HAER and the Recording of Technological Heritage: Reflections on 30 Years' Work

Eric DeLony

Last of the programs created as part of the "new preservation" in the late 1960s, the Historic American Engineering Record (HAER) was established to recognize the achievements of engineers, industrialists, and laborers. New preservation was begun in the 1960s by a group of historians, architects, and preservationists concerned with the alarming rate at which architectural landmarks and the scenic and historic quality of American cities was being destroyed by highways and urban renewal in the name of progress. Since 1969, HAER has been a primary catalyst for the recording and, when possible, protection of engineering structures and the industrial workplace, along with historic architecture and other worthy resources.

Introduction

During the 1960s, historians, architects, and preservationists grew increasingly concerned over the geometrically increasing rate at which early works of architecture were being lost to freeways and urban renewal. To a lesser degree, this concern extended to works of engineering and industry. Advocates were quick to point out that these resources were being destroyed at a higher rate than architectural monuments, not to mention losses through natural attrition and the scrap drives of two world wars.[1]

At the same time, American engineers felt beleaguered. Though building the greatest road system since the Romans and soon to put a man on the moon, few engineers were capable of articulating the social value of their work. Instead, their roads and urban renewal projects were perceived as destroyers of cities, splitting neighborhoods, and desecrating wilderness. In short, they were viewed by many as "wooden" and anesthetized to historic structures and the environment. By generating interest in engineering relics, perhaps some professional affirmation might be gained.[2]

An abundance of industrial and engineering sites still dotted the American landscape in the 1960s despite the onslaught of progress in the form of freeways and urban renewal. America retained a wealth of bridges, dams, canals, factories, power plants, and other engineering and industrial structures of historic interest. Many historic sites maintained by the National Park Service (NPS), the states, and local communities reflected engineering or industrial themes.[3] Even though numerous historic sites had survived, preservationists realized that the future held little realistic hope that many more physical objects of engineering and industry could be saved as historic monuments.

Preservation through documentation was a viable alternative, however. The Historic American Engineering Record, the last program to be established as part of the "new preservation movement," was created in 1969 by the NPS, the Library of Congress, and the American Society of Civil Engineers (ASCE) so that documentation on outstanding works of engineering, industry, and technological processes could be preserved.

A number of people working in Washington, DC, were interested in the history of technology and the emerging field of industrial archeology (IA). Robert M. Vogel, the relatively new curator of mechanical and civil engineering at the National Museum of History and Technology, Smithsonian Institution, was one of them. An early advocate of an engineering documentation program, Vogel had attended some of the first industrial archeology conferences in England. Organized by Kenneth Hudson and Angus Buchanan at Bath University, the establishment of IA as a new field of study was debated. Subsequently, Vogel convened a similar seminar at the Smithsonian on April 11, 1967, to launch the American equivalent of an IA movement, based generally on British practice.[4]

Another key player during these formative years was James C. Massey, chief of the Historic American Buildings Survey (HABS) and the first chief of HAER. In cooperation with the Smithsonian Institution, HABS initiated several recording projects in the late 1960s that varied from its normal focus on historic architecture. Vogel had approached Massey and HABS seeking the help of NPS in recording the Bradway Machine Works in Stafford, Connecticut, and the Dudley Shuttle Works in Wilkinsonville, Massachusetts. Along with students from the University of Maryland's College of Engineering, in 1966 he recorded

the Bollman Bridge at Savage, Maryland. This project brought in the ASCE because, simultaneous with the recording, the bridge was designated as the first ASCE national historic civil engineering landmark.

Also actively working for recognition of engineering heritage at the time was Neal FitzSimons, an engineer in the senior executive service responsible for the protective structures program of the Pentagon. Since engineering school at Cornell, FitzSimons had been interested in the history of civil engineering and, after moving to Washington, worked to establish a program on the history of civil engineering within the ASCE. FitzSimons was appointed to a Task Committee to study his proposal, and, in the spring of 1965, the Board of Direction approved the establishment of a permanent Committee on the History & Heritage of Civil Engineering (CHHACE), chaired by Past President Gail Hathaway. Shortly after CHHACE was formed, Hathaway and FitzSimons began discussions with the NPS and the Library of Congress on establishing an engineering documentation program.[5]

On October 3, 1967, in a meeting with Massey and NPS associate director of design and construction, Johannes E. N. Jensen, Gail Hathaway formally presented FitzSimon's proposal for the establishment of a new program to record historic engineering works as a cooperative venture with ASCE. The proposal fell on sympathetic ears since Massey had a personal interest in industrial architecture and, over the previous few years, had promoted HABS recording of textile mills and small industries in collaboration with Vogel and the Smithsonian. Before going along with the idea, however, Park Service Director George B. Hartzog Jr. wanted to ensure that the program not duplicate the work of HABS, and that other disciplines, such as landscape architecture or mechanical engineering, would not seek similar treatment. In response, Ernest A. Connally, director of the recently established Office of Archeology and Historic Preservation and Massey's boss, got assurances from Raymond L. Freeman, a prominent Washington landscape architect and Interior Department official, and from Gail Hathaway that there would be no pressure for the establishment of similar programs from the landscape architects or the other engineering disciplines.

With strong advocates for an engineering documentation program within the Park Service hierarchy, a tripartite agreement to establish HAER was ratified on January 10, 1969, with the signing of a document similar to the one that established HABS in 1933.[6]

Securing funding for the new HAER program was the next step. Congressman George Mahon (D-Tex.) of Lubbock, chairman of the House Appropriations Committee, made certain that the $79,000 line item for HAER was in the NPS fiscal-year 1970 budget. Success in securing the appropriation was due in no small part to Jerry Rogers who had worked with Connally to help set up the National Register of Historic Places. Like Connally, Rogers was a Texan who recently had returned to Texas to start up a new museum of western ranching history at Texas Tech in Lubbock.[7]

During the summer of 1970, R. Carol Huberman was hired as the first HAER Washington office employee, followed by architect Donald G. Prycer who worked on HAER's Commonwealth of Virginia recording project that same summer. Eric DeLony, hired in January 1971, was the first permanent employee, and Douglas L. Griffin, an industrial engineer from Neal FitzSimons' office at the Pentagon, was HAER's first supervisor beginning in May 1971.

Since then, HAER has worked to create a national archive of America's industrial, engineering, and technological achievements. Some of the recording projects fostered subsequent preservation efforts that transformed communities and attitudes toward the industrial work place. The steel mills, factories, foundries, and the canal, road, and rail networks that HAER recorded are now beginning to be thoughtfully regarded and preserved with new insights. Through its federal authority, national standards, summer recording programs, and Library of Congress archives, HAER has furthered recognition of the oft-forgotten contributions of engineers, industrialists, and laborers. This paper examines not only what HAER has done, but also what it is doing and what the future holds.

The first decades can be broken down into three phases:

- 1969–79, a decade of discovery, invention, and proselytizing a new field of heritage preservation
- 1979–84, a period of crisis due to political and governmental reorganization
- 1984–99, a period of steady growth for HAER at a rate of 2–5 percent per year measured by dollars and jobs

An average of $390,000 appropriated annually by Congress has been used to leverage three-for-one dollars from other federal agencies, the states, private preservation groups, and private industry for an estimated operating program of $1.5 million in 1999.

Figure 1. *HAER Advisory Board reception at the Custis-Lee Mansion, Arlington Cemetery, August 31, 1972, for members of HAER's first advisory board. BACK ROW (left to right): Charles Parrott III, HAER architect; Dr. William Murtagh, keeper of the National Register; Alan Fern, chief, Prints & Photographs Division, Library of Congress; Virginia Daiker, architectural historian, Library of Congress; Dr. Lynn White (Stanford Univ.), advisor; Douglas Griffin, HAER chief; Tom Crellin, chief, Historic Architecture Division; SECOND ROW: Eric DeLony, HAER architect; Jack Boucher, HABS/HAER photographer; Mrs. Massey; John Brisco, advisor, ASCE; Mrs. Mavis FitzSimons; Neal FitzSimons, advisor, ASCE; Waldo Bowman, advisor, ASCE; Carol Huberman, HAER historian; FRONT ROW: John Poppeliers, HABS chief; Dr. Connally, chief, OAHP; Janice Connally; Eugene Ferguson, (Univ. of Delaware), advisor; Mrs. Julia Poppeliers; Gail Hathaway, advisor, ASCE.* Jack Rottier, photographer, NPS.

Over the last 30 years, 1,500 or approximately 50 jobs per year were created in industrial heritage documentation, not including numerous jobs held by people preparing mitigatory documentation of threatened industrial and engineering sites.

In its first 30 years, HAER helped expand the boundaries of historic preservation to include engineering and industry. Since 1969 over 7,000 sites, structures, and objects have been recorded with over 60,000 photographs, 600 large-format color transparencies, 49,000 data pages, and 3,000 sheets of measured and interpretive drawings, all transmitted to the Library of Congress. Additionally, HAER has established national documentation standards, cultivated numerous cooperative relationships with a variety of entities, adopted an entrepreneurial philosophy for greater flexibility, and created a national training and documentation program.

Statutory authority, the all-important foundation of any governmental program, was provided in the National Historic Sites Act of 1935 that authorized the NPS

> to secure, collate, and preserve . . . to survey and to make necessary investigations . . . to contract and make cooperative agreements, to develop an educational program and service for the purpose of making the records available to the public for which reasonable charges may be made.

This documentation mandate called on the NPS to secure, collate, and preserve drawings, plans, photographs, and histories of significant architectural, technological, historical, and cultural sites. The basic legislative authority was expanded in 1966 by the National Historic Preservation

Figure 2. *HAER's first Advisory Committee, convened September 1, 1972, in Washington, DC.* STANDING *(left to right): Tom Crellin, chief, Historic Architecture Division; Waldo Bowman, advisor, ASCE; Dr. Lynn White (Stanford Univ.), advisor historian; Virginia Daiker, architectural advisor, Library of Congress; Douglas Griffin, chief, HAER; Gail Hathaway, advisor, ASCE;* SITTING *(left to right): Eugene Ferguson (Univ. of Delaware/ Hagley Foundation), advisor historian and professor of mechanical engineering; Dr. Ernest Allen Connally, chief, OAHP; John Brisco, advisor, ASCE; Neal FitzSimons, advisor, ASCE.* Jack Boucher, HAER photographer.

Act, which charged federal agencies with stewardship responsibilities for the historic properties they owned.[8]

The 1966 act was considerably enhanced in May 1971, when President Richard Nixon signed Executive Order 11593 that mandated that any building, site, structure, or object listed or eligible for listing on the National Register of Historic Places threatened by a federally funded or licensed project must be documented to HABS/HAER standards. These provisions later became law under the 1980 Amendments to the National Historic Preservation Act. This mitigatory documentation mandate has produced a continuous flow of records into the HAER collection. It is significant that most of the sites recorded by this mechanism tend to be of state and local significance. After 30 years of application, few sites of national significance are being destroyed.[9]

Because of its governmental authority and national scope, HAER is recognized as the national standard against which engineering and industrial heritage documentation in the United States is measured. A critical component of the standard is the creation and maintenance of a national archive of records at the Library of Congress.[10] Significantly, HAER documentation is in the public domain. Materials from the collection can be used without restriction other than the courtesy of a credit line citing the delineator, photographer, or author, and the Historic American Engineering Record, National Park Service. Much as the Smithsonian Institution is referred to as the "nation's attic," the drawings, photographs, and histories that comprise the HAER collection might be considered the national memory of engineering and industrial achievements. Taken in this context, the process of documentation becomes a powerful tool, and the collection can be appreciated when one

realizes that it was designed to last not 5, nor 50, but, rather, 500 years.

HAER produces documentation with the help of partners. In addition to the support of the NPS, HAER, through its tripartite agreement, has the backing of two other notable institutions—the Library of Congress and the American Society of Civil Engineers.[11] The groups that cosponsor HAER documentation projects, such as other federal agencies, state and local governments, historical societies, private industry, and individuals, are also considered partners. Donations from these partners augment HAER's annual appropriation from the Congress. Avoiding exclusive reliance on federal funding gives the program great flexibility and makes the role of partners important. Donations and shared funding are based on the premise that all sectors of society (government, business, industry, and individuals) should participate in a national preservation effort. Participation, especially financial, multiplies the effect of the program. More importantly, it encourages partners to recognize the concept of industrial heritage documentation and, by extension, make a commitment to preserving significant attributes of the engineered environment.[12]

HAER documentation is compiled by recording teams, working in a variety of ways, that have constituted, in effect, a national training program. Every summer, students of architecture, engineering, history of technology, industrial design, and other related fields are hired to work on HAER projects under the supervision of veteran project leaders or other professionals (see figure 3).

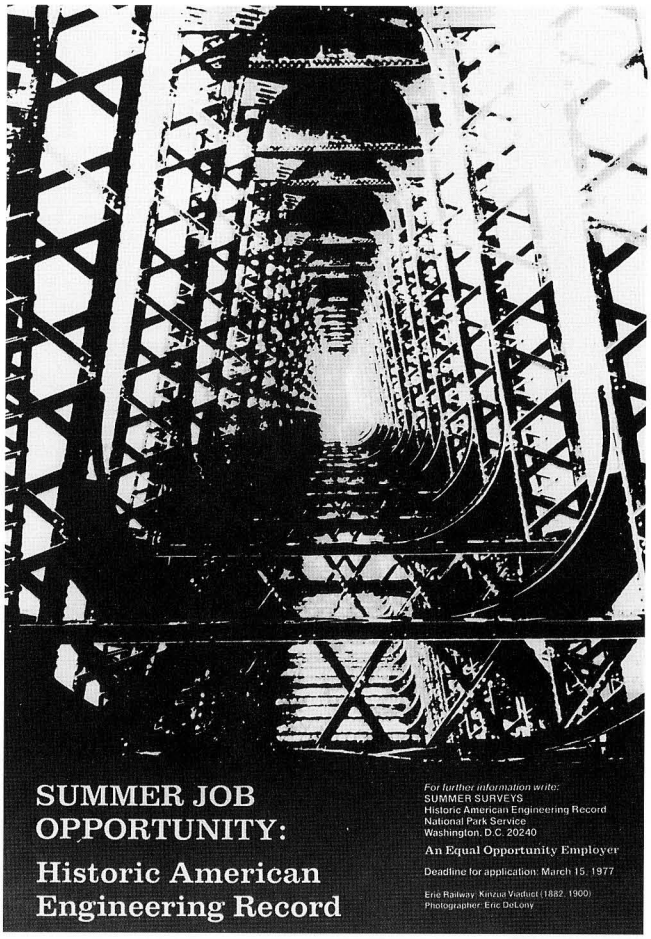

Figure 3. *HAER recruiting poster, 1973. To bring identity to the new program, in 1973 HAER started recruiting (separate from HABS) among schools of architecture, engineering, and the history of technology—getting typically 300–400 applications in the early 1970s, a period of recession. Many architects and engineers were out of work, and few student summer jobs existed. Today, both HABS and HAER face a competitive job market to attract architects and engineers to their summer programs.*

1969–79: A Decade of Discovery and Experimentation

The first 10 years of HAER can be characterized as exploratory, examining as diverse an array of sites, structures, and artifacts as possible and trying different techniques of research, documentation, and graphic interpretation—literally inventing techniques as we did the work. Seeking to broaden knowledge of existing engineering and industrial works, HAER cosponsored site-specific inventories with universities and other preservation groups, including surveys of Southwestern water resources, wind and tide mills on Long Island, and stationary steam engines (see figure 4).[13] State inventories were conducted in Virginia, Pennsylvania, Florida, Oklahoma, California, Delaware, South Dakota, Colorado, Georgia, Michigan, and Rhode Island; area inventories were conducted in Trenton, New Jersey, Cuyahoga County, Ohio, Western New York state, and the lower Merrimack Valley in New England.[14]

Surveys often required new recording techniques. For example, while investigating linear systems such as the early trunklines of the Baltimore & Ohio and the Erie railroads, helicopters were used for aerial reconnaissance that quickly and efficiently inventoried hundreds of miles of right-of-way (see figures 5, 6). Aerial photography also was used to get an overview of large industrial complexes such as the mills and power canal systems that remained from Alexander Hamilton's "Society for the Establishment of Useful Manufactures," one of the first planned industrial

EXISTING SURVEYS | DATA | DWGS | PHOTOGRAPHS | STATES

HAER INVENTORY

PH0407038

1. NAME OF STRUCTURE: Manhattan Bridge
2. DATE: 1909
3. NATURE OF STRUCTURE: suspension bridge
4. INDUSTRIAL CLASSIFICATION: BRIDGES: SUSP. (61)
5. LOCATION: STREET & NUMBER: Flatbush Avenue at the East River,
CITY OR TOWN: New York City
COUNTY: (047)(061) KINGS; NEW YORK
STATE: 36 NY
7610
6. USGS QUAD MAP & UTM GRID REF.: BROOKLYN 18.585280.4506430
7. OWNER OF PROPERTY: Dept. of Public Works
ADDRESS:
8. CONDITION: X EXCELLENT ☐ GOOD ☐ FAIR ☐ DETERIORATED ☐ RUINS ☐ UNEXPOSED ☐ ALTERED XX ACCESSIBLE TO PUBLIC

9. DESCRIPTION & BACKGROUND HISTORY: NUMBER OF STRUCTURES; DIMENSIONS; FABRIC; STRUCTURE & FORM; SURVIVING MACHINERY, FITTINGS AND EQUIPMENT; APPROX. AREA OF SITE; ALTERATIONS; PRESENT USE; ENGINEER/ ARCHITECT/DESIGNER; IMPORTANT EVENTS & INDIVIDUALS.

The Manhattan Bridge, which opened on the last day of December 1909, was built to relieve the congested traffic of its neighbor, the Brooklyn Bridge. Gustav Lindenthal (1850-1935) prepared the design. Two steel towers carry four cables, each with a stiffening truss. The double-decked bridge was designed for four subway tracks on the lower deck, two street railways and two elevated lines on the upper level, and a roadway in between the two inner trusses of each deck. Though the design of the approaches to the bridge was primarily a problem of circulation, Carrere and Hastings were lavish in their use of classical decorative relief; it was, noted the Department of Bridges at the time, to be "a complete, dignified, and monumental ensemble, worthy of one of the principal gate ways of the city."

10. PHOTOGRAPHS & SKETCH MAP ON REVERSE SIDE.

11. RELATED SOURCES OF INFORMATION: HISTORICAL REFERENCES (PUBLISHED ARTICLES, MANUSCRIPTS, REPORTS, DRAWINGS, PHOTOGRAPHIC RECORDS)
CONTACTS: (NAMES & ADDRESSES OF ANYONE WITH EYE-WITNESS ACCOUNTS OR RELEVANT INFORMATION); TAPE RECORDINGS.

The American Architect and Building News, v. 102, n. 1912 (14 August 1912), pp. 61-2.
Ralph Modjeski, "Report on Design & Construction of the Manhattan Bridge Over the East River," Engineering News, v. 2, n. 16 (14 October 1909), pp. 401-409.

12. DANGER OF DEMOLITION OR DAMAGE ☐ YES X NO
NATURE OF THREAT:
13. PRIORITY

14. EXISTING SURVEYS AND DATES: ☐ NHL ☐ NR ☐ HAER ☐ HABS ☐ STATE ☐ COUNTY ☐ LOCAL ☐ OTHER

15. INVENTORIED BY: YOUR NAME: P.H. STOTT
ADDRESS:
AFFILIATION: HAER-SIA
DATE: October 1974

PLEASE RETURN TO THE HISTORIC AMERICAN ENGINEERING RECORD, NATIONAL PARK SERVICE, WASHINGTON, DC 20240

MANUFACTURING INDUSTRIES (MFG) | UTILITIES (UTIL) | POWER SOURCES & PRIME MOVERS (PS & PM) | TRANSPORTATION (TRANS) | COMM | BRIDGES

Figure 4. *First HAER Inventory form, an 8-×-10-inch McBee Keysort card. The holes on the perimeter were used to search for information by decade, state, and industrial structure classification. A knitting-needle-like poker was inserted through the holes corresponding to the various categories.*

complexes in the United States at the falls of the Passaic River in Paterson, New Jersey.

While the inventories were useful for many purposes, the summer recording teams have been the heart of the HAER program. Since the program's inception, more than 1,500 young people have had the opportunity for a hands-on experience documenting the nation's industrial, engineering, and architectural heritage in the summer.[15] In its formative years, HAER first followed HABS convention of fielding teams composed primarily of architects who produced as-is, existing-condition drawings. It soon became apparent that additional skills were necessary to understand large, complex industrial sites. Rather than pristine original properties, most surviving industrial sites had undergone many changes, with multiple layers of additions or partial removals. Deciphering these changes required skillful practitioners in a variety of disciplines—architects, engineers, historians, industrial designers, archeologists, and photographers. Anyone who could contribute was offered internship opportunities to work on HAER projects during the nonacademic portion of the year. Borrowing a precedent from the recently established historic preservation program at Columbia University that the author attended, HAER instituted a similar multidisciplinary team approach to industrial site documentation. Students remain the core of the summer documentation program, and the fundamental philosophy of HAER recording continues to

Figure 5. *1971 aerial reconnaissance of the Erie Railroad. In 1971 Chester Liebs, New York State Historic Trust historian, secured Governor Rockefeller's personal helicopter to survey over 400 miles of Erie Railroad mainline and its major branches from Sparkill, N.Y., on the Hudson to Dunkirk, N.Y., on Lake Erie. The flight quickly determined priorities for more in-depth documentation and greatly facilitated planning the logistics for the ground crew that completed recording during the summer. Left to right: Jack Boucher, photographer, HABS/HAER; Eric DeLony, Chester Liebs, and Jack Waite, NYSHT; Robert Vogel, Anthony Hill, Jack Colborn, New York State Conservation Department helicopter pilots. Flight taken April 27–28, 1971.* Jack Boucher, HABS/HAER photographer.

Figure 6. *Antigravity flying machine hovering while photographers document the Erie Railroad's Portage Viaduct in western New York state.* Jack Boucher, HABS/HAER photographer.

Figure 7. *Crew of the Mohawk-Hudson area survey, summer 1969. Left to right: HAER architects Eric DeLony, David Bouse, Richard Pollack (field supervisor), and Charles Parrott III, document Whipple's cast- and wrought-iron bowstring truss bridge (1867), Nomanskill, New York.* Jack Boucher, HABS/HAER photographer.

emphasize the multidisciplinary team approach with a site-specific focus on the physical remains of engineering and industrial heritage.[16]

The Mohawk-Hudson Area Survey conducted during the summer of Woodstock, 1969, and headquartered at Rensselaer Polytechnic Institute in Troy, New York, was HAER's first official project, although two earlier surveys with similar goals preceded Mohawk-Hudson. The New England Textile Mill Surveys I and II, conducted by HABS in collaboration with Vogel and the Smithsonian, were designed to record the architecture of the New England textile industry (see figures 7, 8). These mills were among the earliest examples of American industrial architecture. Unlike traditional HABS surveys which treated mills primarily as architectural phenomena, the Mohawk-Hudson Survey devoted as much attention to the machinery and the industrial processes as to the architecture.[17] The Mohawk-Hudson Survey, done in collaboration with the Smithsonian, was intended as a demonstration project, a pioneer endeavor in historical research integrating engineering history, local history, and landmark preservation studies into a single research and recording operation.[18]

Following the success of the Mohawk-Hudson Survey, a project was fielded during the next summer to record the Baltimore & Ohio Railroad, investigating the historic remains of America's first major trunkline, and another to document a selection of industrial and engineering sites in Virginia (see figure 9). The B&O survey was funded with help from the Smithsonian and Robert Vogel again served as project director.

HAER's first multiyear projects occurred in 1973 and 1974 in Paterson, New Jersey, and Lowell, Massachusetts, two areas claiming birthplace status as the origin of America's industrial revolution. They were the precursors of HAER endeavors to help revitalize depressed industrial areas. Paterson was designed by Pierre Charles L'Enfant, planner of the nation's capital, with a three-tiered system of power canals. The mills here included the first Colt firearms works, early locomotive manufactories, and, by the late-19th century, mills that eventually distinguished Paterson as the silk capital of the world (see figure 10). The cotton mills at Lowell, located at the falls of the Merrimack River, also used a three-tiered hydraulic power canal system. Lowell became an important center of the American textile industry

Figure 8. *Troy, New York, fire department's hook-and-ladder truck. Used by David Bouse and Charles Parrott III in June 1969 while measuring cornice of Troy Gasholder house.* Robert Vogel, Smithsonian Institution, photographer.

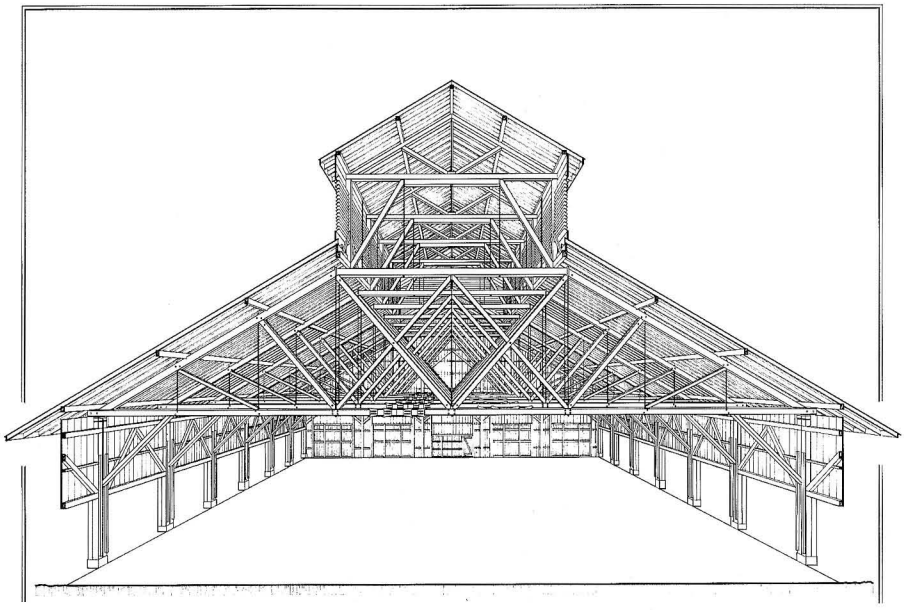

Figure 9. *One-point perspective drawing of the B&O's Rail Rolling Mill in Cumberland, Maryland, one of HAER's first interpretive drawing experiments. It added to traditional plan, section, and elevation views and was intended to give a graphic impression of the large, open floor space free of columns.* Jeffrey Jenkins, HAER delineator.

Figure 10. *Great Falls-SUM Survey, summer 1974. Fortuitous circumstances allowed simultaneous above- and below-ground archeology in this project when a HAER team worked with industrial archaeologist Edward S. Rutsch, whose dirt-archeology team revealed the locomotive bays in a demolished portion of the former Grant Locomotive Shops in Paterson, N. J., and located head and tail races running along the tree line in this photograph. The combined skills of the two teams produced a documentation package that was unprecedented for the new, emerging field of industrial archeology.* Jack Boucher, HABS/HAER photographer.

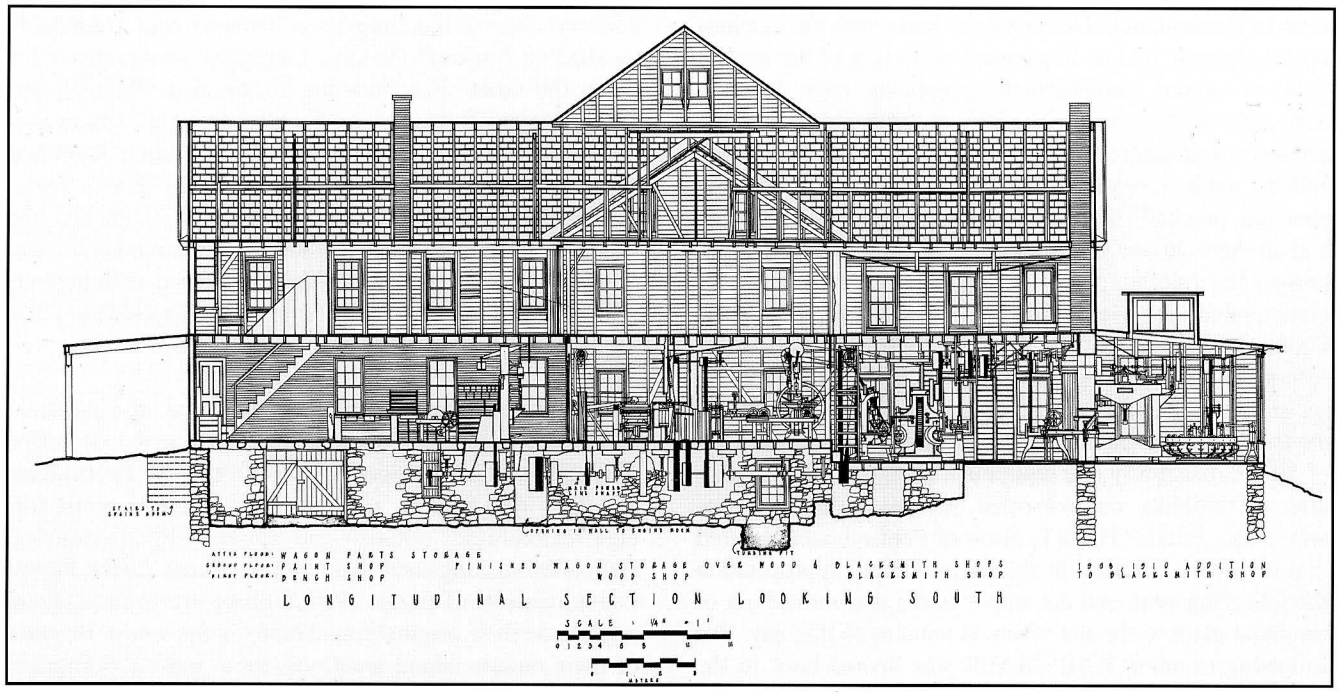

Figure 11. *Gruber Wagon Works 1882, 1906, longitudinal section, looking south. The HAER drawing sheets were used by the Corps of Engineers to plan the dismantling and relocation of the works. Architects John Milner & Associates, Media, Pa., modified and annotated copies of the HAER drawings to indicate the building's sectioning and bracing prior to a move along narrow Pennsylvania country roads. Former HAER architect Charles Parrott III was John Milner's project manager.* R. David Schaaf, delineator, November 1974, HAER.

and, by the Civil War, the largest textile-producing center in the world. Both communities began deteriorating during the early-20th century when their industries moved south.

In the late 1960s and early 1970s, Paterson and Lowell represented the epitome of depressed industrial towns—thousands of square feet of under-utilized mill buildings and factory floors, depressed center cities, and an aging workforce mixed with a growing minority population. Additionally, Paterson featured a 1950s solution to urban decay: an interstate-scale highway through the heart of the decaying industrial district. HAER and its documentation teams worked with local preservationists and political leaders to establish distinctive historic areas that built on the themes of the city's existing industrial fabric instead of the contemporary urban renewal tenets of mass clearing and new construction. Schemes to restore the canals as linear parks that could link neighborhoods together, and adaptively reuse the factory buildings rather than replace them unfolded from HAER's baseline documentation. To this day, both cities continue in this pattern; Paterson was designated a National Historic Landmark in 1976, and Lowell's historic core gained National Historical Park status in 1978.[19]

Other experimental ventures during the 1970s included the formation of an emergency recording team (ERT), based in Washington to fulfill requests for emergency documentation services. ERT sites tended to be small, discrete, and threatened but, because of their size, did not warrant full-fledged summer recording teams. ERT's main purpose was demonstrating federal interest, with hopes of subsequently deflecting the threat to the site. Local sponsors paid for the team's expenses, and with the help of local volunteers, field measurements were made and the site photographed. HAER then completed the drawings as personnel and time permitted.

ERT projects sometimes developed into full-recording efforts. HAER responded to a call from the Pennsylvania state preservation office in 1973 to record the Gruber Wagon Works, located in the town of Bernville near Reading, Pennsylvania, a site that was threatened with inundation by the Blue Marsh Lake dam project of the Army Corps of Engineers (see figure 11). Upon arrival, the team

found a Pennsylvania-Dutch wagonworks with the machinery, equipment, and an impressive collection of the several types of wagons manufactured, completely intact. In addition, a descendent of the original owner, Franklin Gruber, offered a first-hand account of how the wagons were made and the works' evolution. The significance of this remarkable site reached the local media while the HAER team was in the field and resulted in an expanded Corps-funded project the following year aimed at recording the works completely in the event relocation funds became available. Gruber became one of the first sites where literally every splinter in the building was recorded. The comprehensive set of drawings and large-format photographs were used by the Corps to plan the building's partial dismantling, storage of all the machinery and equipment during the move, and, after the building was relocated, its reassembly at a protected site. Senator Hugh L. Scott of Pennsylvania ensured that there was funding in the Army Corps' appropriation the following year, and the wagonworks was moved out of the flood plain to the site where it remains to this day. The following summer, HABS/HAER was invited back to the area to record other sites threatened by Blue Marsh Lake.

Over the years, HAER documented many other sites for a variety of federal agencies: "Rocket Row" at Cape Canaveral, the Charlestown Navy Yard in Boston, and other Army Corps projects such as the Tennessee-Tombigbee Water Way, the Richard B. Russell Dam, and DARCOM, the US Army's Defense Readiness and Materiel Command. The Chesapeake & Ohio Canal was recorded for HAER's parent agency, the National Park Service.

HAER documentation has also been the basis of National Register of Historic Places and National Historic Landmark nominations, thereby supporting other NPS programs. During the 1970s, HAER documented many National Historic Landmark sites such as the Baltimore & Ohio Railroad, features of the Erie Canal, the Mormon Tabernacle in Salt Lake City, and the Fairmount Water Works in Philadelphia. Following HAER surveys, these sites were all designated National Historic Landmarks: Paterson, N. J.; Lowell, Mass.; the Gruber Wagon Works; the Central of Georgia Railroad Shops in Savannah; the South Carolina & Canal Railroad Shops in Charleston; Sloss Furnaces in Birmingham, Ala.; the mills at the falls of the Chattahoochee River in Columbus, Ga.; the Augusta Canal and its associated mills (referred to as the "Lowell of the South"); the McNeil Street Pumping Station in Shreveport, La.; and the Georgetown Steam Plant in Seattle, Wa., Small theme studies prepared by HAER on the Golden Gate, Cincinnati, and Wheeling suspension bridges and the country's surviving long-span, trussed-roof trainsheds resulted in National Historic Landmark designations for those and other sites: Reading Terminal in Philadelphia; Union Station Trainshed in Montgomery, Ala.; Union Station Trainshed in Nashville; Main Street Station Trainshed in Richmond, Va.; the B&O's Mount Royal Station Trainshed in Baltimore; the Central of Georgia's trainshed and shop facilities in Savannah; and the trainshed at Union Station in St. Louis. Abandoned and threatened with demolition, nearly all of them have found some adaptive use since designation.

The 1970s experimental era saw HAER making significant Caribbean inroads by documenting the sugar and coffee industries of the American Commonwealth of Puerto Rico and the Virgin Islands. These projects recorded exotic foreign technologies (Danish and Spanish sugar extraction and coffee making) and identified what may be the largest concentration of early-19th-century stationary steam engines on their original foundations in the world. Because of their remote island locations, these mostly European-imported machines that powered the sugar and coffee mills had escaped the scrap drives of the two world wars.

1979–84: Reorganization

The 1970s were capped by a new type of HAER project and the radical reorganization of federal preservation programs. 1977 was the first year of "rehab-action," a program envisioned to expand the documentation mandate by including a planning element designed to identify adaptive reuses for industrial buildings and strategies for revitalizing depressed industrial towns. Rehab-action was based on two initiatives of the Carter administration—rehabilitation tax incentives and energy conservation. The 1976 Tax Act, which promised tax incentives for owners who rehabilitated their buildings according to the Secretary of the Interior's standards generated the largest amount of funding in the history of the preservation movement to that time. Thousands of projects worth many millions of dollars took advantage of the allowance for income-producing property owners to deduct up to 25 percent of the rehabilitation costs if the property was on the National Register and was rehabilitated to certain standards. Coupled with the tax incentives was energy-efficiency legislation passed in reaction to the oil crisis of the early 1970s, legislation that offered tax incentives for investment in energy-efficient technologies for both new and rehabilitation construction.[20]

Rehab-action components were included in projects fielded in Columbus, Ga., Lynchburg, Va., the Fairmount Water

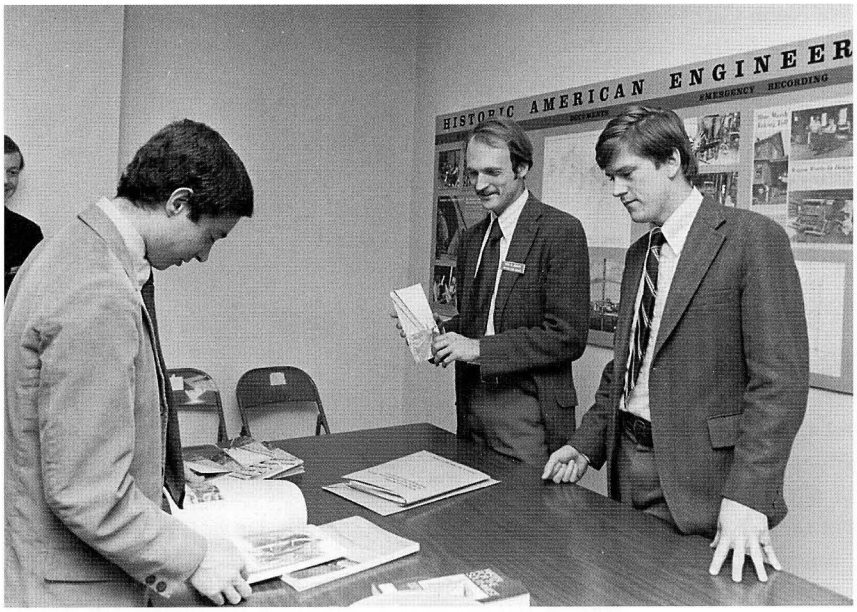

Figure 12. *HAER exhibit, 1974 National Conference of State Historic Preservation Officers. To increase recognition of the program during its formative years, HAER staff organized displays and exhibitions at various events. HAER staff members (left to right): Douglas Griffin, chief; Donald Sackheim, historian; Eric DeLony, architect; and James Armstrong, writer-editor.* Fred Bell, National Park Service photographer.

Figure 13. *Montgomery C. Meigs original chapter, SIA (from the Washington, DC area), November 8, 1975, Keysville Road Bridge, over the Monocacy River near Keymar, Md. The bridge (c. 1875), a column, plate, and channel-type fabricated by the Wrought Iron Bridge Company of Canton, Ohio, was recorded with hopes that the effort would dissuade county engineers from replacing it; however, the bridge was destroyed shortly after recording. Members (left to right) are Sandra DeLony, Alan Nelson, Lars Sande, first SIA President Ted Sande, Eric DeLony, Donald Jackson, Phillip Speiss, Bob Hoke, Charles Looney, Peter Stott, and Robert Vogel.* Photographer unknown.

Works in Philadelphia, and a state-wide survey of North Carolina. Planning students were included in addition to the architects, historians, and photographers usually composing a HAER team. These students conducted economic and marketing analyses as well as surveys on the perceptions of industrial districts in an effort to stimulate revitalization interests in these areas. The planning product incorporated suggestions for revitalization through adaptive reuse and used architectural drawings and sketches to enable local citizens to visualize how districts might be adaptively reused.

The Carter administration also merged the federal preservation programs. Under the leadership of Chris Delaporte, the preservation and natural resource programs of the NPS that reached beyond park boundaries were merged with the Bureau of Outdoor Recreation, resulting in a new agency called the Heritage Conservation and Recreation Service (HCRS). Modeled after the Georgia Trust, created while Carter was governor of that state, the basic premise combined historic preservation with outdoor recreation and the conservation of natural resources. This new vestment merged HABS and HAER in October 1979 to form the National Architectural and Engineering Record (NAER). In April 1980, NAER received a new chief, Robert J. Kapsch. NAER was envisioned as a decentralized program that moved the documentation mandate to eight regional HCRS offices: Albuquerque, Ann Arbor, Atlanta, Boston, Denver, Philadelphia, San Francisco, and Seattle. Washington would function as a policy-setting and standards center, receiving and processing documentation that flowed in from the regions.

The preservation programs lost much of their senior staff to attrition and to the new regional centers. The vision of the Carter administration was philosophically strong, integrating recreation, preservation, and an appreciation of the great natural resources of the United States in a single organization. There was equal merit to the notion of bringing resources closer to the public by having eight mini-NAER offices scattered throughout the country. With a Carter re-election and another four years, reorganization might have worked. But following Ronald Reagan's election on a platform of reducing government, one of the early actions of the new Interior Secretary, James Watt, was to abolish HCRS. As functions and staff were transferred back to the Park Service, relationships between Washington and the NPS regions were redefined.[21]

While 1979 was a banner year in terms of the number of projects fielded by HABS/HAER, reorganization saw both documentation and rehab-action projects decline to a total

Figure 14. *Friends of HAER, Pension Building in Washington 1981 meeting to revitalize HAER's advisory board following its abolishment by HCRS. Left to right: Eric DeLony, HAER principal architect; Richard Anderson, HAER architect; Robert Kapsch, HABS/HAER chief; Bernard Finn, curator of electricity, Smithsonian; Eugene Ferguson, HAER advisor; William Lebovich, HAER historian; Neal FitzSimons, HAER advisor; Ford Peatross, curator, Architecture, Design and Engineering Collections, Library of Congress; Oliver O. Jensen, chief, Prints and Photographs Division, Library of Congress; Robert Vogel, curator, Division of Mechanical and Civil Engineering, Smithsonian Institution; David Sherman, assistant secretary, Department of the Interior; Emory Kemp, HAER advisor.* Jack Boucher, HABS/HAER Photographer.

of four in the summer of 1980. During the summer of 1981, HAER conducted no projects out of the Washington office. Even with the dismantling of the HCRS regional structure, projects were still organized and directed by the NPS regional offices following the earlier model. Under this arrangement, the Pacific-Northwest Region in Seattle recorded the Columbia River Gorge Scenic Highway in Oregon; the Rocky Mountain Region in Denver recorded the Delores River Valley Irrigation Project; and the Western Regional Office in San Francisco documented that city's famous cable car system.

The summer of 1982 was an important turning point. In cooperation with the US Army's Defense Readiness and Materiel Command (DARCOM), the HABS/HAER office in Washington conducted one of the largest and most comprehensive projects ever undertaken in the history of either program. During that summer, pilot surveys were initiated at four DARCOM installations—Savanna Army Depot in Indiana, the Aberdeen Proving Ground in Maryland, and Watertown and Picatinny arsenals in Massachusetts and

New Jersey respectively. Methodologies developed from these projects included reconnaissance-level archeological surveys conducted by the Interagency Resources Division and for HABS/HAER, the identification and evaluation of engineering and architectural resources. Studies of the remaining 64 DARCOM installations were completed by the private sector under a $3 million, multiple-year contract administered by HABS/HAER.

In this period of reorganization, HABS/HAER Chief Robert Kapsch also initiated a two-year project named RAT, Reduction and Transmittal, to eliminate the backlog of drawings, photographs, and written data that had accumulated in the HABS/HAER office. During the summers of 1983 and 1984, legions of historians and architects edited mountains of these materials, transmitting record numbers of projects to the Library of Congress. This also was the opportune time to computerize a listing of all recorded sites, including statistics on the numbers of drawings, photos, and data pages in the Library of Congress collection. The collections grew exponentially during this period as the backlog was eliminated. A database was created and HAER published in 1983 its second listing of sites recorded since its first catalog in 1976. HAER was poised for its next epoch.[22]

1984–99: Maturation

Limited staff and financial resources stemming from the HCRS-era forced HAER to focus its documentation efforts after returning to the NPS. Mitigatory documentation requirements ensured that state or locally significant sites impacted by federal actions were recorded under NPS regional offices, allowing HAER's Washington office to concentrate on Park Service-owned properties, nationally significant sites, and a series of thematically selected, threatened sites. Selection criteria did not depend exclusively on threats and the test of national significance, but also on gaps in the collection, available funding, and the interests and expertise of staff. After more than a quarter century, even though the collection is remarkably rich and comprehensive, certain areas are not adequately represented, such as the chemical and oil industries, other extractive industries (coal and gold mining), and contemporary technologies (nuclear energy and electronics).

Ironically, much of HAER's growth after the mid-1980s can be attributed to deteriorating public works and infrastructure, and the process of de-industrialization. The need to upgrade America's highways and public works (water, sewage, and hydroelectric generation plants, for example) has placed great pressure on recording these sites before they are altered or demolished. Most were built in the last quarter of the 19th or first quarter of the 20th century and, while not all retain historic machinery, many qualify for recording. Rebuilding the nation's highways and rationalizing the rail infrastructure has placed historic bridges and rail facilities in jeopardy. Consequently, more than 1,000 bridges have been added to the collection, and railroad resources are well represented.

The Federal Highway Administration (FHWA) launched the Bridge Replacement and Rehabilitation Program following the collapse of the Silver Bridge over the Ohio River in 1967. Realizing that the dwindling stock of historic metal-truss bridges would be the first to go, HAER began its Historic Bridge Program in 1973. This carefully orchestrated strategy was developed in consultation with the National Trust for Historic Preservation, the Advisory Council on Historic Preservation, state historic preservation offices, and the Federal Highway Administration to promote comprehensive state bridge inventories. By 1987 when inventories were required by law, most states had completed some form of historic bridge inventory. Highway bridges became the first class of historic structures to be nationally evaluated.[23] Following the inventory and evaluation phase, HAER returned to those states that had identified outstanding historic bridges and began their systematic documentation.[24]

HAER's Park Roads & Bridges program is a parallel effort that documents not only the bridges in the national park system but the landscape design and the actual engineering of park roads. Starting in the 1930s, NPS landscape architects cooperated with Bureau of Public Road engineers to design thousands of miles of roads that "lie lightly on the land," and do not disfigure the scenic quality of the nation's great national parks.[25]

When HAER proposed its historic bridges program, the initial reaction of the Federal Highway Administration and state departments of transportation was adversarial. Highway engineers perceived conflicting demands. They were being asked to upgrade a fast-deteriorating infrastructure system while repairing and rehabilitating historic bridges that rarely complied with modern design and safety standards. It soon became evident, however, that there would never be sufficient funding to replace every functionally obsolete and structurally deficient bridge. Rehabilitation was one of the viable alternatives. As the inventories began to reveal the wealth of historic bridges still standing, some engineers came to appreciate their value. Not every bridge

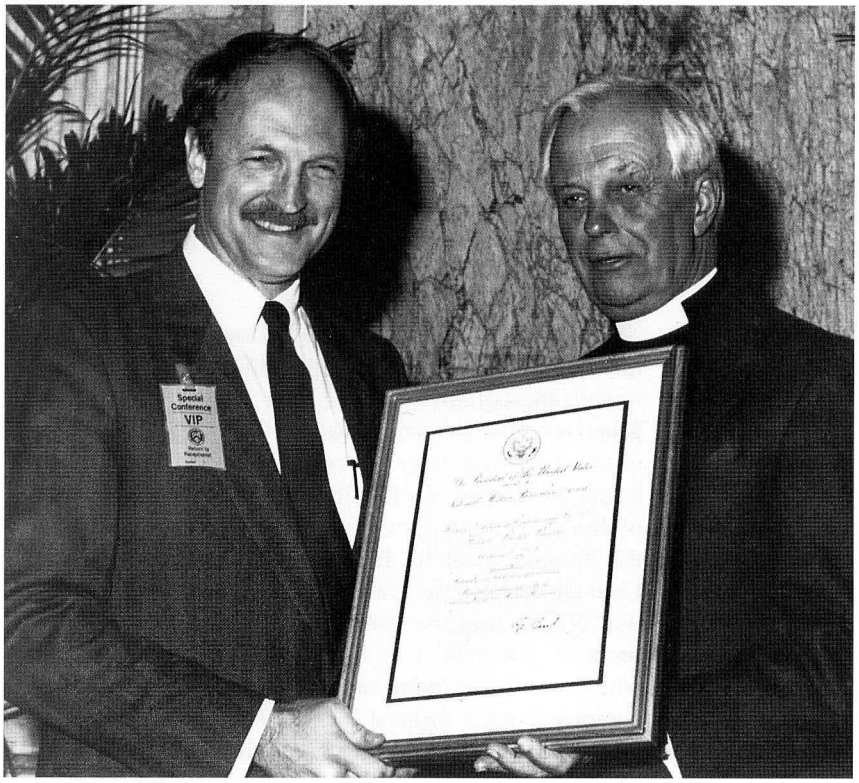

Figure 15. *Eric DeLony, HAER chief, accepts the 1993 National Preservation Award from Reverend John Harper, chair of Advisory Council on Historic Preservation, the first national award for HAER's Historic Roads & Bridges Program. The second was awarded in 1995—the National Transportation Award from the U.S. Department of Transportation and the National Endowment for the Arts.* ACHP photograph.

needed to meet interstate standards. Skilled engineers were able to develop rehabilitation designs that maintained the historic characteristics of the bridges while allowing for reasonable safety. Some states have even dedicated a portion of their rehabilitation funds to preserve their truly outstanding historic bridges.[26]

Bridges do not exist in historic or physical isolation. Roads are an important context for bridges and have historically played a significant role in the development of the American cultural landscape. A wonderful network of back-country roads continues to be popular for Sunday leisure driving. In many parts of the country, touring the countryside generates thousands of tourist dollars. Historic bridges are an important feature of that roadscape, and while nostalgic wood covered bridges have always been popular, there is a growing interest in the concrete arches and metal-truss spans that reveal the story of American inventiveness and manufacturing ingenuity. A viable alternative for bridges that cannot be continued in vehicular service is relocation to roads that receive lower traffic volumes or to forest inspection and maintenance roads. Historic bridges can be recycled on hiking paths and bike trails in local, state, and national parks. They have even been used on golf courses and cattle ranches.

The purpose of these initiatives was to save representative examples of America's historic bridges and to encourage the recognition of scenic back-country roads and parkways. Also, if new construction or rehabilitation was required, the initiatives should encourage quality design that took aesthetics, the historic fabric, and landscape characteristics into consideration as both the states and the NPS invest millions upgrading the highway infrastructure of the United States. Engineers have had a significant shift in perception and attitudes towards historic bridges and roads. HAER, the National Trust, and many of the state preservation offices now are working in alliance with engineers to bring quality design and excellence to America's highway systems (see figure 15).

Other areas in which HAER has focused its documentation programs since the mid-1980s are maritime, military, and hard-rock mining resources. In 1985 HAER initiated a new program of documenting historic ships and other maritime structures such as lighthouses, marine railways, and related features. Since the first ship, *Wawona,* was documented in

Seattle harbor in 1985, many other vessels have received similar treatment.[27] From these experiences, former HAER architect Richard K. Anderson Jr., in cooperation with the Mystic Seaport Museum in Connecticut, wrote the standard manual *Guidelines for Documenting Historic Ships.*

One of the effects of terminating the Cold War is base closures and modernization of our defense resources. Building on HAER's earlier documentation of munitions development, research, and storage installations, new projects were conducted at the Navy's aeronautical research and engineering facilities in Langley, Va.; Wright-Patterson Air Force Base in Dayton, Ohio; and the Philadelphia Navy Yard.

With liberal laws for mining on federal lands, new technologies for extracting gold, and continued high prices for the metal, what little remains of historic hard-rock gold mining resources is in jeopardy. In cooperation with public and private entities, HAER and Dr. Robert Spude, then of the Park Service's Rocky Mountain Region, organized a week-long historic mining workshop in 1989 in Death Valley for western mining historians and archeologists. This developed into HAER's Hard-Rock Mining Initiative that devised cooperative recording projects with the mining industry, state and national parks in the West, state preservation offices, and archeology and history groups.[28]

But the most powerful force directing HAER documentation since the 1980s is the de-industrialization of America, as the nation moves from a manufacturing to a service economy. For over a century, the miles of magnificent steel mills, blast furnaces, and coke plants along the Monongahela River around Pittsburgh shaped the world's image of America's industrial might. They no longer exist. The same holds true for New England's textile industry, the anthracite regions of northeastern Pennsylvania, and the hard-rock mining fields of the American West. Even the physical artifacts of America's space program, such as Rocket Row at Cape Canaveral, are being reclaimed by Everglades-like jungles and a severe marine environment. Large, complex industrial sites, particularly those with rapidly evolving technologies, are extremely susceptible to functional, technological, and economical obsolescence. Increasingly, this happens before the sites are old enough to be considered historic by National Register criteria. Many will simply vanish without a trace unless HAER can record them. Progress places great pressure on the documentation mandate, resulting in more work than can be handled in a lifetime.

As formerly thriving communities become depressed when industries relocate, de-industrialization has stirred the identification of alternative employment opportunities. One alternative is heritage tourism. Depressed, "rust-belt" communities striving to end their downward spiral have discovered the potential of heritage tourism, a concept not necessarily new. Heritage corridors grew out of a new kind of pork-barrel politics, though in this case, it is good pork. Though places like Williamsburg, Old Sturbridge Village, Plimouth Plantation, and Deerfield, Massachusetts, had been established in the early-20th century, and historic districts such as Charleston, South Carolina, Savannah, Georgia, and the Vieux Carre in New Orleans had existed for decades, hundreds of new historic districts were established in towns throughout the United States as a result of state-sponsored National Register surveys and nomination.

For much of the public and many in the NPS, Yellowstone will forever be the archetypical American national park—a federal wilderness preserve where urbanites can commune with nature. Economic limitations leave many Americans unable to enjoy a national park experience, and, for others, such an experience may hold little relevance. Since the 1960s, the park service has become the sometimes-reluctant caretaker of new kinds of parks. This new generation of urban parks gave disconnected 20th-century Americans a chance to discover their history and culture, not just pristine wilderness. Stemming largely from the influence of the "new preservation," Congress was persuaded that architectural and cultural sites were as worthy of commemoration as battlefields and scenic beauty. In 1972, the first urban parks were created with the establishment of Gateway and Golden Gate National Recreation Areas in New York, New Jersey, and San Francisco respectively. By the late 1970s, heritage areas like Lowell (1978) were another new kind of park.[29]

The innovative aspect of the heritage area and corridor concept was the interdisciplinary call for integration of preservation and conservation, the protection of entire geographic regions, including buildings, landscapes, and lifestyles. Many of the new heritage areas considered worthy of preservation include canal, rail, and transportation corridors and industrial districts. Paterson and Lowell were two of the first to pioneer the concept, but by the mid-1980s, dozens of other communities began looking to the NPS for help in redeveloping their decaying neighborhoods and industrial cores. Park Service funding, directed to these locales by local Congressmen through the appropriation process, has provided a whisper of hope that these dying towns could be revived. At present, there are about a dozen of these areas in various stages of planning and development, and another ten were designated by the Congress in 1996.

Figure 16. *Context of Sloss Furnaces, Birmingham, Alabama. Though Birmingham, the cast-iron center of the world, is not yet officially designated a heritage area, its citizens saved the Sloss Furnaces in 1976, one of the first major industrial archeology preservation efforts in the south. Led by Marjorie Longnecker White, president of the Birmingham Historical Society, people are working to carve out the "Birmingham District," a five-county heritage area that will save and interpret the history.* Photography by Garrison's Flying Photo, photographer unknown.

Not all sites, no matter how worthy, can be owned and administrated by the National Park Service. For some, the solution lies with the creation of a local and state partnership that administers a heritage area commission with technical assistance from the NPS. Sites designated as national heritage areas include the Illinois & Michigan Canal National Heritage Corridor, America's Industrial Heritage Project (AIHP), the Lehigh & Delaware Canal National Heritage Corridor, and the Blackstone River Valley National Heritage Corridor. Though not yet officially designated, the citizens of Birmingham saved the Sloss Furnaces in the 1970s, and today they are working to save and interpret related aspects of the ironmaking, coal, and mining industries of the five-county area surrounding the cast-iron center of the world, Birmingham, Alabama (see figure 16).

Recently designated areas include the Augusta Canal National Heritage Area (Ga.); America's Agricultural Heritage Partnership (Iowa), to be administered by the US Department of Agriculture; National Coal Heritage Area (W.Va.); Essex National Heritage Area (Mass.); Hudson River Valley National Heritage Area (N.Y.); Ohio & Erie Canal National Heritage Corridor (Ohio); South Carolina National Heritage Corridor, Steel Industry American Heritage Area (Pa.); and the Tennessee Civil War Heritage Area.

HAER is often asked to help identify what is significant in the corridors and also what is not significant, so derelict sites of limited architectural or technological value can be removed if necessary. Not every vestige of the industrial landscape can or should be preserved, but setting aside

selected sites for future interpretation as industrial or open-air museums is one option. It may also be possible to find alternative uses for the industrial buildings and public engineering works. To varying degrees, both strategies have successfully worked in American cities. Industrial heritage areas and corridors are one of the most exciting initiatives to emerge in recent years.

The first industrial heritage corridor, the Illinois & Michigan Canal, which extends south and west from Chicago within the Des Plaines River valley, was created in 1984. HABS/HAER spent two summers identifying and documenting the historic sites that helped define and shape the corridor. The Blackstone River Valley (Mass./R.I.) survey followed in 1986, and AIHP, a much more ambitious project encompassing nine counties in southwestern Pennsylvania, began in 1988. The industries and transportation systems that supported the steel industry in Johnstown define AIHP. Two years later, local sponsors enabled HAER to establish a year-round field office in Johnstown. Another was established in Homestead to study the miles of steel mills, coking operations, and associated industries and transportation networks of the Pittsburgh region. Other National Heritage Areas include the Cane River (La.) and Quinnebaug & Shetucket River valleys (Conn.), designated in 1994.

Spending more than a few months at a site enabled HAER to document the living conditions in workers' communities in these districts in addition to the technological artifacts. Working with HABS, the architecture of the canal towns along the Illinois & Michigan was surveyed. In AIHP, HABS documented company towns and mining communities and published the results. Shotgun houses and the unique pyramidal-roof workers' cottages were recorded in the Birmingham District.

Birmingham lies at the end of the Appalachian Mountain chain in central Alabama, the southern locus of the iron and steel industry. Under the initiative of the Birmingham Historical Society, HAER has spent five years in the Birmingham District documenting cast-iron manufacturing and related industries. Birmingham provided the opportunity to compare workers' housing in the South with that of the North. Three years have been spent in northern Alabama documenting space-era testing facilities at the Marshall Space Flight Center in Huntsville, and TVA's Wilson Dam and Nitrate Plant on the Tennessee River in Muscle Shoals. In addition to these continuing projects, more work will likely come with the newly designated heritage areas.

The concept of industrial heritage areas is a decade-long phenomenon that holds great promise for the future. It is encouraging because for the first time, a mechanism has been created that places amenities in the form of natural, recreational, and cultural resources on a par with the other forces driving development. Community leaders find it hard to deny that these resources are worth preserving. In many communities, citizens now insist that these values be included in any redevelopment scheme.

Features and attributes, manmade and natural, are what distinguishes one community from another, offering identity and a sense of place. Historic buildings and neighborhoods that perpetuate the human scale and varied textures are increasingly the primary components that planners and developers use to revitalize communities. The American public is becoming more sophisticated, realizing that the destruction of old buildings and the replacement of greenspace and waterfronts with shopping malls and suburban developments are no longer the only options.

Prognosis

Interest in engineering and industrial heritage should flourish in the future, maintaining the growth curve that HAER has experienced over the last decade. The contribution that American technology has made towards world development is widely recognized. Threats from infrastructure rehabilitation, deindustrialization, and continued suburbanization will be mitigated; the most important remnants of industry and engineering will continue to be scrutinized; and, hopefully, the more significant sites preserved.

Preservationists, industrial archeologists, and ordinary citizens must speak out when our fragile built environment, whether architectural, vernacular, or industrial, is threatened. Selective recording is especially important for the industries and public works heritage at risk. Coal and hard-rock mining, water supply and sanitation, hydroelectric generation, railroads, and maritime transportation are all undergoing drastic change. In addition to heavy industry, documentation must be completed on "anachronistic industries," such as the Gruber Wagon Works or Ben Schroeder's Saddle Tree Factory (Madison, Ind.). Having survived modernization and redundancy, such sites need to be targeted for recording, preservation, and interpretation as past examples of the American workplace.[30]

HAER has had limited involvement in the mining districts of the mid- and mountain west and in many centers of heavy

Figure 17. *HAER staff, November 17, 1994, on the eve of HAER's 25th anniversary banquet. Left to right: Robert Kapsch, HABS/HAER chief; Richard Quin, historian; Stafford Lindsay, ASCE president; Dean Herrin, historian; Christine Madrid, historian; Jet Lowe, photographer; Eric DeLony, HAER chief; Richard O'Connor, historian; Christopher Marston, architect; Craig Strong, architect; Todd Croteau, industrial designer/architect; Tom Behrens, architect; Ford Peatross, curator, architecture, design, and engineering collections; Jerry Rogers, associate director; and Gray Fitzsimons, engineer/historian.* Jack Boucher, HABS/HAER photographer.

industry, such as Philadelphia, Chicago, Gary, Milwaukee, St. Louis, Kansas City, Denver, Portland, and Los Angeles. Proportionately fewer sites have been recorded in these cities, despite the potential richness and significance of the industrial resources. They hold promise for future HAER recording projects and industrial heritage preservation.

One possible method to address these threats is the development of contextual studies for various structure types and industrial landscapes. Such studies quickly identify classes of resources that are not adequately represented in HAER documentation. Eleventh-hour campaigns to preserve sites under threat could be reduced if a proactive program of engineering and industrial site nominations to the National Register was established nationwide. HAER has initiated efforts in this direction on bridges, blast furnaces, and the textile industry. Contextual studies accelerate the identification of priorities for recording and protection.

Electronic and digital documentation is rapidly developing with startling new technologies evolving nearly every month. HABS/HAER regularly works with the computer and software industries to develop new techniques of CAD-photogrammetry recording. Though traditional field investigation, measurement, and hand drawing will never be replaced, these new techniques allow the documentation of more sites and more efficient recording of complicated structures.

Outside of HAER, the appreciation and awareness of engineering and industrial heritage needs to be developed in institutions of higher education. Technological heritage

should be integrated into architecture, material culture, history of technology, and historic preservation curriculums. Particularly important is that engineers take a larger stake in preserving the outstanding physical remnants of their profession.

While a limited HAER staff is challenged just completing site recordings, more should be done to deliver the rich HAER collection to the public through publications and exhibits. Six years ago, the American Society of Civil Engineers published *Landmark American Bridges,* written by the author. Through an arrangement with Little Brown Publishing Company, the book got an exposure far beyond the engineering community and the Government Printing Office. HAER is currently preparing a companion volume on significant 19th-century engineering achievements authored by HAER historian Dean Herrin. Both books made exclusive use of the HAER collection and provide a model for other scholars.

In the spring of 1997, two exhibitions opened, one at the National Building Museum in Washington titled *Lying Lightly on the Land: Roads and Bridges in the National Parks,* and another in France at the Ecomusee in Le Creusot on industrial heritage in America. In fall 1997, the French exhibit traveled to other European cities. Using more than 250 images, it is the largest exhibit ever mounted from the HAER collection. As part of its 30th anniversary, HAER, the Library of Congress, and ASCE will organize a retrospective exhibit at the National Building Museum on the evolution of HAER documentation.

HAER's collaboration with industrial archeologists in other countries has taught us that we live in a steadily shrinking global community. I have been fortunate to represent the United States at several triennial meetings of the International Committee for the Conservation of the Industrial Heritage (TICCIH).[31] These symposia indicate that most nations are acutely aware of their industrial heritage and are working to ensure recognition and preservation. But what works for one country may not necessarily work for others. With varying governmental structures, legislation, and emphases, the means by which nations document and save industrial heritage differ. But in this context, HAER stands apart for its consistency, continuity, and thoroughness, dispatching student teams into the field to record sites in a standardized manner and format, and then editing and transmitting that documentation to a public archive. More than 30 years of work has accumulated an impressive mass of information that will, it is hoped, be continued into the future.

Engineers have begun only recently to share this vision of the future development of America. Forums like the annual meetings of the American Society of Civil Engineers, the American Society of Mechanical Engineers, and Society for Industrial Archeology offer the opportunity to inform engineers of their past achievements and to encourage choices based not only on the bottom line but also on aesthetics and quality-of-life issues. So much of our historic built environment is the product of engineers that its conscientious maintenance and preservation requires their expertise and insights. Especially important are specialist engineers who have not only kept abreast of current engineering standards but are also familiar with the materials, formulas, and mind-set of their predecessors, allowing them to craft solutions that respect the character and qualities of past achievements. These specialists would make it possible to blend old and new so we all can enjoy and relish the best of each in our daily lives.

HAER's success is, in part, because its documentation is more than just a permanent record. HAER is also in the amenity business, attempting to save the very best from the past to pass on to the future. Saving structures of fine materials, human-scaled proportions, exceptional craftsmanship, and varied textures enhances the quality of life and maintains familiar surroundings. In places where historic architecture, industry, and engineering are lacking, attitudes supporting quality design may also be absent. Such values are especially needed in America, where the past is thrown away, the expedient is built, quick profit pursued, and, in the process, the countryside is trashed. In an age of instant gratification, suburbanization, and desecration, preserving industrial heritage helps provide a link with the past along with deeper insights into the human imagination.

Some may view documentation as pedantic, just a nice thing to do that is not necessary. But the completion of several hundred projects for several hundred clients with several thousand people demonstrates how powerful a tool documentation is. HAER has striven to implant an industrial heritage ethic in America that imbues the oft-forgotten engineering structure or industrial workplace with significance and meaning. Industrial heritage preservation has the potential of increasing the involvement of working-class people, a sizeable segment of the population, in the preservation movement. Recognizing industrial workplaces reaffirms the value of working-class occupations. Hopefully, preservation will encourage this population to join efforts to create a better environment and quality of life through an appreciation of historic places, be they architectural, vernacular, or industrial.