn up by a faculty committee consisting of representatives of both UA and UAB. All students will sit for this identical qualifying examination. When the students have taken this examination, the results will be reviewed by the same joint committee. Thus, the performance requirements will be identical for students who enter the joint program through UAB and those who enter the joint program through The University of Alabama. We would draw your attention to the additional information given about the qualifying examinations on page 32 of our proposal.

4. "Establishment of identical curriculum and other degree requirements at both Institutions." The identical curriculum and other degree requirements were stated on pages 27 through 34 of the proposal. Each student, whether principally resident at UAB or UA, will pursue an approved program of study which will satisfy these identical requirements. Note, in particular, that on page 31 we specified a "common set of four core courses (12-semester hours)," and on page 27 we specified the course work conditions. In a doctoral-level program, the students are, of course, treated as individuals, and their precise program of study and dissertation research are determined by their graduate committee. The graduate committee for all students will consist of faculty members from both UAB and UA. The true intent of our proposal, which we would like to reiterate at this time, is that the curriculum and other degree requirements will be identical for students entering the joint program through UA or UAB.

5. "Development of carefully delineated procedures for sharing research equipment." The faculty at each institution are already well aware of the facilities available at the other and are aware that they are entitled to use the facilities of the other institution on an equal basis with the faculty members at that institution. However, to emphasize this, we will arrange formal tours for each faculty member at one institution through the laboratory facilities of the other institution. Further, we will place a requirement on students admitted to the program, that during the first term of residence at either UA or UAB, they will
be required to visit the laboratories of the other institution to
familiarize themselves with the facilities available there. When a
student who is principally resident at one institution wishes to
use the facilities of the other, that student will write a
memorandum of request to the Graduate Program Director of the
institution at which he/she is principally resident. That
Graduate Program Director will forward it to his counterpart at
the other institution, who will make the necessary arrangements to
schedule access. Please consider this present memorandum, signed
by both Graduate Program Directors, as a pledge that admitted
students principally resident at either institution will have
equal access to the combined resources of both departments.

6. "Establishment of a joint graduate studies committee to implement
and monitor the above provisions." We are happy to accept the
suggestion contained in Dean Macmillan's memorandum of May 27,
1985, that this committee be comprised of the two Graduate Program
Directors, two other faculty members from UA and two other faculty
members from UAB, and the Deans of Engineering from UA and UAB.
The two Graduate Deans would serve ex-officio on this committee,
and would receive progress reports on or before December 31, 1985
and June 30, 1986.

7. "At the outset... the bulk of the work of students should be done
at UAB until UA has greater resources in place." As stated in
the section on Advisement beginning on page 26 of the proposal,
"The Graduate Program Director will serve as the student's
initial, temporary faculty advisor." Thus, initially, it will be
the responsibility of the two of us to advise every student and
sign off on his/her course registrations. We will therefore
personally be in a position to make sure that this pre-condition
imposed by ACHE will be satisfied. When a graduate committee is
formed for a particular student, this responsibility will be
delegated to the Chairman of that committee. We propose that for
every student a report documenting the course work taken, the
dissertation research conducted, and the campus on which each was
performed will be sent to the two Graduate Deans at the close of
each academic year, so long as Condition No. 7 is in place. By so
doing, this condition will be scrupulously observed.
We believe that through our conferences, we have responded conscientiously to the seven pre-implementation conditions imposed by ACHE. By means of this present memorandum, we are expressing our response to the Graduate Deans of the two institutions. We ask you to convey these responses to ACHE by whatever protocol is appropriate, and we look forward to an early favorable response from ACHE so that this long-delayed program, which is greatly needed by its constituencies, can get underway without further delay.

Raymond A. Buchanan
Chairman, Dept. of Materials Engineering
UAB

Marvin D. McKinley
Head-Dept. of Metalurgical Engineering - The Univ. of Alabama

CC: Dr. J. H. Woodward, Dr. Roger Sayers, Dr. Jay Goldman, Dr. Robert Barfield

Enclosures: Graduate Faculty CV's

CV's included for B. Andrews, R. Andrews, Patterson, Thompson, Buchanan, McKinley, Stefanesuc, Hansen, and Wilkins.
THE PROGRAM

Organization and Administration

The Ph.D. program in materials/metallurgical engineering will be independently administered by the Graduate Schools at The University of Alabama and The University of Alabama in Birmingham under the cooperative policies specified in this document. Students will be independently admitted into the program by the respective Graduate Schools under the requirements stated below. Similarly, students will be independently graduated either by The University of Alabama in Birmingham or The University of Alabama when all degree requirements, as specified below, are satisfied. The degree granted to the successful candidate will be either of the following, depending on the location of his/her graduate committee chairperson which will coincide with the location of the majority of the dissertation research: Ph.D. in Materials Engineering awarded by The University of Alabama in Birmingham, or Ph.D. in Metallurgical Engineering awarded by The University of Alabama.

At The University of Alabama, the Ph.D. program will be housed within the Department of Metallurgical Engineering. The Head of the Metallurgical Engineering Department currently serves as Director of the Metallurgical Engineering Graduate Program and therefore will administer the Ph.D. program. The Director will be responsible for maintaining the cooperative elements of the program, and will report to the Dean of the College of Engineering and to the Dean of the UA Graduate School. A similar organizational structure will exist at The University of Alabama in Birmingham. The Ph.D. program will be housed within the UAB Department of Materials Engineering. The Departmental Chairperson currently serves as the Director of the Materials Engineering
Graduate Program and therefore will administer the Ph.D. program. The Director will be responsible for maintaining the cooperative elements of the program, and will report to the Dean of the School of Engineering and to the Deans and Co-Directors of the UAB Graduate School.

The UA Director and the UAB Director will serve as alternating chairpersons of the Metallurgical/Materials Engineering Ph.D. Coordinating Committee. The Directors will communicate frequently, and the Committee will meet twice each year to ensure that the cooperative elements of the program are being maintained.

Admission Requirements

In order to be admitted to the doctoral program, a student must have satisfied the following set of minimum requirements common to both universities:

1. A bachelor's degree from an accredited college or university in engineering or one of the physical sciences;
2. Not less than B level scholarship overall or over the last 60 semester hours of undergraduate credit;
3. A minimum combined score of 1100 on the verbal and quantitative sections of the Graduate Record Examination Aptitude Test; and
4. Letters of evaluation.

Students admitted into the program with a bachelor's degree in one of the engineering disciplines other than Materials Engineering or Metallurgical Engineering, or with a degree in one of the physical sciences, will be required to take a series of undergraduate preparatory courses in materials/metallurgical engineering. Based on the student's academic
background, the specific undergraduate preparatory coursework (normally a minimum of 21 semester hours) will be determined by the UAB or UA Director with the concurrence of the faculty. In addition, if the student's background did not include the development of proficiency in computer programming, an appropriate preparatory course will be required.

Under exceptional circumstances, a student not meeting all the above admission requirements may be admitted into the program on probation. This probationary admission must be approved by the Graduate Program Directors at both universities. Once admitted, the student must then establish good standing by achieving not less than a B average upon completion of 12 semester hours of approved coursework.

Advisement

Immediately upon admission to the program, each student will be assisted in program planning and other academic matters by either the UA or UAB Director. The Director will serve as the student's initial, temporary faculty advisor. During this stage, the student will be encouraged to enter discussions with all faculty members as an aid in the development of an appropriate program of study and area for dissertation research. When the student has selected a research area agreeable to the faculty and Director, a permanent advisor will be assigned.

A graduate committee will be appointed for the student as early as possible, and no later than the first year of study. The graduate committee for Ph.D. candidates will include the advisor as chairperson and at least four other members. The graduate committee members will be selected based on the student's academic interest and area of research. At least one of the
committee members will be from the other cooperating university, i.e., UA or UAB. The graduate committee is charged with supervision and approval of the student's research and course of study toward the completion of all requirements leading to award of the degree.

Curriculum Requirements

The program of study leading to the doctoral degree in metallurgical engineering or materials engineering for an entering student with a baccalaureate degree in metallurgical engineering or materials engineering will include the following elements:

1. A minimum of 24 semester hours of approved coursework in materials engineering or metallurgical engineering;
2. A minimum of 24 additional semester hours of approved coursework in metallurgical engineering, materials engineering, or fields supportive of these disciplines (At least 12 of the 24 additional semester hours must be in supportive fields.);
3. Qualifying examinations covering both undergraduate and graduate coursework; and
4. A research dissertation in metallurgical/materials engineering (minimum of 24 semester hours).

Students entering the graduate program with a baccalaureate degree in one of the engineering disciplines other than Materials or Metallurgical Engineering, or in one of the physical sciences (predominantly physics and chemistry), will be required to take a series of undergraduate preparatory courses (normally a minimum of 21 semester hours) in addition to the above requirements. Furthermore, if the student's academic background did not
include the development of proficiency in computer programming, an appropriate preparatory course will be required.

All students will be required to earn a Master of Science Degree in Metallurgical Engineering or Materials Engineering as a definitive step in their advancement toward the doctoral degree. Up to 24 semester hours of coursework earned for the Master's degree may be incorporated within the total Ph.D. coursework requirement, i.e. up to 24 of the required minimum of 48 semester hours. At least two-thirds of the required minimum of 48 semester hours of coursework must be at the 500 and 600 levels.

The following table lists the materials/metallurgical engineering courses currently available and applicable to the graduate program:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>MTE 417</td>
<td>Theory and Practice of Metal Casting</td>
</tr>
<tr>
<td>MTE 418</td>
<td>Special Casting Procedures</td>
</tr>
<tr>
<td>MTE 423</td>
<td>Corrosion Engineering</td>
</tr>
<tr>
<td>MTE 430</td>
<td>Polymer Engineering</td>
</tr>
<tr>
<td>MTE 412</td>
<td>Nondestructive Evaluation of Engineering Materials</td>
</tr>
<tr>
<td>MTE 441</td>
<td>Extractive Metallurgy I</td>
</tr>
<tr>
<td>MTE 442</td>
<td>Extractive Metallurgy II</td>
</tr>
<tr>
<td>MTE 443</td>
<td>Metal Processing</td>
</tr>
<tr>
<td>MTE 443</td>
<td>Casting Metallurgy, Mold Design</td>
</tr>
<tr>
<td>MTE 444</td>
<td>Casting Metallurgy, Melting</td>
</tr>
<tr>
<td>MTE 444</td>
<td>Extractive Metallurgy III - Hydrometallurgy</td>
</tr>
<tr>
<td>MTE 445</td>
<td>Metallurgical Plant Design</td>
</tr>
<tr>
<td>MTE 452</td>
<td>Welding Processes</td>
</tr>
<tr>
<td>MTE 453</td>
<td>Welding Metallurgy</td>
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</tbody>
</table>
MTE 457 (UAB) Powder Metallurgy
MTE 461 (UAB) Non-Ferrous Metallurgy
MTE 461 (UA) Thermodynamics of Metals I
MTE 462 (UA) Thermodynamics of Metals II
MTE 473:474 (UA) Physical Metallurgy
MTE 473 (UAB) Structure and Properties of Glasses
MTE 477 (UA) Nuclear Metallurgy
MTE 478 (UA) Electronic Materials
MTE 482 (UA) Structure of Metals
MTE 483 (UAB) Electronic and Magnetic Properties of Materials
MTE 484 (UA) Non-Destructive Testing
MTE 503 (UAB) Metallurgical Thermodynamics
MTE 562 (UA) Metallurgical Thermodynamics
MTE 511 (UAB) Advanced Physical Metallurgy
MTE 513 (UAB) Advanced Mechanical Behavior of Materials
MTE 519 (UA) Solidification of Metals
MTE 523 (UAB) Solidification of Metals
MTE 520 (UA) Nucleation and Growth Phenomena in Cast Iron, I
MTE 521 (UA) Nucleation and Growth Phenomena in Cast Iron, II
MTE 524 (UAB) Advanced Solidification
MTE 530 (UAB) Properties of Ceramic Materials
MTE 533 (UAB) X-Ray Diffraction
MTE 537 (UAB) Quantitative Microscopy
MTE 542 (UAB) Operation of Electron Microscopes
MTE 543 (UAB) Electron Microscopy
MTE 547 (UAB) Advanced Corrosion Engineering
MTE 553 (UAB) Advanced Phase Diagrams
MTE 580 (UA) Advanced Phase Diagrams
MTE 577 (UA) Advanced Nuclear Metallurgy
MTE 579 (UA) Advanced Physics of Metals
MTE 583 (UA) Advanced Structure of Metals
MTE 585 (UA) Materials at Elevated Temperature
MTE 587 (UA) Corrosion of Metals
BME 520 (UAB) Biomaterials I
BME 521 (UAB) Biomaterials II
MTE 590 (UAB) Special Topics in (Area)
MTE 591:592 (UA) Special Topics in (Area)
MTE 591 (UAB) Individual Study in (Area)
MTE 595:596 (UA) Seminar
MTE 598 (UA) Research Not Related to Thesis
MTE 599 (UA) Master's Degree Thesis
MTE 599 (UAB) Master's Degree Thesis
*MTE/BME 622 (UAB) Biomaterials III
*MTE/BME 623 (UAB) Biomaterials IV
*MTE 624 (UAB) Advanced Solidification (currently MTE 524)
*MTE 645 (UA) Recent Advances in Steel Production
*MTE 647 (UAB) Advanced Corrosion Engineering (currently MTE 547)
*MTE 665 (UA) Dislocations
*MTE 670 (UA) Diffusion in Solids
*MTE 672 (UAB) Advanced Powder Metallurgy
*MTE 675 (UA) Physical Metallurgy of Carbon and Alloy Steels
*MTE 680 (UA) Computer Applications in Metallurgical Engineering
*MTE 690 (UAB) Special Topics in (Area)
*MTE 691:692 (UA) Special Topics in (Area)
*MTE 691 (UAB) Individual Study in (Area)
*MTE 699 (UA)  Doctoral Dissertation

All students will be required to take a common set of four core courses (12 semester hours), as follows:

1. Metallurgical Thermodynamics - MTE 503 (UAB), MTE 562 (UA)
2. Advanced Phase Diagrams - MTE 553 (UAB), MTE 580 (UA)

plus two of the following:

1. Either Advanced Physical Metallurgy - MTE 511 (UAB)
   or Advanced Physics of Metals - MTE 579 (UA)
2. Advanced Mechanical Behavior - MTE 513 (UAB)
3. Solidification - MTE 523 (UAB), MTE 519 (UA)
4. Materials at Elevated Temperature - MTE 585 (UA)

Candidacy and Dissertation Requirements

Admission to candidacy for the doctoral degree will be contingent upon the successful completion of qualifying examinations and the successful presentation of a dissertation research proposal. Normally, a student will be considered eligible for candidacy when he/she has completed all of the required coursework. After being admitted to candidacy, the student must then complete the remaining requirements for the degree, with the principal remaining requirement involving the doctoral research and dissertation.

*Proposed pending Ph.D. program approval
QUALIFYING EXAMINATIONS -- Qualifying examinations will be composed of questions requiring substantive knowledge of experimental and theoretical topics in metallurgical/materials engineering. The questions will not be limited to course content. The examinations will be designed to assess the breadth and depth of the student's knowledge, encourage organization and integration of knowledge, and inform the faculty concerning the student's academic competence.

The qualifying examinations will consist of the following: (1) a written examination based on undergraduate material, normally six hours in duration (a one-day examination), (2) a written examination based on graduate material, normally six hours in duration, and (3) an oral examination normally two hours in duration. The qualifying examinations should be completed within one academic term after completion of all required coursework. No more than two attempts will be allowed to pass the examinations. The qualifying examinations will be developed and evaluated by the student's graduate committee and any additional faculty deemed appropriate. The student and committee should meet early to discuss the format and nature of the examinations. Furthermore, the committee and student should discuss any deficiencies in the student's background and a reading list may be provided if deemed necessary.

DISertation RESEARCH PROPOSAL -- Immediately following successful completion of the qualifying examinations, the student will present in written and oral form his/her dissertation research proposal. The student's graduate committee, with the aid of any additional faculty, will evaluate the merit of the proposed research. The committee members will also make helpful suggestions to the student regarding the direction and efficiencies of the research activity. Upon successful completion of the qualifying examinations and the dissertation research proposal, the student will be admitted to candidacy.
DOCTORAL DISSERTATION -- Each candidate for the Ph.D. degree must complete the doctoral research and write a dissertation demonstrating his/her attainment in independent, original scholarship within the materials/metallurgical engineering field. While completing the dissertation requirements, the student must register for MTE 699 (UAB) or MTE 699 (UA), Dissertation Research, for a minimum of 24 semester hours of credit (plus additional coursework if required or desired).

The student's graduate committee will supervise the dissertation. Changes in the student's committee, necessitated by changes in the student's research interest or other reasons, may be made by the UA or UAB Graduate School based upon the recommendation of the UA or UAB Metallurgical/Materials Engineering Graduate Program Director.

Scholastic Requirements

STUDENT EVALUATIONS -- In order to assess progress in the program, each student will be evaluated by his graduate committee at regular intervals and at least on a semi-annual basis. Each student will be informed by his advisor of the results of the evaluation as soon as possible after the meeting. If the evaluation process concludes that probation is necessary, the Director of the Graduate Program will also write the student a formal letter notifying him/her of the evaluation results and the conditions required to reestablish good standing. The evaluation process will be based on the following criteria: (a) satisfactory academic performance (requiring at least a B overall average), (b) assistantship or fellowship performance, and (c) rate of progress toward the degree. The evaluation will also include a review of the student's professional attitudes and ethical behavior.
PROBATION -- Students may be admitted on probation, or placed on probation after admission if they fail to earn at least a 3.0 overall grade point average in their first 12 hours of study or at any point thereafter. The student may also be placed on probation, upon the recommendation of the program faculty, in instances of unsatisfactory performance on an assistantship or fellowship or of unethical conduct. Decisions concerning probation, readmission or termination will be made according to the UA or UAB Graduate School rules and are subject to appeal procedures within the program and the Graduate School.
FACILITIES AND EQUIPMENT

The research laboratory space currently available to support the cooperative materials/metallurgical engineering Ph.D. program consists of 9,000 ft² at UAB and 20,000 ft² at UA. The combined space available is adequate to initiate an excellent program. The research and advanced instructional equipment contained in these laboratories is also deemed adequate at the present time to initiate the Ph.D. program, especially in view of the fact that graduate students and faculty will have total access to the laboratories and equipment at both campuses.

Plans for equipment acquisitions in the near future have been discussed in detail by the UA and UAB faculty. The research equipment items selected for highest priority, with emphasis on the enhancement of research capabilities without undue equipment duplication at the two universities, are as follows:

1. a JEOL JSM-35 CF scanning electron microscope (UAB),
2. a spectrograph with oxygen probe system, carbon and sulfur determinator, and nitrogen and oxygen determinator (UA),
3. a high temperature microhardness tester (UA),
4. a research-quality transmission electron microscope (UAB),
5. a vacuum induction melting furnace (UA),
6. an image analysis system for light microscopy (UA), and
7. a fluorescence attachment for the x-ray diffraction unit (UA).

The major laboratory equipment items currently available, and categorized in terms of research areas, are as follows: