100 YEARS TRB
MOVING IDEAS: ADVANCING SOCIETY

CENTENNIAL PAPERS

Standing Committee on Testing and Evaluation of Transportation Structures (AFF40)
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STRUCTURE PERFORMANCE: A CENTURY OF MEASUREMENTS

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BACKGROUND OF COMMITTEE

Transportation Research Board is celebrating its 100th Birthday in 2020. During these 100 years, the purpose of transportation infrastructure has changed significantly from supporting horse drawn carriages to soon to be realized space travel. Customer expectations have evolved from reliance on roads to carry goods and people from one place to another safely to large multimodal networks offering uninterrupted mobility with superior reliability. The economics of transportation infrastructure has similarly shifted from local to global and viable infrastructure is now seen as a competitive advantage in an ever-evolving global economy. Regardless of these changes, safety remains a primary concern to all stakeholders, for a good reason, and inspection and evaluation plays a major role in this aspect. The Standing Committee on Testing and Evaluation of Transportation Structures has focused its efforts on applying technologies to the study of in-service bridge behavior for the validation and improvement of design guidelines and safety inspection and evaluation for transportation structures of all types. The committee has been active and committed to this goal since its inception more than 50 years ago by bridging the gap between state of the art and state of the practice through technology transfer and supporting research in these areas.

The Standing Committee on Testing and Evaluation of Transportation Structures got its official start in 1962 as the Field Testing of Bridges Subcommittee, one of six subcommittees formed in that year under the Committee on Bridges which itself was formed twelve years earlier in 1950. The six subcommittees included the Bridge Dynamics Subcommittee, which would play a significant role in the history of the current standing committee. The parent Committee on Bridges, which operated under the Department of Design, served as the first formal organization dedicated to the practice of bridge engineering within the Highway Research Board (HRB), which was later renamed the Transportation Research Board (TRB). The parent committee and its subcommittees were reorganized two years later in 1964 into a fully-fledged division with six committees. In 1964, the Committee on Bridges was renamed Section C-Bridges and remained under the Department of Design. Within Section C, the Field Testing of Bridges Committee took the designation D-C5 while the Bridge Dynamics Committee took the designation D-C6. The first chairperson of the Field Testing of Bridges Committee was L. T. Oehler from the Michigan State Highway Department while C. P. Siess of the University of Illinois chaired the Bridge Dynamics Committee.

The Field Testing of Bridges and Bridge Dynamics Committees would serve just seven years as independent entities. These committees were combined in 1969 and renamed the Committee on Dynamics and Field Testing of Bridges with the designation D-C5. C. P. Seiss

chaired the newly formed committee. The designation D-C5 lasted just three years before the section reorganized again to include both design and construction, becoming Design and Construction of Transportation Structures, Group 2 Council/A2C00: Section C-Bridges. Under this new organization, the Committee on Dynamics and Field Testing of Bridges took the designation A2C05.

In 2005 the members of the committee proposed a name change to Committee on Field Testing and Nondestructive Testing (NDE) of Transportation Structures, which was accepted by TRB. The name change coincided with structural changes in the parent committee structure resulting in a new designation for the committee to AFF40. Then in 2015, the committee members and TRB again reevaluated its name settling on its current moniker of Standing Committee on Testing and Evaluation of Transportation Structures (AFF40).

For the remainder of this paper, the term Committee AFF40 is used to refer to the current and past committee regardless of name or designation used in prior years. For reference, the name and designation used over Committee AFF40's history, along with committee chairpersons, are presented in Table 1. The early history of the Committee on Bridges and Committee AFF40 described herein and in Table 1 was drawn from a 2000 TRB Paper entitled *Fifty Years of TRB Bridge Committees* authored by I. M. Viest and C. P. Seiss [1].

Table 1 - History of Committee AFF40

Parent/Committee Name	Designation	Chairperson	Term
Department of Highways			
Committee on Bridges	n/a	G. S. Paxson	1949-53
Department of Design			
Committee on Bridges	D-8	G. S. Paxson	1953-61
Department of Design / Committee on Bridges			
Field Testing of Bridges Subcommittee	D-8(6)	G. S. Vincent	1962-63
Bridge Dynamics Subcommittee	D-8(2)	C. P. Seiss	1962-63
Department of Design / C-Bridge Division			
Field Testing of Bridges	D-C5	L. T. Oehler	1964-68
Bridge Dynamics	D-C6	C. P. Siess	1964-68
Department of Design / C-Bridge Division			
Dynamics and Field Testing of Bridges	D-C5	C. P. Siess	1964-68
Design and Construction of Transportation Facilities / A2C00 Bridges			
Dynamics and Field Testing of Bridges	A2C05	R. F. Varney C. P. Heins J. W. Baldwin D. B. Beal A. S. Nowak F. W. Klaiber R. A. Walther	1970-75 1976-81 1982-87 1988-91 1992-96 1998-04 2005-07
Field Testing and Nondestructive Testing of Transportation Structures	AFF40	R. A. Walther G. Washer	2008-10 2011-13
Testing and Evaluation of Transportation Structures	AFF40	G. Washer S. Alampalli	2014-16 2017-22

COMMITTEE SCOPE

The mission and purview of Committee AFF40 has evolved over time as the needs of the bridge industry changed, with some of this being recognized in the committee name changes. To understand this evolution one must understand the original focus of bridge committees within TRB, which were formed at about the same time as the nation undertook construction of an interstate highway system. As outlined by Viest and Seiss [1] bridge committees were created within TRB to serve as a forum open to all individuals that would support the advancement of bridge specifications, which were under the purview of the American Association of State Highway and Transportation Officials (AASHTO). To this end, TRB bridge committees were focused on tracking, disseminating, and advancing bridge research with the goal of improving the state of bridge design. Many of the early papers and sessions sponsored by the TRB bridge committees dealt with bridge loads and design standards. Committees were formed primarily around materials, such as concrete, steel, soil, fiber reinforced polymers, etc. The purview of these committees thus focused on advancing design specifications for bridge elements constructed with these materials.

Safety and economy are often the primary drivers for the advancement of bridge design methodologies. As transportation networks advanced in the 1950's there was also a critical need to better understand bridge fatigue to support larger, heavier trucks traveling in greater volumes and at faster and faster speeds. This includes not only repetitive truck loading effects, but dynamic effects from environmental loads due to wind, temperature, and seismic events. As design standards advanced to support the new interstate highway system a need arose to provide field verification of new designs.

Early on, the TRB bridge committees sought to gather individuals with specialized expertise in testing and evaluation to advance the industry's understanding of bridge behavior and support the field verification of new design standards. The forum consisted of two groups, with one dedicated to field testing and the other focused on bridge dynamics. Within a short time however, the groups were combined and eventually became the current day Committee AFF40.

No documentation is available about the mission and purview of Committee AFF40 from prior to 1985, but one might logically draw inference from Viest and Seiss' paper [1] that describes early research efforts of the TRB bridge committee and its subcommittees. Viest and Seiss describe how early contributors to the bridge committees had successfully lobbied AASHTO Road Test organizers to include bridges as part of their research of highway pavements. Specifically, Viest and Seiss cited a need to monitor the performance of various bridge types to repetitive truck loadings, including overloads and loadings to failure. Research sponsored by National Cooperative Highway Research Program (NCHRP) and National Science Foundation (NSF) about this same time mirrored the efforts being undertaken in the AASHTO Road Test and produced significant advances in understanding of bridge fatigue and dynamic effects of loading.

The experimental program conducted under the AASHTO Road Test included eighteen bridges and a large number of vehicles of various sizes and dimensions. Although the primary interest of the study was the determination of dynamic behavior of bridges, a large portion of the project was also concerned with obtaining comprehensive data on the characteristics of the test bridges and vehicles [2].

At about this same time and into the 1960's, AASHTO was working to advance bridge design standards moving bridge design from the working stress method to the load factor method. So, one might assume the mission and purview of the early bridge committees, which included committees on concrete and steel superstructures and bridge foundations, revolved around

advancing bridge standards for these materials and elements. And, thus the bridge dynamics committee concerned itself with improving the industry's understanding of live load effects of truck loadings and fatigue, while the field-testing committee served to characterize in-service bridge performance. Collectively, these two groups were focused on collecting, interpreting, and sharing bridge data collected under the AASHTO Road Test. The members of these early committees worked closely as evidenced by many jointly sponsored publications, sessions, and research.

Review of publication histories of C.P. Seiss and I. M. Viest suggest that the above assumptions might be accurate, as their published works mirror the scenarios presented. Moreover, the acknowledgements presented in C. P. Seiss's *Dynamic Studies of Bridges on the AASHTO Test Road* [2] from the early 1960's give credit to the Bridge Dynamics Subcommittee as providing guidance and oversight of bridge research conducted concurrent with the road test. Lastly, an overview paper [3] describing the bridge research program of the AASHTO Road Test published in TRB's Transportation News cites overview of the bridge testing program by an Advisory Panel on Bridges and the Special Committee on Dynamic Behavior of Tested Bridges. The members and leadership of these road test committees included the committee chairs of the early subcommittees that became what is today known as Committee AFF40.

Following this early period and until 1985, there is little information available to understand how the mission and purview of Committee AFF40 evolved. Review of meeting minutes available from the time interval of 1978-1984 illustrated the topics of interest to the committee through presentations made to the committee during the annual meetings. Common themes among these presentations included the development and application of weigh-in-motion systems, load testing of bridges in the field, measurement of fatigue loading spectrums on bridges, and the dynamics of bridges. Several presentations describing shaker devices for inducing vibrations in bridges both in the field and the laboratory were also discussed, as well as analysis of dynamics characteristics of bridges. Instrumentation and sensors for strain measurement and recording cumulative fatigue loading on bridges were presented to the committee. During this time the committee also discussed the need to collect, digest, and disseminate bridge test data related to determining the load capacity of bridges.

The mission and purview of Committee AFF40 after 1985 is much clearer, as written documentation exists in triennial reports and verbal history from living past chairpersons. The oldest written mission statement that could be found was offered in 1988 as follows:

> *The Committee is concerned with the application of field testing and dynamics to advancements in design, inspection, and strength evaluation of highway bridges.*

During the 1980's the committee goals included promotion of field testing in the inspection and strength evaluation of bridges, dissemination of research through presentations and publications, encouragement of research studies in bridge dynamics and field testing, and cooperation with other TRB committees and aligned organizations concerned with bridge design and evaluation. Notable accomplishments during this period included support of bridge load rating and evaluation manuals, such as NCHRP 292, Strength Evaluation of Existing Reinforced Concrete Bridges; and NCHRP 301, Load Capacity Evaluation of Existing Bridges; and NCHRP 12-28(13), Bridge Rating Through Nondestructive Testing. Many of these manuals and others were authored or co-authored by long-standing members of Committee AFF40. This research also led to significant improvements in AASHTO's Manual for Maintenance Inspection of Bridges.

The 1980's also saw significant committee involvement in the advancement of understanding in live load effects from dynamic behaviors of truck suspension systems and use of weigh-in-motion sensors.

The committee's efforts continued into the 1990's with basically the same sets of goals but focus shifted to include support of research into Load and Resistance Factor Design (LRFD), which was adopted officially in 1994 by AASHTO. Committee AFF40 members played a significant role in helping the industry understand bridge behavior in order to develop accurate load and reliability factors for the new LRFD code. The 1990's also saw significant advances in load rating manuals and bridge evaluation procedures, also using load and resistance methods.

Committee AFF40 initiated a subcommittee A2C05(1) in 1991 entitled "Seismic Response of Bridges" following the Loma Prieta earthquake, which occurred in 1989. The Loma Prieta earthquake illustrated the vulnerability of bridges to seismic ground movements. At that time, there was no "home" within TRB for addressing seismic design issues so this group took residence under the dynamics and field testing committee. The subcommittee met each year between 1992 and 1994, with increasing attendance at each meeting demonstrating the interest and need for coverage of the topical areas within TRB. In 1994, the A2C05(1) subcommittee applied to be promoted to a "Task Force" within the TRB committee structure, and was provided the moniker of A2C52. The Northridge earthquake of 1994 and the Kobe, Japan earthquake of 1995 further illustrated the need for a separate committee devoted to seismic design. The task force A2C52 was successful enough that in the year 2000 the Seismic Design of Bridges Committee (A2C08) was formed, which was later assigned committee number AFF50.

During the 1980s and 90s and prompted by notable bridge failures such as Schoharie Creek Bridge in New York, considerable emphasis was generated from owners to seek solutions that could detect damage in structures well before failures occurred. As an offspring of this need, considerable research was conducted to investigate changes in dynamic behavior of structures that have undergone progressive deterioration or subject to a distress-inducing event such as a bridge impact, fatigue cracking, or fracture. Committee AFF40 was a home for these researchers and owners and the committee was very active in this area. However in the early 1990s, it was realized that a change in dynamic properties of a structure is not sensitive enough for damage detection.

As Committee AFF40 moved into the 2000s it took a close look at its evolution and proposed a new mission statement that was adopted officially in 2005. The new mission was presented in the 2005 Committee Triennial Strategic Plan (TSP) as follows:

> *This committee is concerned with the dynamics of bridges behavior and the actual behavior of bridges in the field under load including: planning and encouragement of laboratory and field tests, nondestructive evaluation procedures, to determine the responses of bridges to both static and dynamic forces (except seismic);development of analytical methods for use in planning and interpreting these tests; encouragement of field testing to obtain load strain histories; promotion of suitable procedures and instrumentation for testing; interpretation and evaluation of research results; coordination and dissemination of information; and a continuing review of literature and research related to this field.*

The 2005 mission statement was the first to recognize officially the inclusion of nondestructive evaluation (NDE), which reflected significant industry interest in this area. NDE technologies are commonly focused on the detection and characterization of localized damage and defects in bridge members, such as areas of delamination in bridge decks, fatigue cracks in steel

bridge members, etc. Prompted by Federal Highway Administration's (FHWA) creation of a Nondestructive Evaluation (NDE) Laboratory in 1999 and significant NDE research at Germany's Federal Institute of Materials Research and Testing (BAM), the committee saw an influx of members involved in the fields of NDE and condition evaluation of bridges. As such, Committee AFF40 in 2002 formed a subcommittee dedicated to the interests of the NDE community. This subcommittee meets annually still today at the TRB meeting and is concerned with research, development, application, and promotion of technologies and methods to nondestructively assess the condition of highway structures and to detect, locate, quantity, and assess localized defects in highway structures. Ultimately, these efforts led to a slight change in name and mission of the committee, which become the Standing Committee on Field Testing and Nondestructive Testing of Transportation Structures in 2008 with a mission statement that closely matched the 2005 mission.

Over the last ten years, the industry has seen significant advances in instrumentation and NDE technologies, in both the cost and convenience realms. Coupled with advances in wireless data collection and data presentation techniques, these advances have fostered the growth of structural health monitoring (SHM). To this end, the Committee AFF40 has co-sponsored a joint subcommittee dedicated to advancing SHM. The subcommittee is named the Structural Health Monitoring Subcommittee and is jointly co-sponsored by AFF40, AHD30 (Bridge Management) and AHD35 (Bridge Maintenance). The SHM Subcommittee meets annually at the TRB meetings and is currently pursuing production of a guide document for owners that explains the application and benefits of SHM for bridges.

Committee AFF40 is currently focused on the development and application of health monitoring technologies and instrumentation for the maintenance and management of the nation's highway inventory. The focus of bridge testing and evaluation has also shifted to include both global as well as local effects. Global evaluation relied on structural health monitoring and load testing where local evaluation has relied on nondestructive methods. Realizing the value of emerging NDE technologies and their role in effective bridge management, an NDE subcommittee continues under the parent committee. Similarly, as structural health monitoring has increased in popularity and effectiveness it will continue to be supported by the parent committee through joint participation with AHD30 and AHD35. More recently, the industry has seen increased application of remote sensing, artificial intelligence, and machine learning that will continue to advance NDE, structural health monitoring, and field testing programs.

All these changes show continued evolvement and require adjustment of the mission and purview of Committee AFF40 to reflect the changing landscape with the goal of bridging the gap between state of the art and state of the practice. As such, the current mission of the committee is:

> *This committee is concerned with condition assessment and evaluation of the performance of transportation structures subjected to static and dynamic (excluding seismic) forces. The committee addresses the use of laboratory testing, field testing, monitoring, and nondestructive evaluation (NDE) methods to assess the load carrying capacity of structures, detect and quantify defects, and assess condition.*

In order to meet its goals, Committee AFF40 has attracted members from research, practice, and owners. Currently, the committee has a good balance of bridge owners, practicing engineers, and academia. It has two distinguished committee members approved as Emeritus members: Andy Nowak, a well-known researcher, academician, and former chair of Committee

AFF40 and Robert Sweeney, a retired consulting engineer. International members have also been very active in Committee AFF40 for years, which has resulted in many collaborative efforts between United States and International universities and governmental entities.

PRESENT COMMITTEE ACTIVITIES

The primary goals of the committee established in 2018 include the following:

- Promote the use of (field) testing in condition and strength assessment of existing bridges.
- Encourage dissemination of research studies and other applications of field testing through presentations and publications
- Solicit and develop research needs in bridge dynamics and field testing of bridges.
- Work with other TRB Committees and other organizations concerned with bridge evaluation and design.
- Serve as a forum for information on the development and implementation of new nondestructive evaluation technologies and procedures.
- Involve the international representatives on the committee and promote an exchange of information between the United States and foreign countries.

The first three goals of the committee are primarily concerned with technology transfer. Committee AFF40 takes pride in its efforts to foster technology transfer–building the gap between the state of the art and state of the practice. Activities include organizing lectern and poster sessions at TRB Meetings, both the annual meeting and specialty bridge conferences. Activities also include half- and full-day workshops and production of state of the practice documents, on topics such as Structural Health Monitoring and Nondestructive Evaluation, which are currently under development by the committee. The hope is that these documents will become useful tools for bridge owners to encourage use of SHM and NDE for bridge evaluation and monitoring.

Committee AFF40 members are active in other groups with similar goals, such as American Society of Nondestructive Testing (ASNT), International Association for Bridge Maintenance and Safety (IABMAS), American Society of Civil Engineers (ASCE), American Railway Engineering and Maintenance-of-Way Association (AREMA), American Concrete Institute (ACI), and others. Committee AFF40 members serve on committees within these organizations and encourage cross-pollution of ideas between the groups, co-sponsorship of sessions and papers, and other activities.

Committee AFF40 has been successful over the last fifteen years hosting or co-hosting focused workshops that are geared toward the end user of emerging technologies for bridge evaluation and testing. These workshops have generally drawn 50 or more participants and are summarized in Table 2.

Table 2. Workshops sponsored by AFF40 during the last 15 years

Year	Workshop Title
2002	Introduction to Nondestructive Evaluation Technologies for Bridges
2004	An Introduction to Nondestructive Evaluation Technologies
2005	Application of Health Monitoring for Bridges
2006	Inspection of Suspension Cables, Stay Cables, Posttensioning Tendons, and Prestressing Strand
2007	Making Sense of Sensors Used to Monitor Bridges

2009	Role of Nondestructive Testing and Evaluation in Infrastructure Decision Making
2010	Ultrasonic Imaging of Concrete
2011	Radar for Bridge Condition and Performance Evaluations Nondestructive Evaluation for Bridge Maintenance (Cosponsor)
2012	Practical Health Monitoring for Transportation Structures
2013	Nondestructive Testing Automation: Combined Methods and Data Fusion
2014	Reliability Assessments for Nondestructive Evaluation Technologies
2015	Reliability of Nondestructive Evaluation Technologies
2016	Structural Health Monitoring for Bridge Infrastructure Management: What Owners and Practitioners Should Know
2018	Bridging the Gap Between Nondestructive Evaluation and Structural Health Monitoring Acoustic Imaging for Underwater Bridge Inspection (Cosponsor)

Additionally, Committee AFF40 members have been instrumental in initiating and leading Structures Materials Technology (SMT) conferences working with FHWA and ASNT since the early 2000s. The biennial conference continues today and has been offered at different locations to encourage maximum participation from industry and state departments of transportation. Similarly, committee members have been very active with biennial IABMAS conferences as well as other ASCE conferences such as the annual Structures Congress. Recently, committee members have been actively working with the International Society for Structural Health Monitoring of Intelligent Infrastructure (ISHMII) to host the first ISHMII conference in the United States, which will be held in St. Louis, MO in August 2019.

Besides sponsorship of lectern sessions that are regularly part of the TRB annual meeting program, AFF40 initiated Nugget Presentations as part of its annual committee meeting. The Nugget Presentations are short 2- to 4-minute snippets of case studies, ongoing research, or just new ideas that offer a glimpse of future products and technologies. The goal of these presentations is to encourage collaboration and advancement of the committee mission and goals. The twenty or so Nugget Presentations have become a highlight of each annual committee meeting.

Similar to other TRB committees, Committee AFF40 discusses and advances research needs statements for possible inclusion in the National Cooperative Highway Research Program (NCHRP). The committee is proud that several of its recommended research needs statements have been selected and funded by NCHRP. Three recent projects include:

- Developing Reliability-based Bridge Inspection Practices (NCHRP 12-82)
- Evaluation of Element-Level Inspection Quality (NCHRP 12-104)
- Improving the Guidelines for Inspection and Strength Evaluation of Suspension Bridge Cables (NCHRP 12-115)

It is notable that the first two of these research studies have had an impact the contemporary practice for bridge inspection. The methodologies for risk-based inspection (RBI) developed through NCRHP 12-82 were adopted by the FHWA as a means of analyzing bridges for determining the appropriate interval between inspections [4]. These methods are currently being adopted by bridge owners and provide a more rational basis for inspection planning that allows resources to be focused toward bridges where inspection needs are greatest. A new version of the

AASHTO Manual for Bridge Element Inspection (MBEI) that features visual standards for common bridge element defects was developed under NCHRP 12-104. This new manual was adopted by AASHTO in 2018.

FUTURE GOALS

While globalization fostered the growth of our nation's transportation infrastructure over the last 100 years, the next century will challenge us to perfect asset management strategies that balance the priorities of mobility and reliability while maintaining safety and security. Emerging technologies and innovative materials and construction methods are expected to play a major role in meeting these needs. To this end, Committee AFF40 has committed its future efforts to the application and promotion of technologies that meet the needs of owners for the condition assessment and performance evaluation of transportation structures, including those constructed using innovative materials and methods. Ironically, these aspirations have significant similarity to the original Committee AFF40 mission that grew out of the AASHTO Road Test program, which was to provide guidance for the testing and field verification of the bridge design methodologies of the period.

Adoption of new technologies and innovative materials requires engagement of all stakeholders coupled with continuous outreach efforts that promote the practical application of solving problems in a manner that provides easy to understand and actionable data for asset management. Advances in the state of the art for laboratory testing, field testing, monitoring and NDE have been accompanied by a rise in skepticism that these tools provide useful data that can be adapted to the needs of owners and end-users. Therefore, the committee's future plans focus on outreach efforts that lead to adoption of these tools in decision making. Efforts to analyze and demonstrate the reliability and utility of new technologies will also be supported. The committee will strive to bring together researchers and owners/end-users to break down barriers that hinder the adoption of new tools and methods for the condition assessment and performance evaluation of transportation structures.

Committee AFF40 has done an excellent job for more than fifty years in sponsoring sessions (podium and poster) and workshops at TRB that allow for the sharing and transfer of knowledge. However, to meet the needs of bridge owners and busy professionals who cannot attend TRB, the committee must vigorously pursue other venues and mediums that bring researchers and owners/end-users together, including fostering relationships with allied organizations. To encourage rapid adoption of the latest technologies and methods, Committee AFF40 must pursue activities and products that demonstrate the successful application of technologies and methods for the condition assessment and performance evaluation of transportation structures. Key products being pursued by Committee AFF40 include:

- A primer on Structural Health Monitoring that describes the judicious and targeted use of technology. The primer is intended to showcase how technology can be used to provide value for owners when costs are weighed against benefits.
- While advanced calculation methods are available to determine the ultimate capacity of existing structures, timely and accurate in-service data needed for model input and service life prediction is not always forthcoming. Load testing provides a useful alternative for such cases where current calculation methods, for one reason or another, cannot provide satisfactory answers to performance questions on existing bridges. Thus, the committee is preparing a state of the practice document on Bridge Rating through Load Testing that will cover the preparation, execution, and analysis of load tests, including both diagnostic and

proof tests. If effectively used, these methods can extend the useful life of existing bridges in a cost-effective fashion.

- Because deck deterioration is critical to the performance of bridges, the committee has undertaken preparation of a document on Bridge Deck Evaluation that describes the selection, use, and benefits of NDE technologies for the determination of bridge deck service life.
- A webinar on Augmented Reality for structural inspections to encourage the use of artificial intelligence in civil applications as well as to engage millennials to take interest in the inspection arena.
- A white paper on the use of remote sensing (satellites to drones) technologies for inspection, evaluation, and asset management.
- Sponsorship of workshops or forums geared toward the sharing of ideas and needs of transportation structure owners and those responsible for making maintenance and rehabilitation decisions.

The committee also sees a significant need to foster collaboration with experts in data analytics and advanced technologies such that data collected through laboratory testing, field testing, monitoring and NDE can be better applied in transportation structure asset management systems. In particular, data collection efforts that evaluate interventions throughout the structure life cycle will be pursued. The growth in machine learning, data fusion and visualization tools will also be pursued to provide better models for transportation structure deterioration and performance.

Nondestructive evaluation tools for the condition assessment of the highway infrastructure and field testing of bridges is of interest to broad array of committees, including the other bridge committees as well as maintenance and management of bridges committees. Thus, Committee AFF40 maintains and will continue to develop strong relationships with these and other committees and organizations concerned with monitoring the in-service performance and safety of structures.

As Committee AFF40 looks to the future, the committee considers its past and how the committee has evolved to its present scope. Looking forward, the primary factors that will shape the transportation community and topics within the committee's scope, over both the near and long term, will require improved methodologies for condition assessment and monitoring of transportation structures in balance with the constraints of limited budgets and personnel resources. New strategies for implementation of technologies to make condition assessments more efficient and effective means that tools for knowledge transfer became important and technologies for condition assessment must be matched with repair and rehabilitation strategies, organizational structure, mobility, design features etc. to improve the overall efficiency of transportation programs.

The original members and friends of Committee AFF40 played an integral role in the development of our nation's interstate highway system through their contributions to the advancement of the state of the practice of bridge dynamics and field testing. Today's members and friends of Committee AFF40 are presently contributing to the advancement of technology for the testing and evaluation of transportation structures, while tomorrow's members and friends will no doubt leave their mark too.

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