OCA PAD AMENDMENT - PROJECT HEADER INFORMATION

Active

Project #: D-48-808
Center #: 10/31-6-T5251-0A0
Cost share #: OCA file #: 130
Center shr #: Work type : PUB SER
Contract#: CA-0424-5-8001-16
Mod #: AMEND 16; MOD 2
Prime #: Document : DO
Subprojects ? : N
Main project #: Contract entity: GTRC

Project unit: DEAN ARCH Unit code: 02.010.170
Project director(s): MYERS J H DEAN ARCH (404)894-3390

CFDA:
PE #:

Sponsor/division names: US DEPT OF INTERIOR / NATL PARK SRVC
Sponsor/division codes: 111 / 006

Award period: 900504 to 920630 (performance) 920630 (reports)

Sponsor amount
Contract value 0.00 Total to date 32,800.00
Funded 0.00
Cost sharing amount 0.00

Does subcontracting plan apply ?: N

Title: DEVELOPMENT OF A NATIONAL CENTER FOR PRESERVATION TECHNOLOGY

PROJECT ADMINISTRATION DATA

OCA contact: E. Faith Gleason 894-4820
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ENGINEERING AND SAFETY SERVICES DIV
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Security class (U,C,S,TS) : U
Defense priority rating :
Equipment title vests with: Sponsor
N/A

Administrative comments -
MOD #2 TO AMENDMENT #16 ADDS A NO-COST EXTENSION TO 6/30/92 TO THE PROJECT
AND TO THE BASIC COOPERATIVE AGREEMENT (OCA/BOA #130).
GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

NOTICE OF PROJECT CLOSEOUT

Closeout Notice Date 10/12/92

Project No. D-48-808__________

Center No. 10/31-6-T5251-0A0_

Project Director MYERS J H__________

School/Lab DEAN ARCH_____

Sponsor US DEPT OF INTERIOR/NATL PARK SRVC_________________________

Contract/Grant No. CA-0424-5-8001-16__________ Contract Entity GTRC

Prime Contract No. ___________________________

Title DEVELOPMENT OF A NATIONAL CENTER FOR PRESERVATION TECHNOLOGY

Effective Completion Date 920630 (Performance) 920630 (Reports)

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Comments_____________________________________________________________________________________

Subproject Under Main Project No. ___________________________

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NOTE: Final Patent Questionnaire sent to PDPI.
August 25, 1992

Mr. Ward Jandl
Preservation Assistance Division
National Park Service
Suite 200
800 North Capitol Street
Washington, DC 20002

Dear Ward,

Per Blaine's request, enclosed is an unbound copy of the draft preservation technology report. I have asked our print shop to package the draft in a three-ring binder with tabs between the reports. Those will follow behind this copy.

You will notice that there are four reports instead of the three called for in the scope of work. This is because I felt the area of resource development was likely to be critical. If it is possible to make a contribution in that area as well, it could be more important in the short term than the other subjects.

The reports are really a combination of observations, judgements and recommendations based on our experience surviving in the "preservation research" business for over ten years now. I think the object of this project was to capture the benefit of that experience and I am reasonably satisfied that it does that. I am also reminded as I write this, that you have never been to visit in those ten years, so I hope you will be in Atlanta some time soon, and will have time to come by.

Please call if you have any questions, or need additional information.

Sincerely,

John H. Myers
Assistant Dean for Research

Enclosure

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A SERIES OF FOUR REPORTS ON THE PROPOSED NATIONAL CENTER FOR PRESERVATION TECHNOLOGY

Needs; Producers; Training and Resources

CENTER FOR ARCHITECTURAL CONSERVATION
A SERIES OF FOUR REPORTS ON THE PROPOSED NATIONAL CENTER FOR PRESERVATION TECHNOLOGY

INTRODUCTION

REPORT 1: Preservation Technology Problems

REPORT 2: Preservation Technology Producers

REPORT 3: Technology Transfer Training Agenda

REPORT 4: Financial Resources

PREPARED BY:

JOHN H. MYERS, DIRECTOR
CENTER FOR ARCHITECTURAL CONSERVATION
GEORGIA TECH
ATLANTA, GEORGIA 30332
INTRODUCTION

This document is comprised of four reports, each of which addresses a range of issues associated with a proposed National Center for Preservation Technology. This combination of reports seeks to explore some of the fundamental issues which a Center must address. The reports address:

1) preservation technology problems
2) preservation technology producers
3) technology transfer training agenda
4) financial resources.

Support of the idea for a National Center for Preservation Technology has a long history, but current events and pressing needs have resulted in a focused national movement to formally establish such a Center, whose purpose would be to facilitate preservation technology transfer. Initiatives from this movement include the following:


The Coalition for Applied Preservation Technology (CAPT) was formed in 1986 to advocate the recommendations of OTA.

Federal legislation (S2911 and S2912) currently HR 429, was proposed by Senator Wyche Fowler (D - GA) and includes the establishment of a Center.

Limited funds were made available in FY90 for preliminary planning for a Center.

A University Consortium for Preservation Science and Technology was formed in 1989 to create a nucleus of interested university resources in support of the National Center concept.

In addition, many other specific planning and development activities have occurred over the past few years. These efforts continue up to the present time.

In each of the four reports, the focus is on how each subject relates to the design and establishment of a National Center for Preservation Technology; a center which focuses on the transfer and application of technology. The reports examine the problems from an organizational perspective, so that the conclusions can support the continued development and organization of the Center.
The complexity of the relationships between existing organizations; the range and applicability of technology; the breadth and depth of technical needs; and the diversity of multiple participating disciplines are all potential barriers to the successful development of a focused national center program. The planning effort seeks to explore these areas, with the objective of supporting action which is responsive to the needs and interests of major disciplines in archaeology, architecture, museum curation, and which is effective in developing, applying and transferring technology to meet the needs of society at large, and the cultural resource community specifically. To accomplish this task, it will be vital to develop effective strategies for organization operation and capitalization.

While it is premature to discuss the specific structure of a "National Center for Preservation Technology", it is important to construct a preliminary "vision" of such a Center. From the vision, a path of progress can be forged. Such a vision should emerge from the overall mission of the Center. A foundation of work and experience has been laid down by the groups identified above, and other organizations which have long recognized the need for such a Center. The vision would grow and take form in the expression of the capabilities, roles and organizational requirements of the Center, including the roles and relationships of the Federal government, state and local governments (including their universities) and the private sector (business, volunteer and non-profit groups). The development of the "vision" for a National Center into an elegant statement of the need for, and the form of, the National Center is important to demonstrate intellectual leadership, establish confidence and assure the public support needed for continued development.

This series of four reports is only one component of the planning effort, and it focuses on issues related to buildings or historic architecture. Other disciplines and fields must evaluate and articulate their needs and goals before a meaningful dialogue can occur between disciplines, for the purpose of planning an integrated Center. An integrated Center is one which will meet the needs of a broad sector of the conservation community, and ultimately the public. Each technical discipline will have its own agenda, levels and types of technological skills; and, importantly, its own language, philosophy and methodology. To reach a high level of integration or at least co-ordination, among the participating disciplines there must be a dialogue among professional disciplines in a forum which is intended to advance the planning objectives of the Center.

These reports are prepared by the Center for Architectural Conservation (CAC) at the College of Architecture, Georgia Tech. The Center was established in 1982 and has operated continuously for almost ten years with a basic mission similar to that of the proposed mission for the National Center, that of providing an appropriate technological response to the needs of the Federal, state, local and private preservation community. While there is no comparison between the scale of CAC's work and the scope of the proposed National Center, there are few other comparable examples available in the U.S. It is hoped, therefore, that where there are applicable lessons from the CAC's experience, that such lessons and insights can be beneficial to the planning effort.
Each of the following reports, as issue papers, must be seen and understood as inter-dependent. In fact, more strongly than that, they are all facets of a single process which is *dynamic, extensive* and inseparably *linked*. 
LIST OF EXHIBITS

EXHIBIT 1-A: EXAMPLES OF TECHNICAL PROBLEMS IDENTIFIED BY NPS

EXHIBIT 1-B: EXAMPLES OF TECHNICAL PROBLEMS IDENTIFIED BY AN SHPO

EXHIBIT 2-A: ARCHITECTURAL RESEARCH CENTERS CONSORTIUM

EXHIBIT 2-B: ORGANIZED RESEARCH UNITS

EXHIBIT 2-C: RESEARCH LABORATORIES

EXHIBIT 2-D: SELECTED LIST OF BUILDING MATERIALS MANUFACTURERS

EXHIBIT 2-E: UNIVERSITY CONSORTIUM FOR PRESERVATION SCIENCE AND TECHNOLOGY

EXHIBIT 4-A: ACCREDITED ARCHITECTURAL SCHOOLS

EXHIBIT 4-B: U.S. FOUNDATIONS

EXHIBIT 4-C: NATIONAL ENVIRONMENTAL TECHNOLOGIES ACT

EXHIBIT 4-D: ORGANIZED RESEARCH UNITS
REPORT ONE: PRESERVATION TECHNOLOGY PROBLEMS
The historic preservation community and the cultural resource management field have no shortage of needs or problems. Almost universally, the inventory of cultural sites far exceeds the amount of technical and financial resources available to document, evaluate and protect them. Over time, the backlog of maintenance, repair, rehabilitation and restoration has grown to immense proportions, and intensified the problems. While this has traditionally been true for cultural resources, the problems have grown to the level that the entire infrastructure of the country is increasingly cited as critically deficient.

The increasing scale of the national "problems" along with increasing demands on limited resources, are two underlying reasons why many professionals, owners and managers feel strongly about the need for an institution to focus on technology, and its potential for alleviating many problems. Planners and organizers of a National Center must recognize this basis, and keep their planning focus on the fundamental issues of technology, and how technology can be transferred and applied to cultural resource problems. Technology, however, is not the only solution to every unsolved technical, resource or management problem. Sound principles of organization, planning, operation and adequate resource allocation will always be fundamental issues in the ownership and sound management of all architectural resources.

An example of this is a committee empaneled by the National Research Council in 1989. The Committee set out to address "Advanced Maintenance Concepts", but soon acknowledged that most of the problems with the core maintenance and sound operation of buildings did not occur due to lack of advanced techniques, i.e. technology. The universal conclusion of the experts was that lack of commitment, awareness, and sound management principles most often led to decaying resources. The Committee's findings were released in a publication entitled "Committing to the Cost of Ownership". It was the committee's strong belief that a statement had to be made to pierce the shell of indifference to real requirements or responsibilities of property ownership. In the total life cycle, there were requirements for design, construction, operation, maintenance, rehabilitation and, perhaps, demolition.

In this context, technology should be viewed as something which can assist with some functions and perform others, but it is not a substitute for programming adequate resources and maintaining a commitment to proper monitoring, preventive maintenance, and early repair of deficiencies. The same is true for historic buildings, as for the balance of all buildings in our built environment.

The fact that these cautions apply to all buildings is one indication of a fundamental principal which is often forgotten. That principal is that historic buildings are but one part of a larger set of all
existing buildings. Historic buildings may be distinguished in some ways by ornamentation, style or archaic components, but as buildings they are subject to the same processes as all buildings; and are attended to, in most cases by many of the same disciplines and craftspersons. In this report, several parallels will be drawn between the perceived problems of the historic preservation community and the building industry at large.

It is important when identifying and discussing needs and problems, to recognize that they fall into two basic types. The first and simplest type is the straight technical problem of how to identify, evaluate, repair, maintain or restore a particular material or component. This is what most constituents perceive when discussing "preservation problems or needs". In reality, these are often the simple things to resolve. When pursued, it is usually possible to arrive at solutions for such technical problems. It is the second type of problem, however, which leads to institutional frustration, and which results in the recognition of a need for an organized response, i.e. a National Center for Preservation Technology Transfer. This type of problem is cultural, organizational or institutional in nature. This second type of problem is both far more difficult to resolve, and far more critical to the interests and objectives of the proponents of a National Center. Much work has been done to identify and catalog this first type of technical problem, and this report includes examples of two attempts to identify technical problems, attached as Exhibits IA and IB. This second area which is more relevant to the organizational planning will, therefore, be the primary focus of Report One.

TWO TYPES OF NEEDS

This section addresses "problems" in the cultural resource area, in the context of organizing a National Center for Preservation Technology. Addressing this subject in a meaningful way requires a definition of the context and the scope. "Needs" or problems, exist at two broad levels. First there are the specific technical needs or problems encountered by preservation technology users, of all types, in the evaluation, and conservation of the resources, public and private. These needs are real and serious in the "front line" effort to identify, maintain, repair or restore structures. It is fundamentally important to recognize that every user problem does not represent a preservation technology research need for R&D or technology transfer. In most cases, individual technical problems occur because of the lack of adequate knowledge about philosophy, tools, techniques, procedures, methods or materials, and/or the proper interpretation, application and integration of all of the above. Such problems or needs are important as one part of the overall process of cultural resource management.

Specific technical problems, (such as the repointing of masonry joints), are actually "indicators" of the effectiveness of the total research process, and, as such, must be identified, evaluated and used, on an ongoing basis. They will serve as one "input" to refine the direction of the overall institutional effort to manage cultural resource research, education and practice. This is a critical point, because few people have a clear technical understanding of the process of the development of intellectual
knowledge through research, and its dissemination through education in a variety of forms, to its eventual application at the point of a specific problem. This leads to a naive expectation that if we have a catalog or a shopping list of problems, that the role of an organization like a National Center is little more than attacking these problems one by one. In reality, individual attention to the myriad of specific technical questions or problems is an integral, but minor, aspect in the overall development and implementation of a national institution to provide leadership in the management of preservation technology. This is not to say that such activity is trivial or unimportant. It is critical to the end users who have needs; it is vital to a public perception of the value and utility of a National Center; it is crucial to sustain political and financial support and it is ultimately the final objective of the entire process. It is not, however, the dominant factor in the design of a National Center. In addition, information about the itemized needs and problems of users abounds to support the National Center planning. To mention two of the many efforts to catalog the needs, there is the 1988 work by the Preservation Assistance Division of NPS to develop a list of preservation needs, attached as Exhibit IA, and the national survey of the National Conference of State Historic Preservation Offices (NCSHPO) via the State Historic Preservation Officers (SHPO's) in cooperation with the National Register programs of NPS to develop a prioritized list of national needs. A sample of the problems identified by the state of Georgia is attached as Exhibit 1B.

The second level, or type, of problems relate to the conceptual planning and implementation of any national research center. These relate to the process of developing and operating an effective national organization to perform and/or promote research and technology transfer in areas related to the older and historic buildings. It is this "second" type of problem which most needs to be addressed by the planners and developers of the Center. As this report focuses on buildings, it is important to state at the outset that there are some cultural or professional differences between disciplines involved in the management and conservation of cultural resources. These often create false impressions, lead to unwarranted assumptions and generally cause some professions to do business differently than others. The positive aspect of this is that those disciplines with closer linkages to the "hard sciences" have a foundation in scientific methodology and, because of this, can have a positive influence on those with less training and experience in research, technology development and transfer. This report describes these as the "TEN BASIC PROBLEMS IN PRESERVATION TECHNOLOGY". They are addressed below.
TEN BASIC PROBLEMS OF PRESERVATION TECHNOLOGY

The numerous specific technical problems are, in large measure, caused as a result of ten basic problem areas. To solve the problems, work is needed to:

I REDUCE ISOLATION/FRAGMENTATION

II INCREASE AWARENESS

III INCREASE APPROPRIATE RESEARCH

IV CREATE AND FOSTER A DISCIPLINARY BASE

V ADOPT AND ARTICULATE A RESEARCH STRATEGY

VI ESTABLISH A TECHNOLOGY TRANSFER PROCESS

VII INCREASE THE NUMBER OF PROFESSIONALS

VIII DEVELOP AN INFORMATION STRATEGY

IX ESTABLISH AN ECONOMIC STRATEGY

X ESTABLISH POSITIVE ORGANIZATIONAL ENVIRONMENT

These needs represent problems which must be addressed in order to bring about substantive changes in the preservation status quo. There are many potentially successful strategies which can effectively address these needs. Such strategies must be incorporated into the design and operation of a National Center, if it is to have the maximum impact. It is important to explore these needs as a prelude to future action.
I. REDUCE ISOLATION/FRAGMENTATION

The historic preservation community in the U.S. has traditionally been isolated. Early efforts of activists which led to the preservation of important landmarks and to the establishment of preservation organizations, took place based on the efforts of small groups of dedicated individuals. Perhaps because many efforts to support preservation grew out of the need to mobilize against a threat to specific cultural resources, it is inherent that results and impact have traditionally been localized in time and place. In addition, the reactive nature of many preservation initiatives has led to, or occurred in the midst of, polarization and adversarial action. The outgrowth of this is that individuals and groups in the field, have often been negatively stereotyped.

The well-entrenched tendency to isolate historic or architecturally significant buildings may be well-intentioned. It may have resulted from attempts to raise awareness; reflect a special appreciation for the special qualities of these buildings, or to prevent culturally significant properties from damage or demolition due to ignorance. However well intentioned, historic preservation has often found itself an isolated and misunderstood community, often perceived at odds with other social and community interests. Too often conflicts are resolved adversarially with the result that many sectors of society become polarized from the single issue of "historic preservation" - commonly expressed by the polarized groups as "hysterical preservation". Even to the present day, this phrase is often heard from those involved in the compliance review process.

The fact that these tired stereotypes still exist and that they die hard, pales in significance when compared to other long term effects of isolation. These include, but are not limited to:

- poor to no integration of conservation theory, philosophy and practice into architectural and engineering education

- shortages of trained and experienced historical architects due to limited training opportunities

- reduced integration of cultural resource conservation issues into mainstream economic and political planning.

The Historic Preservation Act in 1966 and subsequent Federal and State programs, such as tax incentives programs made some dramatic progress toward moving preservation into the economic mainstream, but the substantive problem of isolation still exists and has many manifestations. Examples include:

Government - Local community political and economic leadership is typically driven by economic and development interests which are vital to community growth. Even with current policies and
improved awareness, cultural resource values have not been integrated effectively into the management ethic of government at many levels. For this to happen, progress needs to be made to establish cultural resource values as an integral part of community values. To accomplish this, there has to be some recognition that there are many values which must be accommodated in society. Cultural resource values should be integrally linked to other values such as social and economic values, and in doing so preservationists (as proponents of cultural resource values) must realistically accept that there will always be a balancing of values in political and governmental decision making, and that sometimes cultural resource values will not and should not prevail. Only through playing an active role in the process can proponents insure that the issues be given fair and balanced treatment. Through such participation cultural resource values will gain credibility and integration.

There are other activities in government besides political decision making. These include operation and management. Preservation as an issue is often a minor or non-issue; and it is not uncommon to encounter hostile attitudes in the construction/building oriented departments of local, state and Federal agencies. There is a strong possibility that much of the adversarial environment which occurs, does so out of regulatory conflicts with perceived mission. Improved support, information transfer, technology transfer, and research could occur in a National Center. Such work can produce solutions to resolve conflicts and promote sensitive solutions to design and construction problems. This process would help to reduce the polarization and move historic preservation more into the mainstream of building activity, and community action.

Universities - The general isolation of historic preservation as an activity, along with the lack of a disciplinary base, (which is discussed below), have resulted in a very limited number of university programs addressing the technological issues. This is less true for the history, philosophy, policy and planning aspects of preservation, than for the technical and scientific aspects, which have a very weak presence in most university programs. There are serious implications to this result, including:

- lack of curricula to train scientific and technical experts dedicated to HP issues
- lack of adequate integration of technological needs in preservation into research agendas.
- lack of sensitivity of the technical and research community to needs and opportunities in cultural resource areas.

Isolation and fragmentation inevitably lead to reduced effectiveness. Technology transfer, research and information management can reduce polarization, and increase the credibility and value associated with cultural resource ownership and management. A National Center should strive to implement programs which leverage technology to broaden the preservation base.
II. INCREASE AWARENESS

Awareness is integrally linked to the issue of isolation and to other needs or issues, such as information management and education. Lack of awareness of cultural resource values and technical/technological needs has long lasting implications for such things as:

- inadequate demand for sensitive products and services to solve building repair and maintenance problems.

- lack of initiative to conduct research on the technical problems of older buildings.

- potentially damaging lack of sensitivity to the contextual issues of older and historic buildings when basic research is performed, leaving open the possibility of irreversibly harmful results.

- missed opportunities for education, information sharing and technology transfer.

Lack of awareness can result from multiple causes, such as:

- inadequate training/educational opportunities

- lack of presence in primary and secondary education

- competition from other issues, or

- absence of a clear focus.

A National Center can raise awareness of cultural resource values and issues. It can attract the interest of competent individuals in the scientific and technological community. An appropriately designed Center can increase opportunities for research; open up new avenues for basic scientific research and development; broaden the scientific base of the field, and increase the credibility of preservation issues. All of the opportunities exist to be developed by a National Center for Preservation Technology. There will be an integral linkage between the specific technological initiatives and the impact such initiatives have on increasing awareness in the public, the building industry, and the University and scientific community. Progress in the area of increasing awareness will have substantive benefits for stimulating participation, research and technology transfer.

Awareness, as intangible a concept as it represents, is a crucial component of any organized activity. Solutions to problems are often ignored due to lack of awareness. Products and technologies are not tested, applied and transferred to cultural resource problems due to lack of awareness of the needs.
Improvements in awareness, (which can be brought about by a National Center), can play a major role in the integration of cultural resource values into mainstream education, research and industrial activity. Progress in all these areas will have an increasingly productive effect on the conservation of all older buildings.
III. INCREASE APPROPRIATE RESEARCH

The focus of the proposals for a National Center for Preservation Technology has been that there are technologies extant which can be applied to support cultural resource management and preservation. The subject of technology must be addressed in the larger context of research, development and technology transfer. In this context, historic preservation is not the only area where such problems exist. The preservation of historic buildings is an activity which takes place as a part of a much larger scope of building design, construction, maintenance, operation, repair, rehabilitation, re-use and disposal activity. Many of the same professionals, consultants, craftsmen and suppliers who address technical problems with all buildings, also are called upon to address historic building problems.

It is important to recognize that the building industry in the U.S. has serious, widely recognized problems with research and technology transfer. These problems are often cited as a major reason why the U.S. construction industry is losing out in international competition. Historic preservation as a part of this industry, suffers from these same shortcomings. The construction industry has been referred to as a $400 billion cottage industry due to the fragmentation and lack of coordination of its components. One of the serious problems is that, in the fields of architecture and construction, there is an environment which discourages research. Historic buildings have been designed, constructed, maintained, rehabilitated and, at times, demolished by this industry. The lack of research in the area of historic preservation, therefore, can be linked to a larger problem in the building industry. There are numerous problems in the building/construction industry and they also have an effect on research and technology transfer. Addressing most of these is beyond the immediate scope of this report but there are some especially crucial ones such as the problems with the research process and technology transfer mechanisms which are included in the ten preservation problems discussed here.

It is fortunate that the timing of plans for a National Center coincide with an increase in the amount of rehabilitation work in the total construction industry. While historic buildings constitute a small portion of this work, the projects are often significant and highly visible. There is also a commonality of problems associated with the larger universe of older existing buildings. Because of these factors, the National Center has an opportunity to influence the construction industry at large. It can do this by establishing relationships, policies and initiatives which act to reverse the problems and contribute to increased research on appropriate topics. Such activities on the part of the Center would also act to reverse the isolation addressed earlier in the report. One major factor in influencing an increase in appropriate research is to improve the implementation of the total research process, as described in Figure 1. To a large degree, appropriate research is not undertaken because the system does not correctly identify the need, and translate it into responsive research requirements, (See Figure 2).
IV. CREATE A DISCIPLINARY BASE

Architectural conservation or historic preservation is not a discipline. It can best be described as a field consisting mainly of specialists within a variety of disciplines, including architecture, engineering, planning and, to a lesser extent, in the basic sciences. It is not uncommon for many of these specialists to have come into the historic preservation field after their professional training. A substantial amount of learning takes place on a learn-as-you-go basis, through reading, consultation and practice. As a general rule, there are many more structured opportunities in education for the history, theory, planning and management side of the field, than the technological side. Often the engineering, and scientific disciplines are called upon to apply their knowledge to problems in conservation without full knowledge and appreciation of the context in which their decisions will be applied.

This lack of disciplinary base is not uncommon. There are other fields, especially where the activities cross multi-disciplinary lines, where no clear discipline has emerged. Professional programs and training at the University level are slow to develop. They are also, to a large degree, market driven. Hereofore, the University community has responded to the need for technical preservation education through specialty curricula within the existing disciplinary tracks. These programs are often dependent on the interests, availability and initiative of specific individuals, rather than based on market driven decisions to produce graduates to meet specific societal needs.

The issue of creating a disciplinary base of architectural conservation is a substantive one involving national institutional issues which are difficult to influence. For many years this was an objective of the former National Conservation Advisory Council (NCAC), now the National Institute for Conservation (NIC). This organization developed and published a basic curriculum for conservation. Two pilot grant programs to experiment with the curriculum were awarded to Columbia University and the University of Florida. Any published results from these studies would be worthwhile to review. It would be expected that limited funding and activity produced commensurate results, however, substantive learning may have occurred in the process.

Establishing a disciplinary base will be difficult but it is important to insure that a professional level of education and training is provided on a consistent basis. It is also important to begin to build a base of professionals to address the growing needs of the preservation community and the needs of the owners and managers of older and historic buildings. Once a professional disciplinary base has been established, professional associations, networking and support services will follow naturally.

Opportunities will exist through a National Center's interaction with the university community to work in this direction. It should be realized however that initiatives by universities will be based on market driven decisions that there is a demand for the products, i.e. the graduates and knowledge,
generated by its programs. Large commitments of funds will be required to fully implement substantive conservation curricula. The loads associated with that may impact other educational programs, and a balancing must occur consistent with growth of the desired capability. The source of support for such activities and programs can come from a variety of sources. It should not come from a National Center except as seed money for appropriate initiatives, in the context of long range plans to establish a degree based disciplinary program. Also see Report Four on Resources.

A National Center for Preservation Technology has the opportunity to articulate the need for the disciplinary base; to collect and evaluate the evidence and experience which supports this; to articulate the need, vision and benefits for successful efforts in this directions, and to collaborate with the university community to produce results. Additional opportunities exist to establish "certification" programs to validate that professionals having completed established courses of study, meet national expectations and standards. One strategy is to foster the notion that a certain level of education is needed to be credible resource to the preservation community and to establish programs which validate that individuals have achieved that level.
V. ADOPT AND ARTICULATE A RESEARCH PROCESS

The discussion of increasing research, in section III above, addressed only the amount of research which is conducted. A more serious problem accounts for many of the specific technical problems which exist in the preservation field. In the mid-1980s the Business Roundtable defined the research process as a basic scientific method. Their report outlines the steps in a complete research process from the identification of specific problems all the way to commercial applications to address those problems. "This model which is presented as Fig. 1 is especially important to this study because it articulates a sequence of a steps which includes the performance of research and technology transfer. Since the need for technology transfer was a central issue of the 1986 OTA Report recommending a National Center for Preservation Technology, understanding the process is a vital step in correcting it.

Figure 1 displays the five basic elements in the research process. These steps are necessary to provide a process where appropriate research can be effectively applied to specific problems, and that the results of that research be applied to solve the problem, both specifically and for society at large via commercial application.

The five basic elements in the research process include:

- Identification of needs
- Development of research requirements based on the needs
- Performance of research
- Technology transfer
- Commercial applications

Each of these is a necessary step in the research process if the process is to function effectively to serve the needs of society by using science and technology to solve problems. Each step is interdependent, and problems with any step can negatively impact the results. The Building Roundtable's findings were that whole parts of the process were missing. In fact they found that three of the five parts were generally absent from the research process in the construction industry. Figure 2 shows that:

- needs were not being identified
- research requirements were not being prepared
- technology transfer was not occurring.

The situation which could be expected, if these findings were true, is one where there would be many perceived problems; products services or solutions to these problems would be inadequate; there would be substantial waste, redundancy and inefficiency in the research community. This is precisely the condition which the OTA workshops identified throughout the prehistoric and historic preservation technology areas.

The question may arise as to whether the area of historic preservation is really a part of the construction industry. The relationship cannot be denied. With few exceptions, the sources of research expertise for building materials, methods and products is the same community that owners and managers of historic properties look to for leadership. These include, but are not limited to, the National Institute of Standards and Technology; universities; building material manufacturers; private and public laboratories; the National Institute of Building Sciences, the National Science Foundation and other specialized organizations.

This flawed process is recognized by many leaders in the building related industries. The reduced effectiveness of the research process is probably an important factor in the low research activity in the building industry (see number III above). Between the focus on new product development as the primary area of research, and a flawed research process, there is little incentive to invest a portion of profits in basic research.

A National Center has a major opportunity in this area. The well documented problems with the research process make it apparent that the entire nation is impacted by a flawed process. Since the problems flow, not from the process itself, but from a failure to follow the steps or implement the process, there is an opportunity for leadership. A National Center can provide this leadership.
THE RESEARCH PROCESS

FIG. 1

IDENTIFY NEEDS → CONDUCT RESEARCH → COMMERCIAL APPLICATION

RESEARCH REQUIREMENTS → TECHNOLOGY TRANSFER
MISSING ELEMENTS IN THE CONSTRUCTION INDUSTRY

- Identification of NEEDS
- Link Between NEEDS and RESEARCH
- Link Between RESEARCH and APPLICATION
The process in Figure 1 works to solve technical problems, and the National Center can articulate that process, incorporate it into all research planning and project development and implement it as a part of all research activities or programs. The central theme of technology transfer extends naturally out of the research process, where its role is to be the technical mechanism by which research is translated to effective action, results, and products.
VI. ESTABLISH A TECHNOLOGY TRANSFER PROCESS

Technology transfer, generally referred to in the research community as T2, is one of the principle reasons for OTA recommendations to create a National Center. There is a perception that technologies exist which can be adapted and applied to preservation problems. There are also many misperceptions about what T2 is, but there is a recognition in the business and research communities that the U.S. has very poor technology transfer mechanisms.

The first step to establish a process is understanding the nature of technology. Recognizing that technology itself is independent of science or engineering, but can flow from either discipline is another important step. Defining a technology transfer process, or mechanism, to meet the T2 objectives for the National Center will be a central objective of any National Center plan.

One of the most popular misconceptions about technology transfer is that it is training. Training is not technology transfer, although training is a part of technology transfer. In R&D circles the term "technology transfer" is used to describe one of two activities. One type of technology transfer is the application of technology to a purpose other than that for which it was designed. The other type is the transfer of technology developed in the research process, from the lab into general use. In reality, there is a broad continuum of activity where technology is developed to solve problems. Often a technology or product may have multiple applications, but the use of one product for multiple applications is not a transfer of technology.

Technology transfer is a difficult task and one which is affected by many market factors such as economics, regulations, competition and timing. The U.S. in general lags behind other countries in technology transfer in engineering and construction related technology. The Construction Industry Cost Effectiveness Task Force of the Business Roundtable found that in 1983 the U.S. had "very poor technology transfer mechanisms". Little has changed since that time. The AIA report on "Creating the Human Environment" in 1970 reported that the average time for the transfer of eighteen selected products from successful research to standard practices was 17.4 years. Examples include the Critical Path Method (CPM) Scheduling, 11 years, and pre-assembled window units, 18 years. Again in June, 1987, the Office of Technology Assessment concluded that the U.S. Construction industry had:

- no national goals established
- R&D not targeted to national needs
- very low industry/Federal R&D funding
- very poor T2 programs.
The findings regarding poor technology transfer mechanisms, and extended times for the transfer of successful research into practice are discouraging and disturbing. It is noted that several other countries have lower $\text{T}_2$ times than the U.S. Japan's average of 3.4 years was less than half that of the U.S.'s 7.4 years for 123 technologies in the twenty years between 1953 and 1973.

Much of the difference in $\text{T}_2$ times occurs because of the economic and regulatory environment in which research is conducted. Environments with faster $\text{T}_2$ seem to exhibit:

- stated value for $\text{T}_2$
- government encouragement and assistance
- substantive private sector funding
- exploitation of foreign technology
- dedicated organizations to track and expedite
- tax benefits
- risk capital availability
- patent protection/royalty rewards
- relaxed regulations

Much of this is likely to be beyond the immediate control of any National Center for Preservation Technology. Awareness of the impact of these issues, and how they individually and collectively affect the transfer of technology, however, must be in the forefront of National Center $\text{T}_2$ programs.

The other type of technology transfer is more difficult to track and analyze. It may, however, offer more short-range opportunities for success. This type of $\text{T}_2$ is the transfer of technology developed for one purpose, to another purpose for which it was not developed. This is not an institutionalized activity and it occurs randomly. It occurs when there are connections between users (with needs) and producers or others knowledgeable about technology. The randomness of this process occurs because there are few structured mechanisms to promote this. Not only does the connection have to occur, but it has to occur involving two or more parties where the technological knowledge of one party must embody some concept or product which, if applied, might solve a problem or enhance the progress of the user. As unpredictable as this hypothetical encounter is, there is still the requirement that some spark of creative intuition, association or recognition must occur on the part of one or both of the parties. It is important to recognize that the creative recognition, the potential for technology transfer,
can occur on the part of any of the participants in such a connective encounter. What is critical is there has to be discussion or presentation of material which contains information to trigger the awareness.

At the point where the idea first emerges that a particular technology may have value in another field, or for a specific problem, much still has to be done to test and develop the theory. The development of the idea must take place in a way similar to the research process described in Section V above, and illustrated in Figure 1. It may even be possible to look at this type of T2 as an activity which exists separately from the research process described in Figure 1, but that when it is triggered and the opportunity is identified, it could bridge over to the research process at one of several points along the continuum. Where technologies have products or methods which are more or less applicable to another field with minimal change, the technology may enter the research process near the end, very close to the stage of operational products. In other cases where questions remain to be answered, or the applicability is less direct or immediate, the entry point into the research process is much earlier, perhaps at the stage of identifying research requirements to answer the questions.

A National Center could play a vital role as a catalyst in the process of T2. By developing and maintaining a broad base, a foundation could be established. Programmed interaction could be conducted between representatives of government, universities, and the private sector. Through a variety of communications mechanisms, the connections necessary for T2 to begin can be maintained over time. These processes of communication must extend into the professional research environment, as well as to isolated areas where activities related to design and materials technology occur.

As an active catalyst for T2, the National Center programs must consider and adopt appropriate intellectual property policies and procedures. Such policies and procedures, if they currently exist in the National Park Service, are a minor consideration in the overall operations of most programs. New and updated policies will be needed to both interface with other organizations which have more aggressive intellectual property policies, and to encourage direct development of intellectual property within the National Center. Such policies will include royalties for government personnel.
VII. INCREASE THE NUMBER OF PROFESSIONALS

There are inadequate numbers of professionals with the knowledge, skill and ability to address the needs of cultural resources in the U.S. This makes it difficult for users of technology, i.e. owners and managers of significant properties, to obtain appropriate advice and guidance. The lack of identifiable expertise is another aspect of the issue. Individual users may not know what kind of expertise is needed, or know what disciplines are appropriate to consult.

In part, this shortage emanates from the conditions of isolation and lack of a strong, identifiable disciplinary base for the field of architectural conservation. Both of these areas were discussed earlier and recommendations were made for increasing the presence and awareness of an adequate course of training and education for individuals who wish to have dedicated careers in this field. Curricula must be designed to produce a graduate with the ability to meet a particular set of needs. The present need is for a larger number of technologically trained individuals to address a full range of resource management, maintenance and protection issues. For this to happen, the market will have to reflect the need.

A self-perpetuating void has been created by circumstance over time. The lack of well defined disciplinary answers, or a disciplinary base for architectural conservation professionals has also influenced the community. In the absence of a clear disciplinary base, there is no well-established position description, or series of positions, for which regular hiring is conducted by government and industry.

The closest appropriate position title is "historical architect." This title is better defined by some organizations than by others, but even where there is a reasonable understanding of what an historical architect is, such as at NPS, it is often difficult to identify, recruit and hire individuals with appropriate qualifications.

Broad based action should be taken to increase the number of qualified professionals to support the conservation needs of older and historic buildings. It should include:

- coordination with professional organizations in related fields
- interaction with the university community to influence curricula and degree programs
- leadership in defining the needs, and levels of need
- leadership in articulating the needs, opportunities and status of related professional discipline-based education and employment
develop, not only the skill requirements of core professionals, but the total labor requirements for the full range of conservation needs, from daily maintenance to complex building diagnostics. This includes describing and relating the roles of the various positions and skill types needed.

support to local governments and other agencies with historic buildings to assist them in adopting new positions based on the professional "ladder" created.

develop and articulate relationships between practicing professionals and the research community. This should link to the area of research in architecture, to nurture centers of scientifically based architectural research.
VIII. DEVELOP AN INFORMATION MANAGEMENT STRATEGY

Much has been discussed about information dissemination over the years. Many of the problems which were addressed by OTA in 1986, as well as H.U.D. in 1978, were related to information management. Simply stated, the most desirable situation is one where appropriate information can be delivered quickly and efficiently to the point of a problem, or to a user who needs it.

Traditionally it has been impossible to achieve the ideal delivery of information because of many factors, including, but not limited to:

- lack of resources to collect and maintain a large enough information base
- lack of programs and resources to identify, collect, track, update and deliver
- lack of personnel to analyze and interpret
- lack of centralized, or established resource centers to respond to public or other information needs
- lack of awareness in the public and professional user communities about existing sources of information and expertise
- inadequate networking among information sources to foster a broader based information delivery strategy
- lack of a single coherent strategy to manage information in the historic preservation community.

The development of an effective information management strategy will require progress in overcoming all of these limitations. The resource development, and networking issues will be among the most difficult to address. Effective networking strategies which make use of existing communities, and indeed among the larger university community will be one of the most promising avenues to develop. Government agencies generally lag behind the university research community in the establishment and utilization of nationwide computer communication linkages. These linkages permit both electronic mail and data file transfer. Utilization of these established networks can increase efficiency and eliminate redundancy, while accelerating improved communications.
IX. ESTABLISH AN ECONOMIC STRATEGY

Economics drives much of the activity in society. This is true for research, educational and technology transfer activities. It is also true for cultural resource activity and the architecture and building construction industries. This is not necessarily a simple or direct process, e.g. many significant architectural works are preserved or restored at great expense with no direct financial return. In these cases, decisions have been made that the value of the properties warrants the expenditure of resources to protect it. Clearly economics must not be thought of as a purely financially driven process, but instead as a process where values are placed on many aspects of society. Resources are allocated based on those values, the priorities which emerge between values, and the availability of resources.

The tax incentives programs are an excellent example of how the priorities placed on cultural resource values were escalated and given economic stature, which resulted in increased preservation activity. This process was not driven solely by recognition of the value of cultural resource values, but by the timely juxtaposition of economic concerns for cities and urban areas; lack of investment in the infrastructure and another issues which led to the use of tax policy to influence construction, and re-investment in the cities.

As circumstances change, public policy like the tax incentive change, but there are other value based economic issues which should be articulated to support desired activity in historic preservation. A strategy is needed to identify these and articulate them in a manner which positively influences the policies and activities of those who can provide information delivery, research and technology transfer affecting cultural resources. Fortunately there has been substantive research and publication on the economic benefits of preservation since the early 1970s. This can be used to raise awareness.

The development of an effective economic strategy will relate closely to recommended efforts to reduce the isolation of cultural resources issues, and to information management strategies. A thorough review and compilation should be performed using all the economic impacts of the use, rehabilitation and preservation of older and historic buildings. A strategy should be crafted which articulates the impact, values and costs of maintaining the existing building stock. The strategy should be developed not as an isolated program of the National Center, but as a collaborative effort with other organizations whose constituency and influence represent and affect broad sections of the population. This collaborative strategy should include organizations like:

- the AIA to influence the design community
- universities and professional associations to influence education
- organizations in the building industry
publications serving the planning, design community

municipal government associations.
X. Establish a Positive Organizational Focus

The needs and objectives outlined up to this point are specific and interrelated ones. There is one all-encompassing need which transcends the specific ones. This is the need to establish a positive organizational focus for the efforts to address preservation technology problems and issues. This focus should be developed in such a way as to create a positive organizational climate extending out to the other organizations with which the Center collaborates.

As the basic organizational management plan for the National Center is developed, the mission statement should address not only the Center's basic charter or mission, but that the mission should be accomplished through developing external relationships and associations with other organizations. These organizations should include any which have a mission which affects cultural resources. This would include most of those organizations previously referred to in other sections, such as government, university, private and non-profit organizations which address science, engineering, architecture, planning, public policy, economics, etc.

Creating a positive organizational climate means establishing relationships with organizations which function in a spirit of partnership, not of competition. The task is too great to be undertaken by any single organization, even if resources permitted. The science mission and outreach of scores of organizations throughout the country could be enhanced through interaction with a National Center for Preservation Technology. The increased awareness of how their own missions impact cultural resources, should result in a higher value for cultural resources and the existing built environment. The objective of the organizational network should be to stimulate an immediate increase in the awareness of cultural resource values. The increase should be transferred to the constituencies of the partnering organizations via established mechanisms such as conferences and journals.

Collaborative relationships must be carefully designed and nurtured. Direct financial resources are not always required, but there must be perceived value to associations with a partner such as the National Center. These benefits could be access to better information; technical resources for conferences and meetings; extended influence; credibility; the potential for new or joint programs; an enriched mission; the opportunity to extend each organizations' influence, and other benefits. To succeed, efforts to build an organizational "umbrella" to promote National Center objectives must be practical, non-threatening and progressive, i.e. it must identify basic linkages which lead to practical benefits, and build upon those gradually over time. Expansive agendas without the financial and human resources to implement them, will result in frustration and inaction. Careful nurturing of professional relationships with practical, mutually beneficial objectives will establish a strong foundation for organizational relationships.

The following list is a summary of some of the organizational problems which exist as barriers to collaborative activity. This section of the report identifies the types of needs/problems. They will
have the most implications for the success or failure of an effort to create a successful National Center.
ORGANIZATIONAL NEEDS/PROBLEMS SUMMARY:

Needs and problems are inseparable as the need is to solve the problems. In the planning and implementation of a National Center, planners must address the following:

Organizational Barriers

- different organizational missions
- different priorities
- conflicting administrative/political objectives
- lack of a framework for organization collaboration

Cultural Barriers

- false perceptions
- territoriality
- suspicion
- stereotyping

Strategic Barriers

- fragmentation of participants
- lack of a research methodology/process
- lack of a scientific basis for architecture
- lack of a research tradition in the building industry
- lack of flexible resources

It is important to recognize that these factors constantly affect relationships between organizations and institutions. Because of the number of relevant and interested organizations which will have an interest in a formal, National Center, it will be important to operate with an "up front" awareness of the "corporate cultures" of participating organizations, as well as their specific technical and financial roles. The process and the ultimate program which becomes the National Center will be enriched through the positive orchestration of contributing participants. Creating a management structure, organizational climate and division of responsibilities will be one of the major challenges of the planning effort.

Many organizations will be interested in the National Center initiative, and many may participate in programs and projects. Each organization is likely to have its own mission; even among organizations of the same type, such as universities, there may be dramatically different organizational goals which affect motivation and performance. Similar organizations may differ significantly due to leadership,
age, priorities, size, range of programs, technical capabilities, external influence, personnel and financial factors. Within any organization, preservation technology and related issues may have significantly different relevance to the organization. For example, many architectural firms have individuals and, in some cases, departments which provide conservation services, but almost identical capabilities could be found in an engineering office, a large materials laboratory, or a dedicated private profit or not-for-profit company. Within a university, historic preservation architects or programs may exist within different academic or research units, or these may be technical experts in the basic scientific or engineering disciplines who do or could undertake research and the development, application or transfer of technology for cultural resource management purposes.

In every case, as diverse entities collaborate, the prospect of different perceptions, missions and levels of skill and knowledge can influence the result. The history of the development and application of technology to historic preservation technical problems is replete with examples of failures and damage due to inadequate communication between participants who weren't "coming from" the same perspective on the problem.

The National Center can, by developing integrated solutions to the range of problems addressed in this report, make progress toward a more responsive professional community where resources are effectively applied, and efficient, effective solutions become available for the technological problems.
EXHIBIT 1-A

EXAMPLES OF TECHNICAL PROBLEMS IDENTIFIED BY NPS

- Much work has been done on specific technical problems. Attached is a summary of problems identified by NPS, as one example. Report One focuses on problems existing at the institutional level, which lead to specific problems such as these going unaddressed.
PRELIMINARY LIST OF RESEARCH PROGRAM NEEDS RELATED TO HISTORIC STRUCTURES, ARCHEOLOGICAL SITES AND MUSEUM OBJECTS

including

Laboratory and Field Research

and

Technology Transfer

These research projects encompass researches that should be accomplished at several levels, including: research done in cooperation with private industry, national laboratories, cooperative park study units, other university research, and research accomplished under contract.

Cultural Resources
National Park Service
Washington, D.C.

September 1988
LONG RANGE PRESERVATION RESEARCH PROGRAM

1. CONDUCT LABORATORY AND FIELD RESEARCH ON THE MECHANISMS OF DETERIORATION

Premises: All materials will deteriorate; all systems will fail.

Goal: To Better Manage Deterioration of Historic Structures

Products: Results of the Laboratory and Field Research will consist of a compendium of research reports on the chemical, physical, and mechanical processes of deterioration of specific building materials, and the interaction of materials and systems under a variety of architectural and environmental conditions.

Results of this Research will constitute scientific knowledge about materials and systems and can be used to develop a Building Diagnostics System.

Research on the Breakdown of Materials will include the Laboratory Research Topics listed below.

Moisture in 3 forms
  --solid moisture
    Frost action on poorly burnt brick
    Rust -- expansive forces
  --liquid moisture
    Through moisture migration -- dissolution
    Dissolved salts, sulphates and nitrates
    Galvanic action -- corrosion of metals by wood
    Rust -- expansive forces
    Wind erosion by evaporation
  --gaseous moisture
    Salts in solution moving through or over materials
    Rust -- expansive forces

Inherent Weaknesses
  Inherently poor materials

Natural Agents of Deterioration
  Ultraviolet light on untreated wood
  Insects/organisms -- entomological
  Biological action -- plant materials (acid in roots)
    varies with climate, molds
  Aging -- embrittlement

Human Agents of Deterioration
  Human erosion

LHN:12/2/86
Research on the Breakdown of Building Systems  Examples of Laboratory and Field Research are listed below.

Moisture in 3 forms
--solid moisture
  Ice dams in winter -- valley

--liquid moisture
  Downspouts (especially in walls) plugged, saturating walls
  Weathering surfaces not protected (flashings has failed)
  Rising damp

--gaseous moisture
  Condensation on or in wall surfaces -- sweat, mold
  Lack of (or reduction) of breathability of walls

Location
  Excavations
  Vibration (pile driving, external internal)
  Adjacent construction

Geology

Soils
  Soil subsidence
  Changes to grade/vegetation/watering practice/sprinkler systems
  Changes of water table -- moisture in soil

Climate

Inherent Weaknesses
  Bad design details
  Poor workmanship
  Inappropriate materials used in context with each other
    too strong mortar
    steel and marble
  Movement of parts of system
  Connection failure
  Cavity wall construction

Natural Agents of Deterioration
  Botanical effects
  Thermal movement of wall or feature or whole building
  Differential of pressures inside/outside
    west side vs. north side re exposure
  Thermal shock
  Damage by birds or animals

Human Agents of Deterioration
  Lack of maintenance or inappropriate maintenance
    Dust as in attics, skylights
  Vandalism

LHN:12/2/86
2. DEVELOP PROGRAMS TO MONITOR THE PERFORMANCE OF "NEW" AND HISTORIC BUILDINGS

Premises: There is a rapidly growing interest in building performance (especially "new" buildings) due to:

--some spectacular building failures (forensic issues of liability),
--compliance with local laws regarding safety,
--the building state-of-the-art is changing so fast, and
--many recent buildings (ca. 1960's and later) are developing some alarming and unforeseen problems.

It is clear that modern building technologists could learn from historic building performance, and that historic building preservationists could benefit from the studies into certain aspects of building "performance," the interaction of materials and systems.

Goal: To Better Manage Deterioration of Historic Structures

Information Sharing

--encourage and foster a formal dialogue and much informal "networking" between the various vested interests,

--create a "forum" (or modify some existing forums) for an exchange of research, knowledge and experience, as to the successes and failures that will add to our mutual understanding of building performance, and thus help each other in our quest to "manage" such building performance.

Developing New Information

--develop cooperative agreements with organizations that are involved with "building research," or "building performance" or "building diagnostics."

--develop an objective methodology for monitoring the efficacy of selected treatments on selected buildings over an extended period of time it will provide valuable information about performance. This information may be useful to modern building technologists as well as assuring long term good decisionmaking for cultural resources. The Census of Treated Historic Masonry Buildings is one program that can provide information about the success (or failure) of masonry treatments that would be useful to all persons interested in building "performance."

LHN: 12/2/86
3. DEVELOP A SCIENTIFICALLY BASED BUILDING DIAGNOSTICS SYSTEM

Growing out of the researches on Building Performance would be a Building Diagnostics System, which would be a scientific basis for evaluating "symptoms" and determining causes of problems identified during the Condition Assessment phase of inspection. The Building Diagnostics System could be a matrix-like manual that would cross reference the interactiveness of materials, environment, and systems, that could be readily used in a "checklist" format to evaluate and diagnose complex preservation problems not otherwise understood. This Diagnostics System would not take the place of the Condition Assessment Inspection Report, but it would enable the Inspector to utilize a much higher state-of-the-art in the assessment of very complex problems, especially where they involve combinations of interactive materials in environmental historic/eco systems.

Such a system could take one of several formats (such as a checklist, or a computer "expert" program), and could address the following:

--all complex problems of materials deterioration and systems failure
--effects of intervention upon historic character
--safety and environmental concerns.
LONG RANGE RESEARCH NEEDS for PRESERVATION of ARCHAEOLOGICAL SITES  

I. Field Research
   A. Identification and Evaluation (to set priorities for preservation and cost-effective programs)
      1. Resource inventories and site/district assessments
      2. Historic contexts development or regional research designs
      3. Information exchange
   B. Site Preservation
      1. Stabilization techniques
         a. To prevent physical and chemical damage
            (1) Short-term
            (2) Long-term
         b. To monitor condition
      2. Site protection techniques (what are they, how do they work, what are well designed protection programs?)
         a. Effectiveness of techniques
         b. Public education as an element of law enforcement
   C. Technology Transfer
      1. Site discovery techniques: chemical, remote sensing, other instruments, manual subsurface techniques
      2. Site discovery and resource estimation methods: statistical sampling at the regional, site, and intrasite spatial scales
      3. Resource inventory data management
         a. Retrieval of site information according to preservation priorities
         b. Integration of site inventories with other data collection systems
            (1) GIS
            (2) Previously completed agency/project activities
      4. Field conservation of artifacts and materials

II. Laboratory Research
   A. Identification and Evaluation (to set priorities using informed collections analyses and interpretations)
      1. Wet site materials (research questions into cultural change at sites with high degrees of organic preservation)
      2. Human remains (research questions in comparative physical anthropology, biochemistry, microbiology, genetics, paleopathology)
      3. Archeometry (research questions in traditionally large archeological collections using ceramic analyses, obsidian hydration, nuclear magnetic resonance, trace element analyses)
      4. Collections research techniques to improve artifact measurement and sampling (optical scanning of artifacts to record quantitative data)
   B. Preservation of Archeological Materials and Data
      1. Archeological collections curation
         a. Status of Federal archeological collections (what is being preserved, to what purpose, how often are they used, what are the components, where are they located?)
         b. Curation costs (what are modern facilities construction costs, accession costs, collections and records management costs, conservation costs?)
      2. Archeological data management
         a. National Archeological Database (reports, projects, and
archaeological databases portions implementation through records creation and update and data transfer to users

C. Technology Transfer

1. Artifact conservation (research on the impact of artificial environments)
   a. To arrest deterioration
   b. To conserve materials for specific types of future analyses
      (1) Non-invasive analyses (typological comparisons, statistical analyses, flotation, soil chemistry)
      (2) Destructive analyses (chromatography, microbiology, biochemistry, amino acid racemization dating)

RCW/JLRbrief
rcw/fpm/22sept88
Research Needs for Conservation of Museum Objects

Treatment of Objects

Research is needed to quantify the effect of interventive treatments on objects, especially objects made of organic materials, over a long period of time. Scientific data on the long-term effects of materials and methods of application used in treating many types of objects is not available. More information is needed by conservators to insure that treatments applied to objects will not cause unexpected deterioration.

Research is needed to determine the aging characteristics of materials used in interventive treatments.

Many materials used in conservation pose health and safety risks to the user. Research is needed to produce materials and techniques that are safer to the user and still appropriate for the preservation of the object.

Research is needed to develop spin-off applications from other disciplines (e.g., computer technology, space sciences and technology) to the treatment of objects.

Curatorial Materials and Equipment

Ongoing research capability is needed to test the suitability and effectiveness of new materials (e.g., containers, foams, plastics, preservatives, waxes, polishes) that may be used in the proper storage, exhibit, and packing of objects.

Research is needed to determine what materials and techniques are most effective in protecting objects from vibration and environmental changes during transporation.

Environment

Historic structures and objects have different environmental needs. Environmental control standards (e.g., relative humidity and temperature) for objects very often differ from the needs of a structure. HVAC systems are not always effective or appropriate. Research is needed to develop alternative methods for maintaining an acceptable environment for objects without risking the deterioration of the structure housing the objects.
EXAMPLES OF TECHNICAL PROBLEMS IDENTIFIED BY AN SHPO

State Historic Preservation Offices and other groups monitor problems within their program areas. A National Center will have access to this type of data from all the States. A typical example of technical needs prepared by the Georgia SHPO is attached as an example. Most of the problems would also apply to any States.
PLANNING/TECHNICAL ASSISTANCE ISSUES:

Resolving issues other than funding assistance would benefit preservation in Georgia as well.

1. Rapid growth in Metro Atlanta, North Georgia and Coastal areas.

2. Including preservation components in land use planning and growth management programs.

3. Growth along developmental highways and outer perimeter highway.

4. Depressed agricultural economy in South Georgia.

5. Rural preservation/conservation—analyzing techniques and developing alliances and incentives for farms, buildings, homesteads, bridges, grist mills, landscapes, and small towns and businesses that rely on the agricultural economy.

6. Development of new water systems due to last year's drought and impacts on archaeological sites.

7. Abandonment of railroad lines and supporting facilities, such as depots and warehouses.

8. Minority preservation—identifying resources significant to black history, encouraging a preservation ethic among the black community, developing preservation techniques for the special needs of historic black resources.

9. Addressing the expanding interest of local governments in preservation ordinances, downtown revitalization, and community development/appearance.

10. Tourism and visitation to historic sites, preserved neighborhoods and commercial districts.

11. Heritage education—curriculum development and special projects for grades kindergarten through twelve; encouraging a preservation ethic among the young.

12. Encouraging the identification, interpretation and protection of archaeological sites; overcoming looting and vandalism problems.

13. Providing low- and mid-income housing without displacement.

14. Reuse of abandoned buildings such as schools, courthouses, jails, movie theaters, gas stations.

15. Rehabilitation/expansion of state and federal public facilities, such as post offices, prisons,
mental health centers.

16. Researching solutions to technical preservation problems; stucco, tabby, etc.
REPORT TWO: PRESERVATION TECHNOLOGY PRODUCERS
REPORT TWO

PRESEvation TECHNOLOGY PRODUCERS

Technology for use in historic preservation applications is produced by several groups, however virtually none of these is a dedicated developer of preservation technology. Each sector is, instead conducting research and developing technological solutions for other problems such as new building products, films and coatings, structural analysis, remote sensing, and thousands of others. For purposes of understanding what key resources are available to engage in expanded research, it will be useful to identify resources with the capability of R&D, and subsequent technology transfer, which can be directed to, or applied to, historic structure preservation. The major groups which fall into this category include:

- universities

private research labs

building products manufacturers

government research labs.

For purposes of this report, resources will be limited to institutional sources with an established record of R&D. Any individual professional, or for that matter, non-professional may have the creative ability to invent something to solve a problem or increase productivity. Such actions are technology production, but they are random, or unplanned events. They do not represent the basis for programmatic action. Exhibits associated with this report will be limited to organizations. In general, this report does not identify technical service providers as preservation technology producers unless they have independent capability to perform R&D.

The identification of preservation technology producers is a complicated undertaking. The first step must be the definition of preservation technology producers. The strict definition would be an entity which uses scientific or engineering principles to produce technology for the identification, analysis, conservation or rehabilitation/restoration of historically or architecturally significant structures. Technology, as was discussed in Report One, has many meanings from these as vague as "applied science" to somewhat more precise meanings such as "the use of tools, machines, materials, techniques and sources of power to make work more productive". While technology goes back in history to include the development of utensils, tools, and weapons, we generally think of ourselves as living in the age of technology from the time of the Industrial Revolution, about 200 years ago. Presently, technological developments in many areas become designated as a particular kind of technology.
Examples include industrial technology; military technology; agricultural technology; chemical technology; construction technology; space technology; computer technology, and many others, including "preservation technology".

UNIVERSITY BASED R&D

Scientific and engineering disciplines are often engaged in the development of technology through research, see the discussion of research methods in Report One, including Figure 1. Much of the basic research takes place with the science and engineering programs of the universities across the country. Programs vary in size and prominence from one university to another. The National Science Foundation maintains lists and rankings of what are considered "major research universities". There is great competition between universities for research funding and also for research talent and resources. Often the universities follow the "market" as it is defined by national policy and resource allocation for programs needed to address one problem or another. Other times the intellectual resources of the universities are applied to analysis of conditions and for forecasting the future needs. These forecasts, once confirmed by independent analysis or supporting forecasts, can affect policies and programs. This, in turn, affects the universities' research programs. In this fluid and complex process, new programs and priorities arise and others recede. The research community is in a constant state of change within the context of large ongoing research programs tied to national, and increasingly inter-national policies, priorities and needs. In this environment, "preservation technology" occupies an almost non-existent status. The term "preservation technology" will not likely be found in the major research agendas of any science and technology organization. Today's major themes include such issues as: telecommunications; computer technology; bio-engineering; manufacturing and public policy, to cite a few. Even the sub-topics, such as construction research have had low priority until recently, and preservation technology is a sub-area of construction related research.

The role and status of preservation technology in the nation's research and development (R&D) communities will have a direct bearing on the amount of research and technology transfer which occurs. The fact that preservation technology has not been a national priority, has directly led to the lack of technology transfer which, in part, precipitated the 1986 OTA report recommending a National Center to address these issues. Both the OTA report and the subsequent proposals for a National Center have raised the visibility of historic preservation needs. As visibility is raised through national policy and government programs such as the National Center in the Department of Interior, and Legacy in the Department of Defense, the research community will respond with interest, proposals and increased research in the important area. There is already evidence of research units with no history of research in preservation technology issues, taking initiative to enter the field. As this occurs, it will become critical that the sponsors of preservation technology research be aware of the dynamics of the research process, and be able to construct sound statements of research requirements to guide the R&D process, (see Report One, section V, "Regarding Research Strategy").
The scientific and engineering programs of universities include a wide variety of programs. Many of these programs have implications for architectural conservation. Generally there are engineering sub-disciplines in textiles, ceramics, electrical, mechanical and civil. In the so called "hard sciences" there are programs in geology, physics, biology, chemistry and others where the technical areas, theory and phenomena are related to historic preservation issues. From time to time there are engineers and scientists who emerge from the hard sciences who develop an interest in the problems and applications associated with historic building or structural systems, components and materials. These are important expert resources and should be nurtured, but they do not emerge because of planned programs to produce engineers and scientists to work in the historic preservation field, nor do they emerge because historic preservation is incorporated into their professional degree curriculum, see Report One, section IV on fostering disciplinary base and section VII on increasing the number of professionals in the field.

Among universities there are two groups in particular which, because of their closer identification with architectural issues, represent resources which would have a latent or active interest in direct research leading to technology transfer and applications in historic preservation. Both of these groups will need to be nurtured and collaborated with to develop an effective national R&D program. The two groups are:

- architectural research schools (See Exhibit 2A)
- organized research centers (See Exhibit 2B)

The identification of these two does not imply that there are not many other schools, departments and programs in universities which could contribute significantly to historic preservation technology development. A complete list of all accredited architectural schools is attached as Exhibit 4A in Report Four addressing "resources". These two however, represent sources which work in closely related areas, or already have historic preservation missions and experienced faculty and staff.

An Exhibit 2A is attached to this report to list architectural schools with a commitment to research, expressed by their membership in the Architectural Research Centers Consortium (ARCC). Even though relatively few of these schools have strong preservation R&D programs, this can be influenced by the leadership, and collaborative activities of the National Center.

The second Exhibit 2B is a compilation of Organized Research Centers (ORC) which have a stated interest and capability in architectural conservation. There is an expanded discussion of the OROs in Report Four, on resources.

NON-UNIVERSITY TECHNOLOGY PRODUCERS

Outside the university community, sources with the R&D capabilities to develop technology, and
activities related to historic preservation include:

building products manufacturers (See Exhibit 2D)

private research and testing labs. (See Exhibit 2C)

In the private sector, it should be remembered that activity is profit driven. Service by the labs or research in the building products industry, is provided in return for a fee, or in order to develop a product/application which has commercial potential for marketing, again to generate a profit.

Both groups have a potentially important role in supporting the mission of a National Center, hopefully in partnership or consortium which reflect the potential contribution of each participant. Research and testing labs are often geared to solving specific problems. The degree to which each lab implements the complete research process described in Report One, Figure 1, depends on the management and orientation of each laboratory. Private building products manufacturers do some R&D—but it is almost universally directed toward product improvement or the development of marketable new products. Often such work is performed under non-disclosure conditions to prevent the leakage of information to competing companies who could use the data for market advantage. Because of this, it is difficult to identify and track the activities of private research institutions.

Attached to this report as Exhibit 2C is a list of laboratories with analytical and R&D capabilities, and expressed interest or experience with historic preservation. A list of building materials manufacturers would be too extensive to include with this report, however a short list of such manufacturers is included as Exhibit 2D to illustrate typical types of companies which potentially have R&D capabilities which could be directed toward historic preservation problems, if properly engaged in a dialogue of national needs, issues and policies.
Technology is developed through research. Architectural schools in the U.S. with research programs have established the Architectural Research Center's Consortium (ARCC). Members of ARCC should be considered potential producers of technology, although most do not have historic preservation programs at this time.
American Inst of Architects

Richard W. Hobbs, FAIA, Gp. V.P.
American Institute of Architects
Professional Excellence Group
1735 New York Avenue, NW
Washington, DC 20006

Arizona State University

John Meunier, Dean
School of Architecture
Arizona State University
Tempe, AZ 85287

602-965-3216
FAX 602-965-1594

Arizona, University of

Robert Hershberger, Dean
College of Architecture
University of Arizona
Tucson, AZ 85721

602-621-6751
FAX 602-621-8700

Ball State University

Jeffrey L. Hall, Assoc. Dean
College of Architecture & Planning
Ball State University
Muncie, IN 47306

317-285-5859
Architectural Research Centers Consortium, Inc.
Membership List - December 1, 1991

Cal. Poly. State Univ.

Day Ding, Prof.
School of Architecture & Environmental Design
California Polytechnic State University
San Luis Obispo, CA 93407

805-756-1311
FAX 805-756-1536
BITNET DA 028 @ CALPOLY

California, UCLA

Samuel Aroni, Prof.
Graduate School of Architecture and Urban Planning
University of California
Los Angeles, CA 90024

213-825-7430
FAX 213-206-5566
BITNET IAQ2SA1 @ UCLAMVS

Florida, University of

Richard H. Schneider, Prof.
College of Architecture
331 Arch.
University of Florida
Gainesville, FL 32611

904-392-4836
FAX 904-392-0221
Architectural Research Centers Consortium, Inc.
Membership List - December 1, 1991

Georgia Inst. of Tech.

John Meyers, Asst. Dean
College of Architecture
Georgia Institute of Technology
Atlanta, GA 30332

404-894-3390
FAX 404-894-3874

Howard University

Victor C. W. Dzidzienyo, Chairman
Department of Architecture
Howard University
2366 6th Street, NW
Washington, DC 20059

202-806-7424
FAX 202-462-2158

Illinois, University of

Carolyn Dry, Prof.
Architectural Research Center
University of Illinois
24 East Green Street
Champaign, IL 61820

217-333-5871
FAX 217-244-2900
Iowa State University

Mary Kihl, Assoc. Dir.
Design Research Institute
College of Design
Iowa State University
Ames, IA 50011

515-294-7427
FAX 515-294-0907
BITNET DS MRK @ ISU MUS

Kansas, University of

W. Max Lucas, Dean
School of Architecture & Urban Design
206 Marvin Hall
University of Kansas
Lawrence, KS 66045

913-864-4281

Manitoba, University of

Denis Jesson
Faculty of Architecture
University of Manitoba
Winnipeg, Manitoba
CANADA R3T 2N2

204-474-6417

FAX 204-261-7386
Massachusetts Inst. Tech.
Leon Glicksman, Dir.
Massachusetts Institute of Technology
Rm. 3-433
77 Massachusetts Avenue
Cambridge, MA 02139
617-253-2233
FAX 617-253-8993
617-253-1876

Michigan, The Univ. of
Colin Clipson, Dir.
Architecture & Planning Research Laboratory
College of Architecture & Urban Planning
The University of Michigan
Ann Arbor, MI 48109
313-764-1340
FAX 313-763-2322

Minnesota, University of
Julia W. Robinson, Prof.
Dept. of Architecture & L.A.
110 Architecture, 89 Church Street
University of Minnesota
Minneapolis, MN 55455
612-624-7866
Nebraska, University of

William Borner, Prof.
Room 246 Architecture Hall
College of Architecture
University of Nebraska
Lincoln, NE 68588-0107

402-472-3592

New Jersey Inst. of Tech.

Sandy Greenfield, Prof.
School of Architecture
New Jersey Institute of Technology
Newark, NJ 07102

201-596-3079
FAX 201-643-3934
BITNET SR9 0651 @ ADMIN.1.NSIT.EDU

New York, State Univ. of

Yehuda Kalay, Prof.
School of Architecture & Environmental Design
State University of New York
3435 Main Street
Buffalo, NY 14214

716-831-3483
Architectural Research Centers Consortium, Inc.
Membership List - December 1, 1991

Oregon, University of

G. Z. Brown, Prof.
Architecture Department
School of Architecture & Allied Arts
University of Oregon
Eugene, OR 97403

503-346-5647
FAX 503-686-3127

Rensselaer Polytechnic

David S. Haviland, Prof.
School of Architecture
Rensselaer Polytechnic Institute
Troy, NY 12180-3590

518-276-8734
FAX 518-276-2999

Syracuse University

Bruce J. Abbey, Dean
School of Architecture
103 Slocum Hall
Syracuse University
Syracuse, NY 13244-1250
Texas A & M University
Larry O. Degelman, Prof.
College of Architecture
Texas A & M University
College Station, TX 77843
409-845-7852
FAX 409-845-4491

V.P.I. & State Univ.
Robert Schubert, Prof.
Virginia Polytechnic Institute & St. U.
201 Cowgill Hall
Blacksburg, VA 24061
703-231-7736
FAX 703-231-9938
Architectural Research Centers Consortium, Inc.
Membership List - December 1, 1991

Washington University

Dave Van Bakergem, Prof.
Urban Res. & Design Center
School of Architecture
Washington University
St. Louis, MO 63130
314-935-6253

Wisconsin, University of

Uriel Cohen, Director
Ctr. Architecture/Urban Plng. Research
P.O. Box 413
University of Wisconsin
Milwaukee, WI 53201
414-229-6165
FAX 414-229-6976

James L. Haecker
ARCC Executive Director
10008 Morningside Court
Fairfax, VA 22030
703-691-2551
FAX 703-305-4675
EXHIBIT 2-B

ORGANIZED RESEARCH UNITS

Organized Research Units (ORU's) are formally established research centers typically, but not necessarily, in universities. The attached list contains ORU's in the U.S. which have indicated that historic preservation activities are part of their interests and capabilities.
UNIVERSITY OF ARIZONA
ARCHITECTURE RESEARCH LABORATORY
COLLEGE OF ARCHITECTURE
TUCSON, AZ 85721

FRED S. MATTER, DIRECTOR
602/621-6751

Research activities and fields include historic preservation of buildings, desert architecture, energy, water conservation, and modeling and simulation.

UNIVERSITY OF FLORIDA
CENTER FOR TROPICAL AND SUBTROPICAL ARCHITECTURE PLANNING AND CONSTRUCTION
336 WEIL HALL
GAINESVILLE, FL 32611

MARK T. JAROSZEWIC, DIRECTOR
904/392-0226

Research activities and fields include inventory and preservation of the Caribbean architectural heritage, design, building materials and construction of tropical architecture.
UNIVERSITY OF FLORIDA  
RESEARCH AND EDUCATIONAL CENTER FOR ARCHITECTURAL PRESERVATION  
COLLEGE OF ARCHITECTURE  
#331 ARCH BUILDING  
GAINESVILLE, FL 32611  

SUSAN TATE, DIRECTOR  
904/392-7003  
904/392-7266 FAX  

Research activities and fields include architectural preservation and conservation in Nantucket, MA, Florida and the Caribbean, (see previous entry), and secondary education programs in preservation.

GEORGIA INSTITUTE OF TECHNOLOGY  
CENTER FOR ARCHITECTURAL CONSERVATION  
245 FOURTH STREET, N.W.  
ATLANTA, GA 30332-0155  

JOHN H. MYERS, DIRECTOR  
404/894-3390  
404/894-3874 FAX  

Research activities and fields include building diagnostics and computer programs for condition assessment and monitoring.
LOUISIANA STATE UNIVERSITY
COMPUTER AIDED DESIGN AND GEOGRAPHIC
INFORMATION SYSTEMS LABORATORY
ROOM 216, COLLEGE OF DESIGN
BATON ROUGE, LA 70803

JACK N. HAYNES, DIRECTOR
504/388-8816

Research activities and fields include historic preservation, energy conservation, daylighting, building standards and facility management.

UNIVERSITY OF MISSOURI - ST. LOUIS
ARCHAEOLOGICAL SURVEY
BUILDING 32
8001 NATURAL BRIDGE ROAD
ST. LOUIS, MO 63121

JOSEPH M. NIXON, DIRECTOR
314/553-5208

Research activities and fields include cultural resource management in architecture, archaeology and history.
MISSISSIPPI STATE UNIVERSITY
CENTER FOR SMALL TOWN RESEARCH AND DESIGN
P. O. BOX AQ
MISSISSIPPI STATE, MS 39762

GEORGE W. PARSONS, DIRECTOR
601/325-2207

Research activities and fields include historic architecture evaluation, affordable housing, graphic design, ecological design and zoning strategies.

UNIVERSITY OF NEVADA - RENO
HISTORIC PRESERVATION PROGRAM
501 BB
RENO, NV 89557

DON D. FOWLER, DIRECTOR
702/784-6851

Research activities and fields include inventory and detailed studies of historic buildings, districts and ranches in the Great Basin and the American West, studies historic and prehistoric archaeological sites.
UNIVERSITY OF PENNSYLVANIA
CENTER FOR ENVIRONMENTAL DESIGN AND PLANNING
103 MYERSON HALL/6311
PHILADELPHIA, PA 19104

WILLIAM H. BRAHAM, DIRECTOR
215/898-8799
215/898-9215 FAX

Research activities and fields include historic preservation, building technology, regional planning, landscape architecture and computer analysis.

TEXAS A&M UNIVERSITY
CENTER FOR HISTORIC RESOURCES
COLLEGE OF ARCHITECTURE
COLLEGE STATION, TX 77843-3137

ROGER S. ULRICH, ADMINISTRATOR
409/845-1221
409/845-4491 FAX

Research activities and fields include historic preservation.
UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR THE STUDY OF AMERICAN ARCHITECTURE
SCHOOL OF ARCHITECTURE
AUSTIN, TX 78712

LAWRENCE F. SPECK, DIRECTOR
512/471-1922

Research activities and fields include historic preservation, work of 20th Century American architects, new regionalism, and placemaking in American cities.

UNIVERSITY OF TEXAS AT AUSTIN
GRADUATE PROGRAM IN ARCHITECTURE
AUSTIN, TX 78712

TERRY D. KAHN, DIRECTOR
512/471-8135

Research activities and fields include historic preservation, energy studies and design.
KENNETH C. REID, DIRECTOR
509/335-6681

Research activities and fields include pre-history, ethnohistory, history, historic architecture, paleoenvironments and cultural anthropology of the Pacific Northwest.

The Center for Architectural Conservation maintains a database on laboratories and testing facilities with historic preservation experience. This exhibit includes a three-page short list, followed by dossiers on 18 University Research Laboratories. While some of the 120 listed confine themselves to testing, they should all be considered technology producers due to their experience and expertise.
LABORATORIES Short List
*****************************************************************************
ADCO Products, Inc.
Alpena Community College
Ambric Testing & Engineering Associates, Inc.
Analytical Process Laboratories, Inc.
Analytical/Environmental Laboratory
Architectural Terra Cotta and Tile, Ltd.
Armstrong World Industries
Arnold Greene Testing Laboratories
Arnold R. Kline/Professional Testing Laboratory
Artech Corporation
Arthur D. Little, Inc.
Austin Testing Engineers, Inc.
Boston Valley Pottery, Inc.
Bowser-Morner, Inc.
Briggs Associates, Inc.
Buffalo Testing Laboratories, Inc.
CTL Engineering, Inc.
Carleton Laboratory, Columbia University
Center for Preservation Research
City Testing & Research Laboratories, Inc.
Clemson University
College of Ceramics-Alfred University
Colonial Williamsburg Foundation
Commercial Testing Company
Construction Research Laboratory, Inc.
Construction Technology Laboratories, Inc. (CTL)
Copoly Cement Co.
Cornell University
Corps of Engineers/Department of the Army
Crippen Laboratories, Inc.
Dallas Laboratories, Inc.
Delta Testing and Inspection, Inc.
Dendrochronology, Inc.
Dixon & Associates, Inc.
Domtar Research Center
Dunn Laboratories, Inc.
E.L. Conwell & Co.
Edison Welding Institute
Electron-Microscopy Service Laboratories, Inc.
Electron-Microscopy Service Laboratories-Atlanta
Electron-Microscopy Service Laboratories-Bedford
Electron-Microscopy Service Laboratories-Piscataway
Erlin, Hime Associates
Fogg Art Museum
Forest Products Laboratory
Forestry Sciences Laboratory
Franklin Analytical Laboratories
Franklin Research Center
Furhoff, Robert A., Restoration of Interiors
Gano Chance Research Center
Georgia Institute of Technology
Gerald B. Curtis Associates
Gulf Coast Testing Laboratory, Inc.
H. R. Trechsel Associates
Hauser Laboratories
Historic Paint Research
ICCROM
LABORATORIES Short List

 Illinois Institute of Technology- Research Inst.
 Law Engineering Testing Company
 MEI-Charlton, Inc.
 ManLabs, Inc.
 McCrone Associates, Inc.
 McCrone Environmental Services-Newport Beach
 McCrone Environmental Services-Norcross
 McCrone Environmental Services-Westmont
 Micrographics
 Midwest Testing Laboratories, Inc.
 Mobile Chemical
 Munsell Color Company, Inc.
 Museum of Northern Arizona
 National Assoc. of Home Builders, Research Fdn.
 National Institute of Standards and Technology
 Naval Civil Engineering Laboratory
 New York Testing Laboratories, Inc.
 North Atlantic Historic Preservation Center/Lab
 Northwest Laboratories
 Osborne Laboratories, Inc.
 Pacific Inspection & Research Laboratory, Inc.
 Pasat Research Associates, Inc.
 Pittsburgh Testing Lab
 Professional Engineering Consultants, P.A.
 Quirk Consulting
 Research Center on the Materials of the Artist
 Riverton Corporation
 Smith-Emery Company
 Soc. for Preservation of New England Antiquities
 Southwestern Laboratories, Inc. (Dallas)
 Southwestern Laboratories, Inc. (Fort Worth)
 Southwestern Laboratories, Inc. (Houston)
 Standard Testing & Engineering Co.
 Structural and Concrete Laboratory
 Structure Probe, Inc.
 Structure Probe, Inc. (PA)
 Surface & Microstructure Analysis Laboratory
 TEI Consulting Engineers
 TEI Consulting Engineers-Diablo Valley
 TEI Consulting Engineers-Sacramento
 TEI Consulting Engineers-San Francisco
 TEI Consulting Engineers-Santa Clara
 TEI Consulting Engineers-Stockton
 TMA/Norcal
 Testing Engineers-San Diego/U.S. Testing Co.
 Thompson & Lichtner Company, Inc.
 Thompson Engineering Testing, Inc.
 United States Testing Company, Inc.
 University of Arizona
 University of California
 University of Missouri, Forestry/Fishery/Wildlife
 University of Richmond
 University of Utah
 Viewsonics Materials Evaluation/Ultrasonics
 W.B. Coleman Co.
Washington Testing, Inc.
Welsh, Frank S.
Western Testing Laboratories, Inc.
Wiss, Janney, Elstner Assoc., Inc.
Wiss, Janney, Elstner Associates, Inc.
Wood Advisory Services
Alpena Community College

LAB TYPE: University

Services are available to the general public.

SERVICES
------
Consulting
Materials Characterization

MATERIALS
------
Aggregates
Bitumen
Concrete
Soil
Building Name: Lincoln Elementary School
Location: Lincoln, MI USA
Carleton Laboratory, Columbia University

LAB TYPE: University

Services are available to the general public.

SERVICES

Dynamic Testing
Instrumentation
Mechanical Testing
Static Testing

MATERIALS

Composites
Concrete
Masonry
Metals
Building Name: G.E. Building
Location: New York, New York USA
Center for Preservation Research

LAB TYPE: University

Services are available to the general public.

SERVICES

Conservation
Microchemistry
Particle Analysis
Porosimetry
Research
Spectrophotometry

MATERIALS

Adhesives
Brick
Coatings
Masonry
Metals
Paint
Stone
Terra Cotta
Wood
Building Name: G.E. Building
Location: New York, NY USA

Building Name: New York City Public Library
Location: New York, New York USA

Building Name: Essex County Courthouse
Location: Newark, NJ USA

Building Name: Stanton Hall
Location: Natchez, MS USA

Building Name: Mellon Bank
Location: Pittsburgh, PA USA

Building Name: Trinity Cemetery
Location: Boston, MA USA
Clemson University

LAB TYPE: University

Services are available to the general public.

SERVICES

---

Chemical Analysis
Identification
Materials Characterization
Moisture Protection-wood
Preservation

MATERIALS

---

Paper
Stone
Wood
Building Name: USS Cairo
Location: ,
College of Ceramics-Alfred University

LAB TYPE: University

Services are available to the general public.

SERVICES
-------
Chemical Analysis
Electron Diffraction
Fractography
Petrographic Analysis
SEM (Scanning Electron Microscopy)
Spectroscopy
TEM (Transmission Electron Microscopy)
X-ray Analysis

MATERIALS
-------
Brick
Ceramics
Clay
Enamels
Glass
Tile
Whiteware
Cornell University

LAB TYPE: University

Services are available to the general public.

SERVICES
   -------
   Cycled Load Tests
   Dynamic Testing
   Freeze-Thaw Tests
   Permeability Tests
   Porosimetry
   Research
   Salt Damage Tests
   Structural Analysis

MATERIALS
   -------
   Building Stone
   Concrete
   Metals
   Rock
Building Name: Herbivora House, Cincinnati Zoo
Location: Cincinnati, OH USA
Fogg Art Museum

LAB TYPE: University

Services are available to the general public.

SERVICES
-------
Cleaning
Conservation
Materials Characterization
Stain Removal

MATERIALS
-------
Marble
Stone
Building Name: Marble bust of Marcus Aurelius

Location: Newark Museum, Newark NJ

Year: USA
Illinois Institute of Technology- Research Inst.

LAB TYPE: University

Services are available to the general public.

SERVICES
-------
Failure Analysis
Materials Characterization
Research
Stone Conservation

MATERIALS
-------
Brick
Concrete
Metals
Stone

DESCRIPTION
-------
General work in durability/repair for Marble Institute and Limestone Association. Various projects to determine failure in stone and brick.
Research Center on the Materials of the Artist

LAB TYPE: University

Services are available to the general public.

SERVICES
-------
Color Analysis
Consulting
Materials Characterization

MATERIALS
-------
Dyes
Paint
Polymers
Resins
Laboratory Dossier

Structural and Concrete Laboratory

LAB TYPE: University

Services are available to the general public.
Building Name: Municipal Building of New York
Location: New York, NY USA

Building Name: New York Stock Exchange
Location: New York, NY USA
Surface & Microstructure Analysis Laboratory

LAB TYPE: University

Services are available to the general public.

ACCREDITED BY: A.B.E.T., Middle States Assoc.

SERVICES

------
SEM (Scanning Electron Microscopy)

MATERIALS

------
Ceramics
Building Name: Alumni Hall, Alfred University
Location: Alfred, NY USA
Thompson & Lichtner Company, Inc.

LAB TYPE: University

Services are NOT available to the general public.

MATERIALS

Masonry

Terra Cotta
University of Arizona

LAB TYPE: University

Services are available to the general public.

SERVICES
-----
Dendrochronology

MATERIALS
-----
Wood

DESCRIPTION
-----
Historic adobe houses in Tucson and Santa Fe; Walpi Pueblo, Hubbell Trading Post National Historic Site; Acoma Pueblo.
University of California

LAB TYPE: University

Services are available to the general public.

SERVICES

Identification
Materials Characterization

MATERIALS

Wood
Building Name: Keith-Brown House
Location: Salt Lake City, UT USA

Building Name: South Hall, University of California
Location: Berkeley, CA USA

Building Name: Stilts House
Location: Green Valley, CA USA
University of Florida, Florida Museum of Nat. His.

LAB TYPE: University

Services are available to the general public.

ACCREDITED BY: International Association of Wood Anatomists;

SERVICES

--------------
Biological Decay Analysis
Failure Analysis
Materials Characterization
Moisture Problem Analysis

MATERIALS

--------------
Organic Materials
Wood
University of Missouri, Forestry/Fishery/Wildlife

LAB TYPE: University

Services are available to the general public.

SERVICES

---

Dendrochronology
Failure Analysis
Materials Characterization
Moisture Problem Analysis

MATERIALS

---

Wood
Building Name: Francis Valle House
Location: , MO USA

Building Name: Van Horns Tavern
Location: , MO USA

Building Name: Green Tree Inn
Location: , MO USA

Building Name: Amoureaux
Location: , MO USA

Building Name: Delassus House
Location: , MO USA

Building Name: Jean Baptiste Valle House
Location: , MO USA

Building Name: Guibord-Valle House
Location: , MO USA

Building Name: Joseph Thomore House
Location: , MO USA
University of Richmond
LAB TYPE: University
Services are available to the general public.

SERVICES
-------
Materials Characterization
Photomicroscopy

MATERIALS
-------
Wood
Building Name: Hancock's Resolution
Location: , Maryland USA
U University of Utah
LAB TYPE: University
Services are available to the general public.

SERVICES
------
Components
SEM (Scanning Electron Microscopy)
X-ray Analysis

MATERIALS
------
Ceramics
Composites
Electrical Components
Metals
Organic Materials
Polymers
SELECTED LIST OF BUILDING MATERIALS MANUFACTURERS

Building Materials Manufacturers are generally geared to the production and marketing of building materials, systems and products. While corporate research is generally geared to the development of new products, many companies have the potential to produce technology and applications for existing and historic buildings.

Attached is a selected list of major manufacturers.
## SELECTED LIST OF POTENTIAL INDUSTRY PARTNERS

<table>
<thead>
<tr>
<th>COMPANY NAME</th>
<th>PRODUCTS</th>
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<tbody>
<tr>
<td>M</td>
<td><strong>BDLG. MATERIALS</strong></td>
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<tr>
<td>ALCOA</td>
<td>ALUMINUM</td>
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<tr>
<td>ANDERSEN WINDOWS</td>
<td>WINDOWS</td>
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<tr>
<td>ARMSTRONG</td>
<td>FLOORING</td>
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<td>BALDWIN</td>
<td>HARDWARE</td>
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<td>CERTAINTEDED</td>
<td>ROOFING</td>
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<td>CHEMICAL</td>
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<tr>
<td>DUPONT</td>
<td>CHEMICALS</td>
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<td>GAP</td>
<td>ROOFING</td>
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<td>GEORGIA PACIFIC</td>
<td><strong>BDLG. MATERIALS</strong></td>
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<tr>
<td>GRACE CO.</td>
<td>WATERPROOFING</td>
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<td>GROHE</td>
<td>PLUMBING</td>
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<tr>
<td>HE-C-SYLVANIA</td>
<td>LIGHTING</td>
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<tr>
<td>HERMAN MILLER</td>
<td>FURNITURE</td>
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<td>HONEYWELL</td>
<td>HVAC CONTROLS</td>
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<td>HYDROZO</td>
<td>CHEMICALS</td>
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<td>J. P. STEVENS</td>
<td>ROOFING</td>
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<td>KWANNEER</td>
<td>WINDOWS</td>
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<td>QNOLL</td>
<td>FURNITURE</td>
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<td>TOPPERS</td>
<td><strong>BDLG. MATERIALS</strong></td>
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<td>LENNOX</td>
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<td>LIBBY OWENS FORD</td>
<td>GLASS</td>
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<td>MANVILLE</td>
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<td>MILIKEN</td>
<td>TEXTILES</td>
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<td>MONSANTO</td>
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<tr>
<td>PITTSBURG CORNING</td>
<td><strong>BDLG. MATERIALS</strong></td>
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<td>THORO SYSTEMS</td>
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<td>DRYWALL</td>
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<td>JON DUPRIN</td>
<td>HARDWARE</td>
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<tr>
<td>J. R. MEADOWS</td>
<td>WATERPROOFING</td>
</tr>
<tr>
<td>WESTINGHOUSE</td>
<td>ELECTRICAL</td>
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In 1988, a group of University programs organized themselves into a "University Consortium for Preservation Science and Technology", in response to the 1986 Office of Technology Assessment (OTA) report, *Technologies for Historic and Prehistoric Preservation*. This group represents some of the more proactive research Universities with historic preservation technology interests and experience. This consortium is not limited to architectural resources.
In 1986, a Congressional Office of Technology Assessment (OTA) report, *Technologies for Historic and Prehistoric Preservation* (OTA-E-320) recognized that "United States is losing its prehistoric and historic cultural resources at an alarming rate in spite of the best efforts of preservation professionals to identify and protect them." The OTA report recommended the creation of a national institution to reduce costly duplication, improve public access to information, and expand the range of effective technology transfer for the preservation of our nation's cultural heritage. It argued that the greatest single need is to improve the transfer and adaptation of technologies from other disciplines. The report cited the advantages of an interdisciplinary academic consortium working in partnership with federal, state and local governmental agencies, Native American communities and the corporate sector to accomplish state of the art technology transfer for historic preservation and cultural resource management.

Since 1988, the University Consortium for Preservation Science and Technology (USAT) has examined various approaches and strategies that, in its view, would advance the OTA report proposal. In concert with the National Coalition for Applied Preservation Technology (CAPT) and other concerned organizations, USAT seeks to play a constructive role in the process of implementing the OTA proposal by following the leadership reflected in the legislation introduced by Senator Wyche Fowler (D-Georgia) in the Senate and Representative Charles Bennett (D-Florida) in the House as well as efforts now underway in the National Park Service. To demonstrate both the major scientific and fiscal advantages of the OTA concept as embodied in the pending Fowler legislation and other initiatives, USAT members are moving forward with plans to coordinate existing university programs in every region of the country to provide technical, analytical and educational resources for cultural preservation efforts.

Faculty at nine colleges and universities are currently members of USAT. These institutions include: Fort Lewis College (Colorado); Georgia Institute of Technology; University of Arkansas, Michigan Technological University; University of California, Riverside; University of Minnesota, Duluth; University of Nevada, Reno; University of West Virginia, and University of Wisconsin, Madison.

For further information, please contact the chair of the USAT National Executive Board: Professor R. E. Taylor, Preservation Science and Technology Unit, Archaeometry Laboratory, University of California, Riverside, CA 92521. (714) 787-5521. FAX (714) 787-5409 or representatives of USAT in Washington, D.C.: Loretta Neumann/Kathleen Schamel, CEHP Inc., 1333 Connecticut Avenue, N.W., Suite 400, Washington, D.C. 20036. (202) 293-1774. FAX (202) 293-1782.
REPORT THREE: A TECHNOLOGY TRANSFER TRAINING AGENDA
The major mission of a National Center for Preservation Technology is to promote the development and application of new and existing technologies to the problems of historic preservation. This report on training needs is constructed to support a basic training agenda consistent with the objective of increased R&D and technology transfer. As discussed in Report One, training is one part of technology transfer. Given that training is one of several steps in the transfer and application of new technology, training addressed in this report will be limited to that which either 1) promotes increased research and development with its inherent commercialization or technology transfer; or 2) supports the transfer of a specific technology. Three areas of need are addressed:

- development of national certification program
- development of training guidelines for $T_2$
- development of degree programs
- development of a national symposia series linked to professional organizations.

Single issue, short term training courses are not addressed, because they should fall within the context of larger educational programs initiatives. While there are numerous sources of single issue training, such as NPS's compiled list of training resources, effective programmatic action must be goal oriented and addressed to the fundamental issues of technology development and transfer.

NATIONAL CERTIFICATION PROGRAMS

The lack of a disciplinary base and the role of the scientific and engineering professionals as resources to the cultural resource community was discussed in Report One. In addition, the shortage of experts was addressed. Action is badly needed to:

- increase the number of competent professionals
- standardize the knowledge and skills required to be competent in architectural conservation
- sensitize the scientific and engineering disciplines to preservation philosophy, needs and methods.
One of the most direct and achievable educational methods of accomplishing all three of these objectives, is a "certification program" to increase the numbers of trained professionals in the field.

Under the authority of the National Center and in collaboration with universities and appropriate professional organizations, a series of preservation certification programs could be developed and promoted among the primary disciplines with a history of preservation activities. There may be many sources of the basic knowledge skills and ability required to function effectively as a professional in the preservation area. Examples of sources could be the National Park Service's "Skills Development Plan", or the National Institute for Conservation's "Curriculum for Conservation". Both of these documents are designed for a specific purpose but both contain valuable information which can contribute to elements of multiple certification programs.

Designing a National Certification program would have multiple benefits, including:

- improving the quality and consistency of consulting
- establishing a basis for more substantive educational programs to come later
- increasing the value and interest in historic preservation among scientific and engineering discipline
- establishing new Continuing Education options for architecture and engineering professionals
- establishing national standards for knowledge and skills to practice in historic preservation
- establishing a rapid response tool to provide short term training with long lasting benefits
- stimulating increased research and development via certified scientists and engineers.

A certification program would act as an outreach tool to numerous disciplines, while establishing national standards for those who work in the field of preservation. Successful implementation must be gradual, and in close collaboration with the professional organizations and associations which govern the training of professional architects and engineers. There are no parallel organizations for the scientific disciplines, since they are not regulated by state law and regulatory boards.

Certification programs offer the National Center the opportunity to use training to address several of the needs addressed in Report One. Certification programs would be designed to require concentrated training for a period of a few weeks. Such programs reflect the increased importance of their subjects. They are targeted to producing specific results to increase the participants' ability to work in a specific area. One example of an area where certification programs have been developed in recent years is asbestos and hazardous material assessment and abatement. Specific identifiable
goals must be articulated and linked to the continuing educational requirements of the participating professions.

The National Center can, via its relationships with universities establish criteria for certification programs. This will assure that university centers of training and certification can be established throughout the country. Resulting programs will be seen as a resource to improve the skills and abilities of professionals serving the cultural resource management field. A subsequent step will be to work with government agencies, state boards and professional societies to require certification.
TRAINING GUIDELINES FOR TECHNOLOGY TRANSFER

Training is an integral part of the total technology transfer process. Report One, on cultural resource needs, recommended that a "technology transfer process" be established by the National Center. This process would serve as a model for the government, university and private sector research and development organizations working in areas with the potential to develop preservation technology.

The articulation of the role of training as a part of technology transfer will be important and should be given a high priority. There is much confusion among the non-R&D communities about training as technology transfer, thinking that training is one method of technology transfer instead of realizing that it is one component of T2. Other components of T2 include:

- technology identification
- research
- adaptation and testing
- application development
- training users in new methods
- increased commercialization and products.

Training guidelines for T2 should include a definition of the role of training in T2. In addition they should:

- address the parent technology
- address the T2 process
- define the expectation for the technology
- discuss methods, techniques and application issues
- discuss risks or unknowns, if any
- establish feedback loops from trainees, especially in areas where feedback is needed for evaluation
cover all required materials, products and preparation required to use the technology.
DEVELOPMENT OF NATIONAL SYMPOSIUM SERIES

The need for interaction and communications between developers and users of technology was discussed in Report One. This interaction is important to fostering an environment where needs and technologies are discussed and the opportunity for T2 initiatives can occur. The National Center should act with various professional disciplines to create opportunities and forums for the discussion of technology issues.

Preliminary planning efforts can result in the design of symposia which focus on technologies and preservation needs. These symposia could bring selected participants together based on the expected technological cross-over or relevance. Example pairs might include building diagnostics and remote sensing.

Symposia should be planned to be conducted, when possible, as a part of existing national professional conferences, as well as in conjunction with the training and educational activities of building materials/products manufacturers. The symposia should be conducted on a regular basis in order to become integrated into the awareness and planning process of affected industries and associations. There will be significant staffing requirements associated with this effort, along with other training, but a viable credible National Center must have a staff to support critical mission activities such as training. One related initiative which could be strongly linked to this recommendation would be to encourage the use of liaisons between the Center and other Federal agencies and industry partners. Liaison representatives could be active collaborators or preparers of symposia agendas. Their subject matter expertise would contribute to the design of unique, discipline oriented symposia.
DEVELOPMENT OF FORMAL DEGREE PROGRAMS

The less complicated initiatives for creating multi-week certification programs and discipline oriented symposia are designed to provide results in the short term. While the short term results would have long term benefits, and would always play a role in National Center programs, there must be some longer term training initiative to address the needs or problems outlined in Report One.

The certification programs and symposia will have direct positive affects of increasing awareness of preservation technology and \( T_2 \) issues. They will have the effect of broadening the base among the science and engineering disciplines. Out of the participating organizations, opportunities will emerge to create more substantive training for individuals who want technological careers in the field of historic preservation. As a medium priority and a part of long range planning, curricula should be developed leading to degree programs in preservation technology areas.

Degree granting programs will be significantly more substantive than certification programs. They may last for one year or more. Some universities may already have degree programs which lend themselves to one year Masters Degrees, in which case these may emerge as the first degree programs with an affiliation with the National Center. As these individual curricula are created within the programmatic framework, there will be progress toward increasing the disciplinary base of preservation technology and increasing the number of professionals produced by the educational system. National Center staff should be aware of university practice in establishing new degree programs. There are often undesignated degrees which can be utilized for individuals in unique courses of study. In the case of the College of Architecture at Georgia Tech, there is a Master of Science Degree which allows faculty and students to establish specialized, highly individualized courses of study. Such a degree can be used for individualized courses of study until such point as a full case can be established to add a new degree program. At the same time, participation and endorsement from professional societies will be necessary to fully establish the new options. The members of professional societies represent the market for university products, i.e. students. The needs which exist in the field must be reflected in the experience and commitment of the profession. If there is no demand in the A&E community for architects with specialized training in historic preservation, then A&Es will not hire graduates who have been so educated. Conversely, if the rehabilitation market is strong and rehabilitation remains a major revenue generating activity, certifications have a direct market value for A&E companies. The more such training helps with competitiveness, the more valued it will be by those who need it.
CONCLUSION

These four major training initiatives represent the basis of a plan for training consistent with the National Center's mission. Specific, single issue training can be conducted on an as needed basis, or as part of other National Center programs. The more such single issue training can be interpreted as a planned part of a framework for larger coordinated programs, the stronger the national program will become.
REPORT FOUR: FINANCIAL RESOURCES
REPORT FOUR

NATIONAL CENTER RESOURCES

This is an optional chapter in the report. Resources are critical to the successful planning, start-up and operation of any prospective National Center for Preservation Technology, therefore some effort to address this issue is as important as the previous sections. It may in fact be more important, for without adequate resources, the other issues become somewhat moot. The programs of the proposed National Center will require significant funding. While it will be encouraging if the optimal level of Federal funding is appropriated, the early 1990s are difficult budgetary times. It is currently difficult to obtain new funding for start-up programs.

The financial and business side of any organization, especially a new organization like the proposed National Center, is a complicated and often uncertain proposition. Even with government support, within a government agency, funding for any new initiative can be variable and unpredictable. Planning should include creative and entrepreneurial initiatives to stimulate, encourage or leverage funds from other organizations, public and private, who have an interest in the Center's success. This strategy will be important regardless of the base funding level of the Center. It will have at least two important benefits:

1) it will extend the outreach of the Center beyond its funding level, and

2) it will engender a true sense of partnership if collaborative programs are jointly funded.

As with all such ideas, the concept of leveraging other organizations' resources and participation will not apply in all cases, but where it is feasible and appropriate, it is a positive activity.

The possibilities for, and limitations on, resources will vary with the funding source. Several types of funding may be available to support the start-up and operation of the Center. Mechanisms should be established to allow and encourage different mixes of funding sources. In general, funding may come from five basic types of sources:

- direct government support
- special grants/programs
- reimbursibles or matching/in-kind services
- foundations
Each of these sources has different characteristics, including:

- who is eligible to receive funds
- restrictions on the purpose/use of funds
- legal and programmatic implications.

GOVERNMENT FUNDING SOURCES

The most likely and desirable source of funding for the Center is direct Federal appropriations at an adequate level to implement its programs. Such funding will be a critical component for staffing, travel, equipment and supplies to establish and maintain the Center. Even direct appropriations, however, may have some restrictions on the use of funds which may make it difficult to accomplish certain functions therefore alternative funding sources and partnerships may be appropriate and attractive.

REIMBURSABLE PROJECTS

A second type of government funding source may be "reimbursables" where other Federal agencies, or even states, transfer funding to the Center for agreed upon tasks. When the agreed upon tasks support both the agencies program and the Center's mission, such projects represent a powerful partnership for progress. When in addition, a basic amount of overhead is collected, these relationships have the "value added" aspect of generating discretionary program income. Undertaking numerous projects of this type will require a staff orientation to research project management.

The downside to substantive reimbursable programs is that their continuance is vulnerable to fluctuations in sponsor funding, and program shifts. Reimbursable programs require dedicated staff and when down times occur, the possibility of reductions is always present. Flexible staffing plans, or sub-contracting plans must be established to allow the ability to shrink and grow as project loads change.

SPECIAL GRANTS AND PROGRAMS

A third type of government support would be special grants from other Federal agencies for a mutually beneficial purposes. Opportunities to propose such relationships is dependent either on the published programs of the Agency, or more likely, the identification and development of ideas for mutually beneficial programs linking the missions of both the funding agency and the Center. These kinds of opportunities are rare because they must be developed and marketed on their merits. They also represent rare opportunities to connect cultural resource and infra-structure issues to mainstream
goals of the Federal programs. Example ideas could be:

The development of innovative housing programs using older and historic buildings between HUD and the Center, or self-help programs for low income owners/occupants of older and historic buildings.

Joint programs with NSF to evaluate the technology needs to stabilize and maintain older and historic buildings, thus maintaining a valuable part of the country’s infrastructure.

An actual example of a current program where this is happening is the CAC, Georgia Tech grant from NEA to support NPS’s leadership in the second National Interiors Conference scheduled for early 1993. This is the second such project.

The National Center should develop opportunities for all three types of Federal funding. Success with the reimbursables and special programs demonstrates the kind of effective stewardship which helps build and maintain support for direct appropriations. In addition such projects build relationships, establish credibility, promote cultural resource values and extend the benefits of core programs.

MATCHING AND IN-KIND SERVICES

The National Center will have a mission which will be translated into action programs. When adequate funding is achieved, many of these programs may be implemented using budgeted funds. Programs will usually be designed with objectives, deliverables and costs in mind, but as they are designed, the possibility and impact of leveraging matching funds and/or in-kind services should be considered.

In project relationships with universities, this may be a particularly useful approach. Universities are generally experiencing resource constraints across the U.S. This is due to state budget problems, economic changes and changes in Federal policy re: indirect charges on research contracts, and a variety of other factors. Universities, however, allocate substantial resources internally for R&D program development funds, student support and faculty development. It is quite common and often expected, that some "participation" by the university may be required to make projects attractive and university programs competitive.

When developing projects which involve universities, it is important to identify what resources are available which could benefit or extend the impact of the project. It may be that individual faculty members do not have ready access to some of the available resources. Such faculty may be able to use proposed projects to leverage some of those resources from university administration. There are also cases, however, where successful university programs have substantive research funding and are not inclined to subsidize sponsored activities. In such cases it may be difficult to leverage matching funds. A list of architectural schools with research programs who are members of the Architectural Research Centers Consortium (ARCC) is attached as Exhibit 2A, to Report Two. These schools have active
faculty who are engaged in research. The schools support ARCC to promote sponsored research. Obviously schools are looking to sponsored research as a way to build their program resources, (much like the National Center could use "reimbursables" as discussed earlier), but these schools have a tradition of research and a commitment to the research process, which includes technology transfer. If ARCC member schools have the expertise in historic architecture, archaic materials and preservation technology, they may represent good candidates for research partners in the mission of the National Center. It should be noted, however, that relatively few ARCC schools have preservation research programs, so relationships should be entered realistically.

FOUNDATION SUPPORT

One of the most traditional sources of support for research and education in the U.S. is foundations. Foundations of all sizes are established by benefactors, to promote the interests of their founders, or to support worthwhile causes. Such worthwhile causes include cultural resource issues. Foundation support most often takes the form of grants, either to individuals or organizations. Grants may either be outright grants or require matching funds. In cases where matching funds are not required, the presence of some match may make the proposed activity more attractive or competitive.

Foundations generally have published policies concerning their procedures and gift sizes. Policies sometimes may make direct grants to the government agencies ineligible. Proposals to such Foundations may be developed in partnership with universities or other eligible organizations.

A list of U.S. Foundations with published policies in support of cultural resources is attached as Exhibit 4B. In some cases foundations restrict their support to certain geographic areas, therefore partnering organizations would not only be selected for mission interest, but also for location. An example of this would be the relationship between NPS, the Historic Preservation Education Foundation, (HPEF) and the Kaplan Foundation in support of the Window Exhibit.

In addition to the typical philanthropic foundations, there are often foundations attached to major corporations to manage and direct corporate giving.

INDUSTRY

Unlike foundations, industry represents both a potential financial resource and a major potential source of technology. This powerful combination should make industry a valued partner in an effort to advance mutually beneficial projects in the public interest.

Industry can be divided into groups based on their goods and services. A preliminary list of group types which have some impact on older and historic buildings could be developed. These groups could then be evaluated to determine what industry areas relate most closely to the prioritized objectives of the National Center. Based on the findings, programs and proposals can be put forward to initiate
collaborative programs with industry support to address critical problems with archaic building materials and/or systems.

Possible groups could include:

A. Building Products
   - wood products
   - lighting
   - plumbing
   - HVAC
   - roofing
   - metal products/hardware
   - masonry

B. Construction
   - seismic retrofit
   - structural stabilization
   - soil stabilization

C. Architectural Design
   - graphics presentation
   - multi-media
   - design processes
   - interiors

The list can be modified and expanded to fit with the organization and mission of the National Center. Once it is established, specific corporations could be contacted as programs warrant. A selected list of major building products companies is included in Report Two, as Exhibit 2D.

An emphasis should be placed on a partnership with industrial affiliates. In addition, potential industry partners can be expected to look at relationships with the National Center with a view to determining why they should participate, and support any specific program. There will be a need to candidly discuss the question of "What's in it for me?". The realistic way to approach this is that all the parties to agreements and partnerships will be engaging in the relationship or project because they expect some value from the relationship. Both government and industry may initiate activities to produce public benefits. Such benefits do not have to be tangible or financial, but may be altruistic. It is hoped that government-industry partnerships will be entered into out of enlightened self-interest, where the public good is a major motivating force for all participants.
ADDITIONAL RESOURCES

Numerous additional opportunities exist to be explored and developed to increase the resources and impact of a National Center for Preservation Technology. Examples of areas and issues to be considered include, but are not limited to the following:

- Growing concern for environmental issues has made the "environment" a major theme permeating many areas of life. The 90's may be the "Decade of the Environment" and the definition of the environment includes "quality of life" issues. This includes quality of life in the workplace and home, and therefore includes the role of cultural issues, as well as design and material aspects of architecture.

- The proposed National Environmental Technologies Agency (NETA) as outlined in S.2632 would have significant responsibilities for technology development and transfer, including responsibilities which pertain to "technologies relating to the restoration and protection of the environment". Proposed funding was $75,000,000 in FY 93, $140,000,000 in FY 94, and $200,000,000 in FY 95. A copy of the proposed bill is included as Exhibit 4C.

- Within universities (and sometimes independently) there have been emerging dedicated, flexible units generally referred to as Organized Research Units (ORUs). CAC is an example of an ORU. ORU's may exist within the university structure, but generally are much more flexible and responsive than academic programs. ORUs are developed to be created quickly in response to opportunity and adapt to changing requirements. They are popular within universities because they are considered:

  1) to engender interdisciplinary cooperation
  2) to be proficient at providing faculty with access to resources.

While ORUs may have certain drawbacks, these are mostly internal to the universities. The ORUs may represent a responsive linkage to the university in many cases where ORU's exist with a mission sympathetic to the National Center's mission.

A list of university ORUs with stated interest, experience and capabilities in architectural conservation has been compiled from the 1991 Edition of the Research Centers Directory. This is attached as Exhibit 4D. There are many other ORUs of potential value whose missions include materials, construction, physical sciences and others.
Research collaboration with university programs in architectural preservation may not be solely for the direct performance of research, but may be for the purpose of joint proposal development to support research. The attached list and map addresses accredited Schools of Architecture in the U.S.
ACCREDITED SCHOOLS OF ARCHITECTURE

U.S. Full Member Schools

1. Andrews University
2. Arizona State University
3. Auburn University
4. Ball State University
5. Boston Architectural Center
6. California Polytechnic State University, San Luis Obispo
7. California State Polytechnic University, Pomona
8. Carnegie Mellon University
9. The Catholic University of America
10. City College of the City University of New York
11. Clemson University
12. Columbia University
13. Cooper Union
14. Cornell University
15. Drexel University
16. Drury College
17. Florida A&M University
18. Georgia Institute of Technology
19. Hampton University
20. Harvard University
21. Howard University
22. Illinois Institute of Technology
23. Iowa State University
24. Kansas State University
25. Kent State University
26. Lawrence Technological University
27. Louisiana State University
28. Louisiana Tech University
29. Massachusetts Institute of Technology
30. Miami University
31. Mississippi State University
32. Montana State University
33. Morgan State University
34. New Jersey Institute of Technology
35. New York Institute of Technology
36. North Carolina State University
37. North Dakota State University
38. Ohio State University
39. Oklahoma State University
40. Pennsylvania State University
41. Pratt Institute
42. Princeton University
43. Rensselaer Polytechnic Institute
44. Rhode Island School of Design
45. Rice University
46. Roger Williams College
47. Savannah College of Art & Design
48. Southern California Institute of Architecture (SCI-ARC)
49. Southern University and A&M College
50. State University of New York at Buffalo
51. Syracuse University
52. Temple University
53. Texas A&M University
54. Texas Tech University
55. Tulane University
56. Tuskegee University
57. University of Arizona
58. University of Arkansas
59. University of California, Berkeley
60. University of California, Los Angeles
61. University of Cincinnati
62. University of Colorado at Denver
63. University of Detroit
64. University of Florida
65. University of Hawaii
66. University of Houston
67. University of Idaho
68. University of Illinois at Chicago
69. University of Illinois, Urbana-Champaign
70. University of Kansas
71. University of Kentucky
72. University of Maryland
73. University of Miami
74. University of Michigan
75. University of Minnesota
76. University of Nebraska, Lincoln
77. University of New Mexico
78. University of North Carolina at Charlotte
79. University of Notre Dame
80. University of Oklahoma
81. University of Oregon
82. University of Pennsylvania
83. University of Puerto Rico
84. University of Southern California
85. University of Southwestern Louisiana
86. University of Tennessee - Knoxville
87. University of Texas at Arlington
88. University of Texas at Austin
89. University of Utah
90. University of Virginia
91. University of Washington
92. University of Wisconsin - Milwaukee
93. Virginia Polytechnic Institute and State University
94. Washington State University
95. Washington University
96. Yale University

Canadian Full Member Schools

97. Carleton University
98. Laval University
99. McGill University
100. Technical University of Nova Scotia
101. University of British Columbia
102. University of Calgary
103. University of Manitoba
104. University of Montreal
105. University of Toronto
106. University of Waterloo

Candidate Member Schools

A. Frank Lloyd Wright School of Architecture
B. New School of Architecture
C. Parsons School of Design
D. Prairie View A&M University
E. Southern College of Technology
F. Spring Garden College
G. University of California, San Diego
H. University of Nevada, Las Vegas
I. University of South Florida
J. Wentworth Institute of Technology
K. Woodbury University
EXHIBIT 4-B

U.S. FOUNDATIONS

Attached is an annotated list of foundations with an expressed interest in supporting cultural resource programs. Notes indicate specific goals and interests.
POTENTIAL SUPPORTERS

1. Marquette Charitable Organization
   2141 South Jefferson Street
   Chicago, IL 60616

   Write: Betty Basile, Secy.

   Comments: "Emphasis on secondary and higher education and cultural programs, including historic preservation."

2. J. Paul Getty Trust
   401 Wilshire Blvd. Suite 1000
   Santa Monica, CA 90401-1455
   (213) 393-4244

   Write: The Getty Grant Program

   Comments: A private operating foundation with seven operating programs in the visual arts and related humanities; one being the Getty Conservation Institute, and another is the Getty Art History Information Program.

   Support is available for the history of arts, centers for advanced research in art history, archival research projects, etc.....

3. Bass Foundation
   309 Main Street
   Fort Worth, TX 76102
   817/336-0494

   Application: letter

   Deadline: none

   Write to: Valleau Wilkie, Jr.

   Comments: "Giving primarily for the arts and cultural institutions; some support for conservation."
4. Skidmore, Owings & Merrill Foundation
33 West Monroe Street
Chicago, IL 60603

Application: Initial approach - proposal
Deadline: None
Write to: Sonia Cooke, Admin. Dir.
Comments: "Grants for the purpose of education, research or publications in or directly related to the field of Architecture or Architectural Engineering."

5. American Conservation Association, Inc.
30 Rockefeller Plaza, Room 5510
New York, NY 10112
212/247-3700

Application Information: Initial approach, letter or proposal
Deadline(s): Submit proposal preferably early in the year.
Write to: George R. Lamb, Exec. V.P.
Comments: "A private operating foundation organized to advance knowledge and understanding of conservation; to preserve the beauty of the landscape and the natural and living resources in areas of the U.S. and elsewhere; to educate the public in the proper use of such areas."

6. Forbes Foundation
60 Fifth Avenue
New York, NY 10011
212/620-2248

Application Information: Contributes only to pre-selected organizations. Applications not accepted.
Write to: Leonard H. Yablon, Secy. - Tres.
Comments: Support for higher and secondary education ... cultural programs ..."
7. The Andrew W. Mellon Foundation  
140 E. 62nd Street  
New York, NY 10021  
212/838-8400  

Application Information: Initial approach, descriptive letter or proposal  

Deadline: None  

Write to: J. Kellum Smith, Jr., V.P.  

Comments: "Grants on selective basis in higher education, ... and research, cultural affairs, including historic preservation..."  

8. The Louis B. Mayer Foundation  
One Battery Park Plaza, 29th Floor  
New York, NY 10004  
212/908-2713  

Application Information: Letter, proposal or telephone  

Deadline: Submit proposal between March 1 and December 30  

Write: John Bochenek  

Comments: "Support for basic innovation, research, and development in areas of education, arts, letters, and medicine."  

One Liberty Plaza  
165 Broadway  
New York, NY 10080  
212/637-8165  

Application Information: Initial letter or proposal  

Deadline: None  

Write to: Westina L. Matthews, Secy.  

Comments: "Emphasis on education, especially higher education; support also for the arts, cultural programs..."
10. The J. M. Kaplan Fund, Inc.
330 Madison Avenue
New York, NY 10017
212/661-8485

Application Information: Initial approach telephone, proposal, or letter

Deadline(s): Submit proposal only from March 1 - October 15
Giving primarily in New York

Write to: Joan K. Davidson, Pres.

Comments: "Interest primarily in programs in architecture and
urban planning, preservation, parks and other urban
amenities; local cultural institutions and selected arts
projects..."

11. Walter Clay Hill and Family Foundation
c/o Trust Company Bank
P. O. Box 4655
Atlanta, GA 30302

Application Information: Initial approach, proposal

Deadline: Submit proposal preferably from January through
June; no set deadline

Write to: C. Peter Melton, Trust Officer, Trust Co. Bank

Comments: "Grants for the arts, museums, conservation ... support also for
higher education and a historical association."

12. Lenora & Alfred Glancy Foundation, Inc.
1200 Citizens & Southern National Bank Building
Atlanta, GA 30335
404/586-1500

Application Information: Initial approach, letter or proposal

Deadline(s): Submit proposal before end of October; Deadline,
November 1

Write to: Benjamin T. White, Ass't. Secy.

Comments: "Support for higher and secondary education; grants
also for ... cultural programs..."
13. LUBO Fund, Inc.
3910 Randall Mill Road, N.W.
Atlanta, GA 30327

Application Information: Initial approach, letter or proposal

Deadline(s): None

Write to Lucinda W. Bunnen, Pres.

Comments: "Giving for cultural programs, including the performing and visual arts; support also for education."

Metropolitan
The Hurt Building, Suite 449
Atlanta, GA 30303

Application Information: Initial approach, letter or telephone

Deadline(s): June 1, September 1, December 1, and March 1

Write to: Alicia Philipp, Exec. Dir.

Comments: "Grants, unless designated by the donor, are confined to the metropolitan area of Atlanta, with emphasis on social services, arts and culture, education, health and civic purposes."

15. Anncox Foundation, Inc.
c/o Cox Enterprises, Inc.
P. O. Box 4689
Atlanta, GA 30302

Write to: Anne Cox Chambers, Pres. & Tres.

Comments: "Emphasis on educational associations, museums ... cultural programs."
16. The Coca-Cola Foundation  
310 North Avenue  
Atlanta, GA 30301  
404/676-3740  

Application Information: Initial, approach letter  
Write to: Margaret J. Cox, Exec. Dir.  
Comments: "Emphasis on education, arts, and cultural programs..."

17. The James M. Cox Foundation of Georgia, Inc.  
c/o Cox Enterprises, Inc.  
72 Marietta Street, N.W.  
Atlanta, GA 30303  

Application Information: Applicant should have support of local publisher for grant requested.  
Write to: Joseph F. Englert, Secy. – Tres.  
Application Address: P. O. Box 4689, Atlanta, GA 30302  
Comments: "Giving primarily for higher education, hospitals, and the arts."

18. EMSA Fund, Inc.  
20 Westminster Drive  
Atlanta, GA 30309  
404/233-3455  

Application Information: Initial approach, proposal  
Deadline(s): None  
Write to: Alice Franklin, Pres.  
Comments: "Giving primarily for social services, culture, health, and educational programs..."
19. First Atlanta Foundation, Inc.
c/o The First National Bank of Atlanta, Trust Department
P. O. Box 4148
Atlanta, GA 30302

Comments: "Emphasis on higher education, community funds, arts and cultural programs and youth agencies."

20. Exposition Foundation, Inc.
2970 Peachtree Road., Suite 820
Atlanta, GA 30305
-Officers- Frances F. Cocke, Pres.

Comments: "Giving primarily for cultural programs, including a museum, and education."

21. Livingston Foundation, Inc.
55 Park Place, Suite 400
Atlanta, GA 30303
404/577-5100

Application Information: Initial approach, letter

Deadline(s): None

Application Address: c/o Arnall, Golden & Gregory
Fulton Federal Building
10th Floor
Atlanta, GA 30335

Write to: Ben W. Brannon, Pres.

Comments: "Emphasis on cultural organizations."
P. O. Box 4539
Atlanta, Ga 30302
404/586-2488

Application Information: Application form required

Deadline(s): Submit proposal 1 month prior to a meeting (Board meeting date(s): February, May, September & November

Write to: Anne Poland Berg, Grant Consultant

Comments: "Major interests in health, education, and welfare; support for community funds, colleges, universities, private schools, art organizations..."

23. Kate & Elwyn Tomlinson Foundation, Inc.
3000 Habersham Road, N.W.
Atlanta, GA 30305

-Officers- Kathryn Bridges, Chair

Comments: "Emphasis on higher and secondary education, arts and culture..."

24. The Aeroflex Foundation
c/o Berman & Hecht
10 East 40th Street, Room 710
New York, NY 10016

Application Information: Initial approach, letter

Deadline: September

Comments: "Emphasis on cultural programs and higher education."
25. Mosbacher Foundation, Inc.
   515 Madison Avenue
   New York, NY 10022
   Officers - Robert Mosbacher, Pres.
   Comments: "Grants primarily for higher education, cultural programs, including museums, and international studies."

26. Lettie Pate Evans Foundation, Inc.
   1400 Peachtree Center Tower
   230 Peachtree Street, N.W.
   Atlanta, GA 30303
   404/522-6755
   Application Information: Initial approach, letter of inquiry followed by proposal
   Deadline(s): Submit proposal in January or September
   Write to: Boisfeuillet Jones, President
   *Giving primarily in the Chicago, IL area, the midwest and S.C.
   Comments: "Grants primarily for higher education; support also for educational institutions and social services. Preference is given to one-time capital projects of established private charitable organizations."

27. Gaylord & Dorothy Donnelley Foundation
    350 East 22nd Street
    Chicago, IL 60616
    312/326-7255
    Application Information: Initial approach, letter
    Deadline(s): None
    Write: Mrs. Jane Rishel, Pres.
    Comments: "Grants to educational, cultural, health, conservation, research ... institutions."
28  FMC Foundation
200 East Randolph Drive
Chicago, IL  60601
312/861-6135

Application Information: Initial approach, letter

Deadline(s): None

Write to: Catherine Johnston, Exec. Dir.

Comments:  "Giving primarily for higher education and community improvement funds, grants also for public issues, economic education, urban affairs, hospitals, cultural institutions..."

29.  Merlin Foundation
c/o Schulte, Roth & Zabel
90 Third Avenue
New York, NY 10022
212/758-0404

Application Information: Initial Approach, letter

Deadline: None

Write to: William D. Zabel, Pres.

Comments:  "Emphasis on higher education in music and the arts, and cultural programs..."

30.  The R & D Fund, Inc.
1700 Broadway, Room 1702
New York, NY  10019

Contributes only to pre-selected organizations. Applications not accepted.

Comments:  "Grants only to charities of personal interest to the donors, with emphasis on fine arts and cultural programs..."
Ten Rockefeller Plaza
New York, NY 10020
212/903-1216

Application Information: Initial approach, letter

Write to: R. M. Schleicher, V.P.

Comments: "Giving for the arts, education, and social services."

32. Foote, Cone & Belding Foundation
401 North Michigan Avenue
Chicago, IL 60611
(312) 467-9200

Write: Charles H. Gunderson, Jr., Secy. Treas.

Comments: "Emphasis on higher education, community funds, cultural programs and youth agencies."

33. Archille Levy Foundation
c/o Bank of A. Levy
P. O. Box 272
Oxnard, CA 93032
(805) 487-6541

Application Information: Application form required - initial approach, letter

Deadline(s): Submit proposal preferably in July or August (deadline August 15)

Mailing Address: P. O. Box 5190
Ventura, CA 93006

Write to: Robert L. Mobley, Vice - Chairman

Comments: "Emphasis on higher and secondary education including scholarship funds, youth agencies, cultural programs, including historic preservation."
EXHIBIT 4-C

NATIONAL ENVIRONMENTAL TECHNOLOGIES ACT

Recently proposed Federal legislation (S2632) would establish the National Environmental Technologies Agency. It’s responsibilities and authority would address R&D; technology transfer; cooperative agreements; information exchange; monitoring R&D.
S. 2632

To establish the National Environmental Technologies Agency.

IN THE SENATE OF THE UNITED STATES

APRIL 29 (legislative day, MARCH 26), 1992

Ms. MIKULSKI introduced the following bill; which was read twice and referred

to the Committee on Governmental Affairs

A BILL

To establish the National Environmental Technologies Agency.

1 Be it enacted by the Senate and House of Representa-
2 tives of the United States of America in Congress assembled,

3 SECTION 1. SHORT TITLE.

4 This Act may be cited as the "National Environmental

5 Technologies Agency Act".

6 SEC. 2. FINDINGS AND PURPOSE.

7 (a) FINDINGS.—Congress finds that—

8 (1) environmental problems facing the world

9 pose a threat to the environmental security of the

10 United States and other nations;
(2) the causes of many of environmental problems lie in the use of environmentally damaging technologies in areas such as transportation, energy production, industrial manufacturing, and product use;

(3) the development and deployment of environmentally safe technologies will both enhance the nation's environmental security and the economic standing of the Nation in the world's market place; and

(4) the Federal Government should play a significant role in enhancing the Nation's environmental security by—

(A) facilitating the development and deployment of environmentally safe technologies that provide solutions to environmental problems; and

(B) assisting in the diffusion of knowledge of environmentally safe technologies throughout the Nation.

(b) PURPOSE.—It is the purpose of this Act to assist the efforts of private industry, universities, nonprofit research centers, and government laboratories to provide environmentally safe technical solutions to problems threat-
en the Nation's environmental security and, in the
process, to help the Nation's competitiveness.

SEC. 3. DEFINITIONS.

For the purposes of this Act—

(1) the term "Administrator" means the Ad-
ministrator of the National Environmental Tech-
nologies Agency;

(2) the term "Advisory Council" means the In-
dustry and Academia Advisory Council established
by section 5;

(3) the term "Agency" means the National En-
vironmental Technologies Agency established by sec-
tion 4; and

(4) the term "Fund" means the Critical Tech-
nologies Revolving Fund established by section 9.

SEC. 4. ESTABLISHMENT OF AGENCY.

(a) ESTABLISHMENT.—There is established as an
independent establishment of the United States the Na-
tional Environmental Technologies Agency.

(b) ADMINISTRATOR.—(1) The Agency shall be head-
ed by the Administrator of the National Environmental
Technologies Agency, who shall be appointed by the Presi-
dent, with the advice and consent of the Senate.

(2) Section 5313 of title 5, United States Code, is
amended by adding at the end the following new item:
'Administrator, National Environmental Technologies Agency.'

(c) STAFF.—The Administrator may appoint a staff of professionals with skills in the area of program definition and management and such support staff as the Administrator determines to be necessary, of which no more than 3 may be in positions of confidential or policy-making character.

(d) FUNCTIONS.—It shall be the function of the Agency to—

(1) coordinate planning by the departments, agencies, and independent establishments of the United States relating to restoration and protection of the environment;

(2) identify areas that—

(A) need technical solutions to maintain the environmental security of the Nation;

(B) are not receiving the long-term product-oriented research that is necessary to meet those needs; and

(C) exhibit the greatest promise for the successful development of solutions;

(3) support and assist the development of technology having potential future application in the restoration and protection of the environment;
(4) coordinate among the departments, agencies, independent establishments of the United States and the private sector the exchange of technological information relating to restoration and protection of the environment;

(5) support continuing research and development of advanced technologies by industrial, academic, and governmental and nongovernmental entities;

(6) monitor on a continuing basis the research and development being conducted on advanced technologies by private industry in the United States; and

(7) promote continuing development of a technological industrial base in the United States.

(c) **INTERAGENCY ADVISORY COMMITTEE.**—(1) There is established an interagency advisory committee composed of—

(A) the Administrator of the Environmental Protection Agency, who shall be chair of the committee;

(B) the Director of the Office of Science and Technology Policy, or the Director's designee;

(C) the Secretary of Energy, or the Secretary's designee;
(D) the Secretary of Commerce, or the Secretary's designee;

(E) the Secretary of State, or the Secretary's designee;

(F) the Secretary of Defense, or the Secretary's designee; and

(G) the Administrator of the National Aeronautics and Space Administration, or the Administrator's designee.

(2) The interagency advisory committee shall advise and provide information to the Agency with respect to the needs and concerns of their agencies in the field of environmental technologies.

**SEC. 5. INDUSTRY AND ACADEMIA ADVISORY COUNCIL.**

(a) **ESTABLISHMENT.**—There is established the Industry and Academia Advisory Council.

(b) **MEMBERSHIP.**—(1) The Advisory Council shall consist of 9 members appointed by the Administrator, at least 5 of whom shall be from United States industry.

(2) The persons appointed as members of the Advisory Council—

(A) shall be eminent in fields such as business, research, new product development, engineering, labor, education, management consulting, environment, and international relations;
(B) shall be selected solely on the basis of established records of distinguished service; and

(C) shall not be employees of the Federal Government.

(3) In making appointments of persons as members of the Advisory Council, the Administrator shall give due consideration to any recommendations that may be submitted to the Director by the National Academies, professional societies, business associations, labor associations, and other appropriate organizations.

(c) TERMS.—(1) (A) Subject to paragraph (2), the term of office of a member of the Advisory Council shall be 3 years.

(B) A member appointed to fill a vacancy occurring prior to the expiration of the term for which the member's predecessor was appointed shall be appointed for the remainder of that term.

(C) A member who has completed 2 consecutive full terms on the Advisory Council shall not be eligible for reappointment until 1 year after the expiration of the second such term.

(2) The initial members of the Advisory Council shall be appointed to 3 classes of 3 members each, one class having a term of 1 year, one a term of 2 years, and one a term of 3 years.
(3)(A) The Advisory Council shall meet at least quarterly at the call of the chair or whenever one-third of the members so request in writing.

(B) A majority of the members of the council not having a conflict of interest in a matter under consideration by the Advisory Council shall constitute a quorum.

(C) Each member shall be given appropriate notice of a meeting of the Advisory Council, not less than 15 days prior to any meeting, if possible.

(4)(A) The Advisory Council shall appoint from among its members a person to serve as chair and a person to serve as vice chair.

(B) The vice chair of the Advisory Council shall perform the duties of the chair in the absence of the chair.

(5) The Advisory Council shall review and make recommendations regarding general policy for the Agency, its organization, its budget, and its programs within the framework of national policies set forth by the President and the Congress.

SEC. 6. GENERAL AUTHORITY OF THE ADMINISTRATOR.

(a) AUTHORITY.—In carrying out the functions of the Agency, the Administrator may—

(1) enter into, perform, and guarantee contracts, leases, grants, and cooperative agreements
with any department, agency, or independent establishment of the United States or with any person;

(2) use the services, equipment, personnel, or facilities of any other department, agency, or independent establishment of the United States, with the consent of the head of the department, agency, or independent establishment and with or without reimbursement, and cooperate with public and private entities in the use of such services, equipment, and facilities;

(3) supervise, administer, and control the activities within the departments, agencies, and independent establishments of the United States relating to patents, inventions, trademarks, copyrights, royalty payments, and matters connected therewith that pertain to technologies relating to restoration and protection of the environment; and

(4) appoint 1 or more advisory committees or councils, in addition to those established by sections 4(e) and 5, to consult with and advise the Administrator.

(b) TRANSFER OF TECHNOLOGY.—The Administrator may transfer to the domestic private sector technology developed by or with the support of the Agency if the Administrator determines that the technology may
have potential application in private activities relating to
restoration and protection of the environment.

SEC. 7. COOPERATIVE AGREEMENTS AND OTHER AR-
RANGEMENTS.

(a) IN GENERAL.—In carrying out the functions of
the Agency, the Administrator may enter into a cooperative
agreement or other arrangement with any depart-
ment, agency, or independent establishment of the United
States, any unit of State or local government, any edu-
cational institution, or any other public or private person
or entity.

(b) AUTHORITY TO REQUIRE PAYMENT.—(1) A co-
operative agreement or other arrangement entered into
under subsection (a) may include a provision that requires
a person or other entity to make payments to the Agency
(or any other department, agency, or independent estab-
lishment of the United States) as a condition to receiving
assistance from the Agency under the agreement or other
arrangement.

(2) The amount of any payment received by a depart-
ment, agency, or independent establishment of the United
States pursuant to a provision required under paragraph
(1) shall be credited to the Fund in such amount as the
Administrator may specify.
(c) **NONDUPLICATION AND OTHER CONDITIONS.**—

The Administrator shall ensure that—

(1) the authority under this section is used only when the use of standard contracts or grants is not feasible or appropriate; and

(2) to the maximum extent practicable, a cooperative agreement or other arrangement entered into under this section—

(A) does not provide for research that duplicates research being conducted under other programs carried out by a department, agency, or independent establishment of the United States; and

(B) requires the other party to the agreement or arrangement to share the cost of the project or activity concerned.

**SEC. 8. PROGRAM REQUIREMENTS.**

(a) **SELECTION CRITERIA.**—Not later than 90 days after the date of enactment of this Act, the Administrator shall publish in the Federal Register proposed criteria, and not later than 180 days after the date of enactment of this Act, following a public comment period, final criteria, for the selection of recipients of contracts, leases, grants, and cooperative agreements under this Act.
(b) **FINANCIAL REPORTING AND AUDITING.**—The Administrator shall establish procedures regarding financial reporting and auditing to ensure that contracts and awards are used for the purposes specified in this section, are in accordance with sound accounting practices, and are not funding existing or planned research programs that would be conducted in the same time period in the absence of financial assistance under this Act.

(c) **ADVICE OF THE ADVISORY COUNCIL.**—The Administrator shall ensure that the advice of the Advisory Council is considered routinely in carrying out the responsibilities of the Agency.

(d) **DISSEMINATION OF RESEARCH RESULTS.**—The Administrator shall provide for appropriate dissemination of research results of the Agency's program.

(e) **CONTRACTS OR AWARDS; CRITERIA; RESTRICTIONS.**—(1) No contract or award may be made under this Act until the research project in question has been subject to a merit review, and has, in the opinion of the reviewers appointed by the Administrator, been shown to have scientific and technical merit.

(2) Federal funds made available under this Act shall be used only for direct costs and not for indirect costs, profits, or management fees of the contractor.
(3) In determining whether to make an award to a joint venture, the Administrator shall consider whether the members of the joint venture have provided for the appropriate participation of small United States businesses in the joint venture.

(4) Section 552 of title 5, United States Code, shall not apply to the following information obtained by the Federal Government on a confidential basis in connection with the activities of any business or any joint venture that receives funding under this Act:

(A) Information on the business operation of a member of the business or joint venture.

(B) Trade secrets possessed by any business or by a member of the joint venture.

(5) Intellectual property owned and developed by a business or joint venture that receives funding under this Act or by any member of such a joint venture may not be disclosed by any officer or employee of the United States except in accordance with a written agreement between the owner or developer and the Administrator.

(6) The United States shall be entitled to a share of the licensing fees and royalty payments made to and retained by a business or joint venture to which it contributes under this section in an amount proportionate to the
Federal share of the costs incurred by the business or joint
venture, as determined by independent audit.

(7) A contract or award under this Act shall contain
appropriate provisions for discontinuance of the project
and return of the unspent Federal funds to the Agency
(after payment of all allowable costs and an audit) if it
appears that, due to technical difficulties, financial dif-
ficulty on the part of the recipient, or for any other reason,
the recipient is not making satisfactory progress toward
successful completion of the project.

(8) Upon dissolution of a joint venture that receives
funding under this Act or at a time otherwise agreed upon,
the United States shall be entitled to a share of the resid-
ual assets of a joint venture that is proportionate to the
Federal share of the costs of the joint venture, as deter-
mined by independent audit.

SEC. 9. REVOLVING FUND.

(a) ESTABLISHMENT.—There is established in the
Treasury of the United States a revolving fund to be
known as the “Environmental Advanced Research
Projects Revolving Fund”, which shall consist of such
amounts as are appropriated or credited to it from time
to time.
(b) EXPENDITURES FROM THE FUND.—Amounts in
the Fund shall be available, as provided in appropriations
Acts, to carry out the purposes of this Act.

(c) LOANS, GRANTS, AND OTHER FINANCIAL ASSIST-
ANCE.—(1) The Administrator may use the Fund for the
purpose of making loans, grants, and other financial as-
sistance to industrial and nonprofit research centers, uni-
versities, and other entities that serve the long-term envi-
ronmental security needs of the United States, to carry
out the purposes of this Act.

(2) A loan made under this section shall bear interest
at a rate determined by the Secretary of the Treasury (as
of the close of the calendar month preceding the month
in which the loan is made) to be 3 percent less than the
current market yield on outstanding marketable obliga-
tions of the United States with remaining periods to matur-
ity comparable to the period for which the loan is made.

(3) Repayments on a loan made under this section
and the proceeds from any other agreement entered into
by the Administrator under this Act shall be credited to
the Fund.

(d) MANAGEMENT OF FUND.—(1) The Secretary of
the Treasury shall manage the Fund and, after con-
sultation with the Administrator, report to Congress each
year on the financial condition and the results of the oper-
ation of the Fund during the preceding fiscal year and on the expected condition and operations of the Fund during the next 5 fiscal years.

(2)(A) The Secretary of the Treasury shall invest the portion of the Fund that is not, in the judgment of the Secretary, required to meet current withdrawals.

(B) Investments of monies in the Fund may be made only in interest-bearing obligations of the United States.

SEC. 10. ANNUAL REPORT.

The Administrator shall submit a report to Congress annually describing—

(1) the activities of the Agency;
(2) the Agency's plans for future activities;
(3) the manner and extent to which technologies developed with assistance from the Agency have been used; and
(4) the extent to which those technologies have been transferred overseas.

SEC. 11. APPROPRIATIONS.

(a) AMOUNTS.—There are authorized to be appropriated to the Agency to carry out this Act $75,000,000 for fiscal year 1993, $140,000,000 for fiscal year 1994, and $200,000,000 for fiscal year 1995.
(b) LIMITATION ON USE.—Of amounts appropriated to the Agency, no more than 5 percent may be used to pay for administrative expenses of the Agency.
EXHIBIT 4-D

ORGANIZED RESEARCH UNITS

Organized Research Units (ORU's) are dedicated research centers. They are typically, but not always, located in Universities. Within Universities, however, they are often atypical. They are usually multi-disciplinary, flexible, responsive units with the ability to take initiative and pursue opportunities. They represent a potentially powerful partner in joint proposal and resource development. The attached list (also included in Report Two as Exhibit 2-B) is a list of ORU’s with historic preservation research interests.
UNIVERSITY ORGANIZED RESEARCH UNITS
WITH
HISTORIC PRESERVATION INTERESTS AND EXPERIENCE

UNIVERSITY OF ARIZONA
ARCHITECTURE RESEARCH LABORATORY
COLLEGE OF ARCHITECTURE
TUCSON, AZ 85721

FRED S. MATTER, DIRECTOR
602/621-6751

Research activities and fields include historic preservation of buildings, desert architecture, energy, water conservation, and modeling and simulation.

UNIVERSITY OF FLORIDA
CENTER FOR TROPICAL AND SUBTROPICAL ARCHITECTURE PLANNING AND CONSTRUCTION
336 WEIL HALL
GAINESVILLE, FL 32611

MARK T. JAROSZEWICS, DIRECTOR
904/392-0226

Research activities and fields include inventory and preservation of the Caribbean architectural heritage, design, building materials and construction of tropical architecture.
UNIVERSITY OF FLORIDA
RESEARCH AND EDUCATIONAL CENTER FOR ARCHITECTURAL PRESERVATION
COLLEGE OF ARCHITECTURE
#331 ARCH BUILDING
GAINESVILLE, FL 32611

SUSAN TATE, DIRECTOR
904/392-7003
904/392-7266 FAX

Research activities and fields include architectural preservation and conservation in Nantucket, MA, Florida and the Caribbean, (see previous entry), and secondary education programs in preservation.

GEORGIA INSTITUTE OF TECHNOLOGY
CENTER FOR ARCHITECTURAL CONSERVATION
245 FOURTH STREET, N.W.
ATLANTA, GA 30332-0155

JOHN H. MYERS, DIRECTOR
404/894-3390
404/894-3874 FAX

Research activities and fields include building diagnostics and computer programs for condition assessment and monitoring.
LOUISIANA STATE UNIVERSITY
COMPUTER AIDED DESIGN AND GEOGRAPHIC
INFORMATION SYSTEMS LABORATORY
ROOM 216, COLLEGE OF DESIGN
BATON ROUGE, LA  70803

JACK N. HAYNES, DIRECTOR
504/388-8816

Research activities and fields include historic preservation, energy conservation, daylighting, building standards and facility management.

UNIVERSITY OF MISSOURI - ST. LOUIS
ARCHAEOLOGICAL SURVEY
BUILDING 32
8001 NATURAL BRIDGE ROAD
ST. LOUIS, MO 63121

JOSEPH M. NIXON, DIRECTOR
314/553-5208

Research activities and fields include cultural resource management in architecture, archaeology and history.
MISSISSIPPI STATE UNIVERSITY
CENTER FOR SMALL TOWN RESEARCH AND DESIGN
P. O. BOX AQ
MISSISSIPPI STATE, MS 39762

GEORGE W. PARSONS, DIRECTOR
601/325-2207

Research activities and fields include historic architecture evaluation, affordable housing, graphic design, ecological design and zoning strategies.

UNIVERSITY OF NEVADA - RENO
HISTORIC PRESERVATION PROGRAM
501 BB
RENO, NV 89557

DON D. FOWLER, DIRECTOR
702/784-6851

Research activities and fields include inventory and detailed studies of historic buildings, districts and ranches in the Great Basin and the American West, studies historic and prehistoric archaeological sites.
UNIVERSITY OF PENNSYLVANIA
CENTER FOR ENVIRONMENTAL DESIGN AND PLANNING
103 MYERSON HALL/6311
PHILADELPHIA, PA 19104

WILLIAM H. BRAHAM, DIRECTOR
215/898-8799
215/898-9215 FAX

Research activities and fields include historic preservation, building technology, regional planning, landscape architecture and computer analysis.

TEXAS A&M UNIVERSITY
CENTER FOR HISTORIC RESOURCES
COLLEGE OF ARCHITECTURE
COLLEGE STATION, TX 77843-3137

ROGER S. ULRICH, ADMINISTRATOR
409/845-1221
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