IDAHO TRANSPORTATION DEPARTMENT

RESEARCH REPORT

Assessment of Asbestos Containing Materials in Idaho Bridges

RP 283

By

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Prepared for

Idaho Transportation Department

ITD Research Program, Contracting Services

Highways Construction and Operations

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16. Abstract

The Idaho Transportation Department (ITD) has more than 4,000 highway bridges under its control in the State of Idaho. For bridges built before 1980, the Environmental Protection Agency (EPA) requires State Transportation Departments to provide inspection reports concerning the presence of asbestos materials for any bridge that is eligible for major rehabilitation or demolition activities. To assist with such inspections, this project reviewed "as-built" plans of a representative sample of ITD bridges that were constructed between 1918 and 1980 and 190 bridges scheduled for work in the next six years. From a total of 443 bridge plans reviewed, information concerning (a) year of construction, (b) location by district, (c) construction material, and (d) type of design, was summarized along with any evident signs of potential use of materials containing asbestos. Additionally, the researchers reviewed available asbestos inspection reports (AIRs) archived by the six ITD highway district offices, and within the ProjectWise and File 360 databases maintained by ITD. This search revealed 89 AIRs for a total of 114 bridges. None of the bridge plans or the inspection reports indicated any signs of asbestos containing materials (ACMs) in the ITD bridges. For easier access by ITD personnel, all AIRs have been uploaded to a unique folder located in ITD's ProjectWise database, along with an Excel file which summarizes this data. Due to the variability of AIRs submitted by contractors in the past, the researchers recommend the use of a new template form to ensure that all required information is reported in the AIRs submitted to ITD.

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Technical Advisory Committee

Each research project is overseen by a Technical Advisory Committee (TAC), which is led by an ITD project sponsor and project manager. The TAC is responsible for monitoring project progress, reviewing deliverables, ensuring that study objectives are met, and facilitating implementation of research recommendations, as appropriate. ITD's Research Program Manager appreciates the work of the following TAC members in guiding this research study.

- Project Sponsor: Matt Farrar, P.E.
- Project Manager: Shanon Murgoitio, P.E.
- TAC Members: Dan Gorley, P.E., and Victoria Jewell, P.E.
- FHWA-Idaho Advisor: Ed Miltner

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List of Abbreviations and Acronyms

AHERA ..... Asbestos Hazard Emergency Response Act

AIR ..... Asbestos Inspection Report

EPA ..... Environmental Protection Agency

FHWA ..... Federal Highway Administration

ITD ..... Idaho Transportation Department

NESHAP ..... National Emission Standards for Hazardous Air Pollutants

OSHA ..... Occupational Safety and Health Administration

PACM ..... Presumed Asbestos Containing Material

PLM ..... Polarized Light Microscopy

RACM ..... Regulated Asbestos-Containing Material

RD&T ..... Research, development, and technology transfer

SP&R ..... State Planning & Research (FHWA)

TAC ..... Technical Advisory Committee

TSI ..... Thermal System Insulation

Executive Summary

Starting in 1970 and continuing today, the U.S. government has regulated the use of asbestos containing materials (ACM), as well as other materials. The Environmental Protection Agency (EPA) has mandated that each state perform asbestos testing for bridges before any demolition or major construction activities. It is likely that some ITD bridges may contain asbestos minerals and will have to be inspected before the start of any construction activities. Such asbestos containing materials (ACMs) may be present in coatings of timber bridge members, concrete elements, pavement materials, beam seats, joints, railings, and in some of the paints used for steel members. This project's aim was to review bridge-plans and inspection reports with a view to determining the extent of possible ACM use in ITD bridges. Additionally, the research team was asked to develop a "standardized" template for collecting information from asbestos inspection reports (AIRs).

Summary

To meet the project's objectives, using available information in HQ and district archives, File360, and ProjectWise, the research team:

1. Performed a literature review and identified potential locations where ACMs have been encountered during bridge inspections, as reported by other state agencies.
2. Reviewed the bridge-plans for 253 ITD bridges built before 1980 to determine if asbestos containing materials were specified in their construction. This sampling was representative of a variety of bridge types constructed between 1918 and 1980, and the locations were well spread throughout the six highway districts. The information from the bridge plans was summarized in an Excel file.
3. Reviewed plans for 190 bridges scheduled for maintenance in the next six years.
4. Reviewed 89 asbestos inspection reports which covered a total of 114 ITD bridges.
5. Created a repository of all asbestos testing reports, along with a summary Excel file, in the ProjectWise platform for future access by ITD personnel.
6. Prepared guidelines for a standardized template for reporting asbestos inspection results for bridges scheduled for rehabilitation or demolition. This standardization will allow the relevant information to be quickly added to the AIR summary file.

Conclusions

On the basis of the reviewed information, the research team is able to make the following conclusions:

- The study did not identify the presence of ACMs in any of the bridge plans reviewed for the sampling of 253 bridges built between 1918 and 1980, and the 190 bridges scheduled for work in the next six years.
- A review of bridge plans is unlikely to identify the use of ACMs.
- Only a thorough asbestos inspection of the bridge is likely to identify the use of ACMs.
- A review of the available 89 asbestos inspection reports (AIRs), for 114 ITD bridges, did not indicate the presence of ACMs.
- The quality and content of the reviewed AIRs was variable, and often lacked critical information.
- To overcome problems with the quality of the submitted AIRs and the extent of information collected, a standard IIR reporting template is necessary.

Recommendations

Following the review of literature, ITD bridge-plan, and asbestos inspections reports, the following recommendations are proposed:

1. All submitted AIRs for bridges should be added to the repository created in ProjectWise.
2. Each AIR file should be identified by the name: **"[BRIDGE KEY]_[DISTRICT No]_asbestos report"**. Such a consistent file naming approach will allow easier access for ITD personnel.
3. The data from each AIR should be added to summary Excel file in the ProjectWise folder.
4. The template discussed in Chapter 5 and presented in Appendix D should be adopted for all future asbestos inspection reports (AIRs). The contractors/inspectors should specifically list the locations on bridges where the asbestos samples were collected for testing. In addition, the report must contain specific information to identify the bridge under consideration, bridge type and material.
5. The development and implementation of a data entry interface for the summary Excel file should be considered to facilitate the addition of new data collected by future AIRs.

1. Introduction and Background

Overview and Background

In 1970, the U.S. government started regulating the use of asbestos in new building construction following the passage of the "Clean Air Act (42 U.S.C. §7401 et seq.)." The Asbestos NESHAP, OEPA and OSHA asbestos regulations define Asbestos Containing Materials (ACMs) in various ways. EPA defines ACMs as any material or product that contains greater than 1 percent asbestos by dry weight. However, OSHA defines ACMs by 0.1 fibers/cubic centimeter over an 8 hour time weighted average or 1 fiber/ cubic centimeter averaged over 30 min period.

This was soon followed by a prohibition on the use of ACMs in bridges in the 1970's. Subsequently, standards for asbestos control were presented in the Code of Federal Regulations (CFR), 40 CFR 61, Subpart M, NESHAP and Occupational Safety and Health Administration (OSHA). According to "23 CFR Section 650.305", "bridge" is defined as: "A structure including supports erected over a depression or an obstruction such as water, highway or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between under-copings of abutments or spring lines of arches".

The Asbestos NESHAP (40 CFR Part 61, Subpart M, Section 61.145 Standard for Demolition and Renovation) sets forth procedures to be followed when a "facility" is demolished or renovated to minimize the release of asbestos fibers during these activities (ODOT 2018: 1-2). This was followed by the "National Emission Standards for Asbestos - Background Information for Promulgated Asbestos, NESHAP Revisions" dated October 1990 (EPA 450/3-90-017). Based on this clarification, bridges are regulated under the Asbestos NESHAP regulation and hence, must be inspected for ACMs prior to renovation and/or demolition activities (ODOT 2018: 2).

The Idaho Transportation Department (ITD) has close to 1,500 highway bridges under its control in the State of Idaho. Prior to prohibition, ACMs may have been used in ITD bridge construction, particularly between 1918 and 1980. However, it is possible that some bridges constructed after 1980 may have ACMs. These ACMs may be present in coatings of timber bridge members, concrete, pavement materials, beam seats, joints, railings, and in some of the paints used for steel members.

Objectives of the Study

The scope of this project focused only on bridges owned and maintained by ITD. The specific goals of this project were to:

- Develop an efficient approach to sample a valid set of bridges built prior to 1980 and review the construction and material specifications. In addition, review bridge plans to determine if asbestos containing materials were specified in their construction.

- Perform a detailed review of plans and construction specifications on all potential locations on bridges that have suspect ACMs.
- Compile and review available asbestos testing reports of ITD bridges. This information will be collected by reviewing files located in the File360 and ProjectWise databases.
- Create a repository of all asbestos testing reports, along with a summary, in the ProjectWise platform for future access by ITD personnel.
- Design a standardized template for reporting asbestos inspection results for bridges scheduled for rehabilitation or demolition. The data from this report will be added to ProjectWise. Such an archive may be used demonstrate compliance with the Environmental Protection Agency (EPA) and the Idaho Department of Environmental Quality regulations.

Organization of the Report

This report consists of six chapters and Appendices.

Chapter 2 presents a summary of the information gathered from a review of available literature concerning ACMs in bridges. The review provides details of typical locations for ACMs, inspection procedures, and template suitable for creating standardized asbestos inspection reports.

Chapter 3 concerns the methodology applied to collect as-built bridge plans, all sources of bridge information, and asbestos inspection reports for this study.

Chapter 4 discusses the results of the review of the bridge plans and asbestos inspection reports. A summary of the collected data is also included in the chapter.

Chapter 5 presents details of the recommended asbestos inspection template. The selected attributes will be discussed along with the process for adding this information to the data assembled in ProjectWise.

Chapter 6 provides a summary of the research performed, along with conclusions and recommendations for future research. Directions for assembling a repository of the asbestos inspection reports is also included in this chapter.

The Appendices contain support material from the literature search, summaries of the data collected for this study, and the proposed template for the asbestos inspection report (AIR).

2. Literature Review

In following, the regulations imposed by the US EPA, many State DOTs prepared documents which established the requirements for rehabilitation and demolition of bridges with ACM components. This section of the report will summarize the US EPA classifications for ACMs, present details about the geologic nature of aggregates in Idaho, provide brief examples of implementation details from six State DOTs, and discuss two examples of an Asbestos Inspection Report (AIR).

Example State DOT Procedures

Illinois DOT (2002)

The Illinois DOT effort (Illinois DOT 2010) started with the issue of a memorandum dated May 31, 2002, from the division of Local Roads and Streets which led to the development of the most recent procedures presented in Memo 10-02, "Compliance with Asbestos Requirements for Highway Bridges" in November 2010. The Illinois DOT approach reviewed state bridges and placed them in one of three lists:

1. Bridges on Approved No Asbestos (Waiver) List.
2. Confirmed/Unconfirmed List of bridges that either are known to contain asbestos or for which the presence or absence of asbestos is unconfirmed.
3. Asbestos Involvement Confirmed List for bridges that are confirmed to involve asbestos.

The report also included a template for "Asbestos Determination Certification" and procedures for sampling and testing for asbestos.

New York State DOT (2008)

The NYSDOT procedures (NYSDOT 2008) provide information required to select and implement appropriate asbestos management procedures in connection with the identification and abatement of ACMs associated with their transportation construction work. The procedures addressed many potential sources of ACMs ranging from paint coatings used for thermal/salt/water protection to asphalt paving mixtures. The report supports initial asbestos screening by experienced Department personnel before involving special consultants.

Considerable information is provided in this report concerning assessment, sampling, testing, and contract specifications regarding ACMs. It also stresses the importance of reviewing historical construction documentation or records of previous material sampling for the affected structures.

Texas DOT (2008)

The Texas DOT (TxDOT) documents (Morse, et al. 2008) provided a comprehensive survey of procedures implemented by other state DOTs regarding practices for dealing with ACMs before the start of scheduled bridge maintenance and rehabilitation. The survey used a set of forty (40) questions which were sent to 50 DOTs, with 39 DOTs provided a response. The results of the survey were used to train TxDOT staff regarding federal and Texas state regulations, limit worker exposure to ACMs, and to increase overall safety. In addition, the study provides guidelines to determine the location, quantity, and nature of ACM in all bridges. As an example of the documentation, Figure 2.1 shows the most common locations of ACMs on bridges. The TxDOT report concluded by strongly recommending that all bridges in Texas be studied to identify locations and quantities of ACMs present.

New Hampshire DOT (2015)

The New Hampshire (NH) Bureau of the Environment published its requirement in a document titled "Review of Best Practices for Addressing Asbestos on Bridges" in July 2013 (King et al. 2013). These procedures were developed for use by the New Hampshire DOT (NHDOT) personnel to assess their existing bridges for ACMs.

Asbestos was used routinely on NH bridges in many different components of the bridge primarily within a 20-year window between approximately 1958 and 1978. Those components primarily consisted of back walls, membrane between asphalt and concrete decks, bridge shoes, expansion joints, and the utility conduit piping attached to bridges. To date, ACMs have been found in many different areas of the bridge structures, most significantly in bridge decking materials, just below the asphalt layers. During demolition and other activities, such as routine deck maintenance, the asbestos can be disturbed resulting in the release of fibers.

The NH Bureau of Environment reached out to other DOTs and other state agencies across the country, to gather information on the state of practice concerning asbestos in bridges. The contact statistics for this effort to learn about asbestos were:

- 42 out of 50 States provided contact information.
- 8 out of 50 States had no contact information available.
- 34 out of 50 States responded to email requesting information.
- 20 Contacts were very helpful with sharing information.

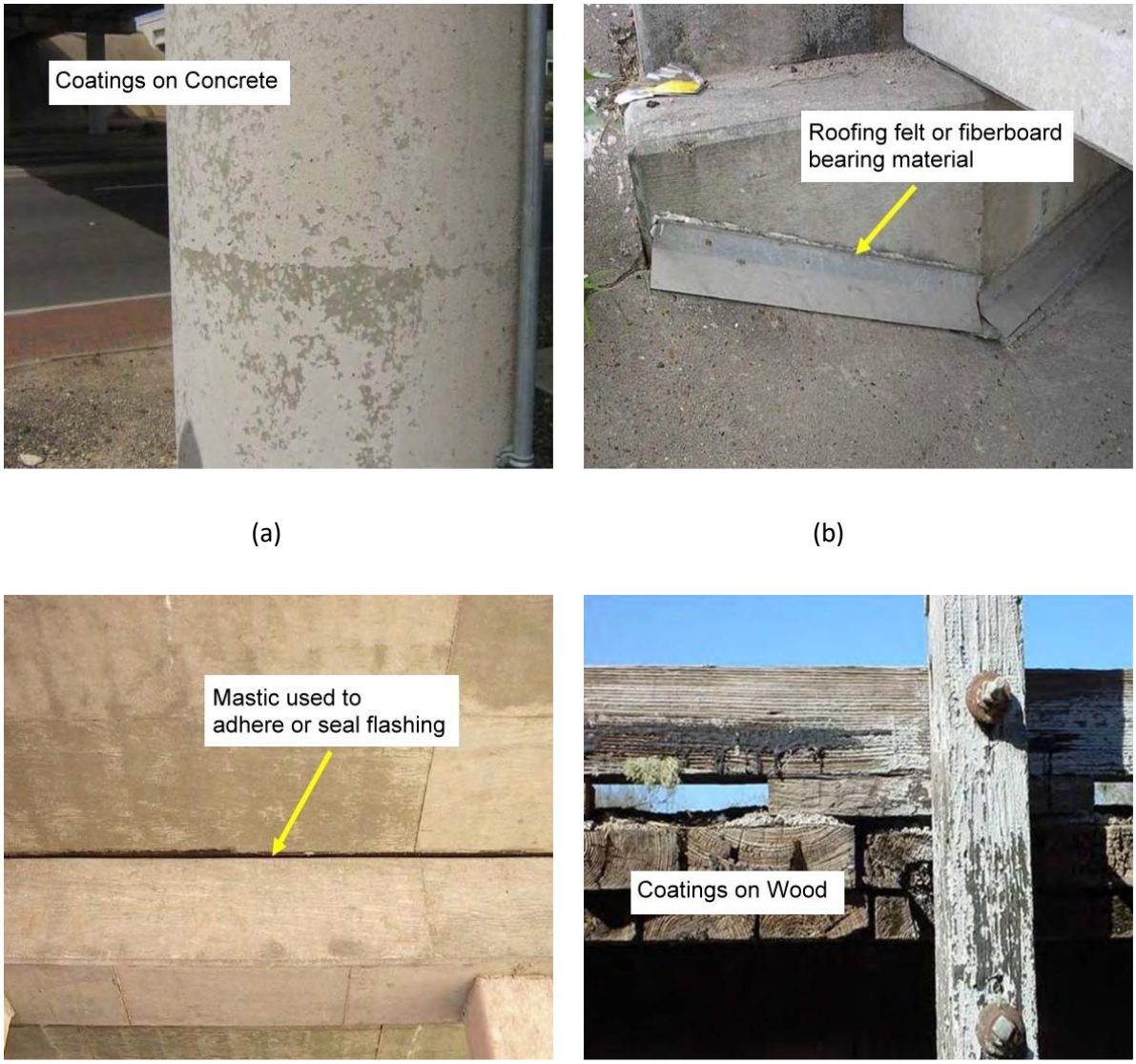

Figure 2.1 Common sources of Asbestos found in bridges (Morse, et al. 2008). (a) shows potential asbestos coating on concrete, (b) photo shows use of felt or fiberboard bearing material which may contain asbestos, (c) shows location of adhesive mastic with possible asbestos, and (d) photo shows possible use of coatings with ACMS on wood.

DOTs in Illinois, Indiana, Pennsylvania, and Texas provided the most useful information. These contacts helped identify typical locations where ACM is found, which happened to be at the same locations identified by NHDOT. These areas include:

- Transit conduit Utility Piping/Insulation.
- Waterproofing Deck.
- Asphalt abutments.
- Caulking.
- Mastics.
- Painting on steel girders.
- ACM in control rooms (tile, sheetrock, etc.).
- Shims.
- Bearing pads.
- Tar sealant.
- Expansion pad material.
- Some Paints and Sealants.

Most of the asbestos related inspections in New Hampshire were performed in-house by DOT personnel. The overall task of the inspections was to:

1. Determine if a bridge contains ACM.
2. Determine quantity of ACM.
3. Determine location and extent of ACM.

Coring, along with laboratory testing, is used extensively to help identify whether the material contains more than 1 percent asbestos, and thus requires special treatment.

Ohio DOT (2018)

In 2018, the state of Ohio developed a document (ODOT Office of Environmental Services 2018) to assist the Ohio DOT (ODOT) personnel to follow detailed procedures for (a) when asbestos inspections are required, (b) getting the inspections and any subsequent abatement coordinated, contracted, and documented for completion.

The report provides additional details about asbestos inspection and reporting. At the completion of the inspection, ODOT requires an Asbestos Inspection Report (AIR), which is expected to include the following details:

1. Date of inspection.
2. Address of the site.
3. Name, address and phone number of the site owner, client, or customer (i.e., District Headquarters).
4. Name and signature of the Asbestos Hazard Evaluation Specialist (AHES) writing the report.
5. Blueprint, diagram, or written description that identifies:
   (a) Location, type of material, and approximate quantity of each ACM identified and each assumed ACM identified.
   (b) Exact locations where bulk samples were collected.
   (c) Date of collection.
6. Description of the manner used to determine sampling locations and the name and signature of the AHES collecting samples.
7. Copy of the bulk sample analysis report, the name and address of any laboratory that analyzed the bulk samples, the date of analysis, and the name and signature of the person performing the analysis.
8. Copy of the Ohio Notification and Demolition Forms (ONDRF) completed by the AHES. A blank example of an AIR is included as Appendix B.

The report also discusses the ODOT procedures for the abatement and disposal of ACMs.

Wisconsin DOT (2019)

The Wisconsin DOT (WisDOT) prepared a "Facilities Development Manual - FDM 21-5-1 Asbestos" (WisDOT 2019) in November 2019 to address ACMs in construction. The document presents procedures which should be applied to all highway bridges, structures and buildings being rehabilitated, renovated, moved, or demolished as part of a federal or state funded project. WisDOT administers all asbestos inspections which allows the Department to:

- Determine if asbestos-containing material is present on or in a structure by obtaining representative samples of suspect material for laboratory analysis.
- Report the results in a standard format.
- Include the information in the environmental document for the project.
- Prepare special provisions for inclusion in the moving, demolition, or let contract.

The publication provides additional information for bridge materials which may require sampling. The materials include:

- Concrete – sampling of bridge concrete is limited to Florence and Marinette counties.

- Parapet or sidewall expansion joint caulk.
- Gasket or grout material underneath guard rail or railing bolt plates.
- Caulk or sealant in expansion joints.
- Tar or sealant in wooden timbers.
- All standard suspect building materials such as insulation, floor tile, cork, brake pads, transite siding, etc. in bridge tender houses and bridge gear units.
- Paint.
- Bridge deck caulk.
- Inactive utility conduit where WisDOT is the owner, or when the owner cannot be identified. In Wisconsin, utilities are responsible for their own inspection and abatement.

For bridges with ACMs, WisDOT requires the completion of an Asbestos Inspection Report (AIR), which must include the following information:

- WisDOT project ID.
- Structure Number.
- Route on structure and feature structure is over.
- County.
- Date of inspection.
- Asbestos Inspector's Name and License number.
- Inspection Firm Name (if applicable).
- Asbestos Containing Material (ACM) (IS/IS NOT) present on this structure.
- Location map.
- Results in table format in the following order:
    - Sample #.
    - Description (what material was the sample taken from).
    - Sample location (where on the bridge or where in the tender house).
    - Results of Analysis (indicate analytical method for positive results).
    - Category I or Category II Non-Friable or Friable or no ACM present.
    - Total amount of material (in square feet, or in linear feet for pipe insulation). If computation is necessary to determine total amount, show computation

(e. g. 6 × 6 inches of grout/bracket is equal to 0.25 square feet of grout/bracket; for all 24 brackets, this is equal to a total of 6 square feet of caulk).

- A disclaimer indicating that WisDOT standard sampling procedures were followed according to FDM 21-1. If standard procedures were not followed, describe the sampling procedures used and the reason for varying from the standard.
- Bridge plan indicating sampling locations and any ACM present.
- Photos of structure and sampling locations. Photos of sampling locations should include a 6-inch ruler for scale.
- Laboratory analytical report.

The report also suggests a standardized naming convention for the submitted electronic reports as:

[DOT PROJECT ID]_[Bridge-Number]_[Route on Bridge][route or feature under bridge]_[County].

An example following the suggested format would look like:

0655-01-00_B-12-0027_USH 18 STH 27-60 over Mississippi River Crawford County

The report also includes details for handling and disposal of ACMs.

Asbestos Testing

OSHA defines ACMs by 0.1 fibers/cubic centimeter over an 8 hour time weighted average or 1 fibers/cubic centimeter averaged over 30 min period. Materials that are known to contain greater than 1 percent asbestos in their composition may either be classified as an assumed ACM. Alternatively, the suspicious material may be sampled by an Asbestos Hazard Emergency Response Act (AHERA) accredited inspector and classified as an ACM if a polarized light microscopy analysis indicates an asbestos content greater than 1 percent.

ACM Definitions according to NESHAP and OSHA

EPA NESHAPs regulations require identification, classification, and strict consideration of existing building materials prior to the beginning any renovation or demolition activity. The NESHAP regulations group ACMs into two main categories, “Friable” and “Non-friable”. Then within the “Non-friable” group, the ACM is categorized further into three categories as:

- Friable ACM: ACM that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
- Category I non-friable ACM that will be or has been subject to sanding, grinding, cutting, or abrading; Category I non-friable ACMs include asbestos-containing packing, gaskets, resilient floor covering, asphalt roofing products.

- Category I non-friable ACM that has become friable.
- Category II non-friable ACM that has a high probability of becoming, or has become crumbled, pulverized, or reduced to a powder by forces expected to act on the material during demolition or renovation activities. Category II non-friable ACMs include any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. Under 40 CFR 61.141, bridge concrete is considered Category II non-friable ACM if it contains more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

As an alternative to the NESHAP definitions, OSHA categorizes ACMs into four classes depending on whether construction plans call for the removal, repair and maintenance, or maintenance only. The OSHA definitions, according to OSHA 29 CFR 1926.1101, are:

- Class I asbestos work means activities involving the removal of thermal system insulation (TSI) and surfacing ACM and Presumed Asbestos-Containing Material (PACM).
- Class II asbestos work means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile, and sheeting, roofing and siding shingles, and construction mastics.
- Class III asbestos work means repair and maintenance operations where asbestos is likely to be disturbed.
- Class IV asbestos work means maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

Asbestos Record Keeping

The ITD Environmental section requires that the employer shall maintain asbestos records for 30 years in accordance with 29 CFR 1910.33. Additionally, OSHA standards require that employers with employees engaged in asbestos-related work retain:

- Personal air sampling records, for at least 30 years; personal air samples are those collected in the worker's breathing zone during performance of work involving asbestos exposures.
- The data used to qualify for exemptions from OSHA's initial monitoring requirements for the duration of the exemption.
- Medical records for each employee subject to the medical surveillance program for the duration of their employment plus 30 years.
- All employee training records for one year beyond the last date of each worker's employment.
- Access to employee exposure and medical records (29 CFR 1910.1020).

- Hazard Communication (29 CFR 1910.1200).
- Also note the OSHA Construction Rule (29 CFR 1926.1101) or the EPA Worker Protection Rule (40 CFR 763 Subpart G) which incorporates the OSHA regulations by reference for certain state and local employees.

The results of any asbestos testing should be archived as part of the renovation or demolition project files.

Asbestos in Aggregates

ITD RP 212 (Gillerman and Weppner 2014) reviewed forty (40) aggregate material sources used by ITD in Idaho and concluded that there was no evidence of the presence of asbestos minerals in any of the aggregates. On this basis, concrete material which used an Idaho aggregate is not expected to be classified as an ACM. If concrete had been prepared with asbestos containing aggregates, such concrete would be classified as an ACM. In this case, items such as the concrete bridge girders, columns, piers, or bridge decks must be declared hazardous. However, readers should be aware that aggregate imported from across state lines was not examined by RP 214 and so may need to be tested for asbestos minerals.

Example Inspections

California

The California Department of Transportation (Caltrans) produced an asbestos and lead containing paint survey report for the Tuolumne River Bridge (Caltrans 2013). The project focused on collecting bulk samples for chemical analysis. Six representative samples were selected from the bridge pads, concrete, and barrier rail shims (sheet packing). Laboratory analysis indicated 70 percent of chrysotile asbestos in the barrier rail shims. Figure 2.2 shows the location of these barrier shims, which are used to separate the rail baseplate from the concrete barrier. Interestingly, NESHAP did not require the removal of the asbestos containing barrier shims prior to renovations.

Figure 2.2 Barrier rail shims with ACM (Caltrans 2013)

New York State DOT

The NYSDOT used a private consulting company (Stantec Consulting Services, Inc. 2013) to investigate the presence of ACMs in the west and east bound bridges of the Long Island Expressway (I-495) over Long Island Railroad (LIRR) in Calverton, Suffolk County, NY. The investigation was part of a 2013 bridge rehabilitation project. The bridges were built in 1970 and have a concrete deck supported by steel girders. The rehabilitation activities included the repair of spalling concrete, bearing replacements, and rehabilitation of the superstructure. The work consisted of reviewing bridge plans where asbestos materials, such as the sheets on the top of the back walls, deck joints, black bearing pads, grey sheet breakers in piers, brown joint fillers at the intersection of the deck and the wing walls, black slip sheets between the abutment and the bridge deck, and the black tar sealers on the longitudinal joints, may be encountered during the rehabilitation. Eighteen (18) samples were collected from these locations. Laboratory analysis revealed that the slip sheet and joint bond breaker material of both bridges, and the vertical joint filler between the wing walls and deck slab of the eastbound bridge contained ACM. Figure 2.3 shows the asbestos containing joint filler located between the wingwalls and the deck slab.

(a) (b)

Figure 2.3 Location of joint filler with possible ACM (Environmental Planning & Management, Inc. 2013). (a) shows the south abutment at east wing wall, and (b) shows the south abutment at west wing wall.

Minnesota

In Minnesota, the I-35 SB off-ramp over "Can of Worms Bridge" was identified for demolition and asbestos investigation was required to be done for the compliance with the EPA regulations. The investigation (WSB and Associates, Inc. 2016) included reviewing the bridge as-built plans from 2006 to identify suspect ACM. The following six materials with some asbestos content were identified:

- Bridge deck.
- Road wear surfaces.
- Bent pilings.
- Guard rails.
- Utilities.
- Superstructure.
- Cast iron drainpipe for storm water discharge.
- Electrical utility conduit and junction boxes.

Laboratory testing showed that all collected material samples did not contain asbestos.

South Carolina

In South Carolina, an ACM investigation of US-21 Sea Island Parkway Bridge over the Harbor River was conducted in Beaufort County, South Carolina in 2017 (F&ME Consultants. 2017). This bridge was planned for demolition. The age of the bridge was unknown, and its structural system consisted of a concrete deck supported on precast concrete piles. In addition, the superstructure was swingable with a locking mechanism that locks the bridge in place when open to road traffic. The fifteen suspected materials identified for asbestos testing were found at the following locations:

- Fabric felt.
- Black expansion joint material.
- Gray expansion joint material.
- Black tar-like material.
- Gray epoxy-like material.
- Block pipe thermal systems insulation (TSI).
- Tan crack sealer, gray crack sealer.
- Black coating on piles.
- Cementitious lining in piping.
- White coating on foam insulated tank.
- Black caulking.
- Green caulking.
- Cove base and mastic.
- Dark gray, vinyl sheet.

Figure 2.4 shows some of these locations. The figure on the left shows one of the bridge bents where the inspectors collected gray expansion joint like-materials. The figure in the right shows the swing part braking pad, where samples were not collected as the material did not appear to contain asbestos.

The South Carolina DOT applied a protocol called “A first positive stop”, which means that as soon as the first sample of any material on a the bridge tests positive for asbestos, the remaining samples should not be analyzed for asbestos. In other words, only one confirmed case of asbestos is adequate for invoking special ACM regulations. Interestingly, in the case of the Sea Island Parkway Bridge, no asbestos was detected in the collected samples.

(a) (b)

Figure 2.4 US-21 Sea Island Parkway Bridge over the Harbor River (F&ME Consultants 2017). (a) bridge bents with joint-filler, and (b) swing braking parts

3. Methodology

The Idaho Transportation Department (ITD) controls about 1,500 bridges located in six highway districts in Idaho. As these bridges are repaired, rehabilitated, or demolished and replaced, there is concern about the presence of asbestos in the bridge materials. US EPA regulations (40 CFR Part 61.145) require that bridges scheduled for construction activities be inspected for asbestos containing materials (ACMs) before the start of any construction activities. The inspection process includes the sampling and testing of materials suspected of containing asbestos. Irrespective of whether asbestos is found, the results of the entire inspection process must be documented and shared with the US EPA. This project's goal is to create a framework for identifying bridges which were constructed using ACMs. This will be accomplished by reviewing:

1. Available design plans and specifications of existing bridges.
2. Available as-built bridge plans.
3. Available asbestos inspection reports (AIR).

This information will be gathered from archived files in the ITD-Boise headquarters and the six highway districts. Additional information is also expected to be gleaned from ITD's ProjectWise and File360 databases, any other data made available by ITD personnel.

The methodology proposed for the ACM assessment of ITD bridges starts with the selection of representative bridges from the current inventory of 1,500 bridges. For each selected bridge, the design and as-built plans, and specifications will be carefully reviewed to see if it is possible to identify the use of ACMs. Also, asbestos inspections have been performed on many bridges which have undergone maintenance and rehabilitation since the adoption of the US EPA regulations in Idaho.

Representative Bridge Data

The considerable bridge information provided by the ITD bridge section was narrowed down to select representative sample of bridges owned by ITD. The four categories used to select representative bridges were:

1. Year built. For simplification, the selected 1918 to 1980 time frame was divided into six groups consisting of five 10-year periods and one final 12-year period for a total of 62 years.
2. Geographical representation within the six districts.
3. Bridge materials (7 types).
4. Bridge structural systems (12 types)

The study also collected information from ACM assessments that were completed for bridges which have been repaired or rehabilitated in the past 62 years. Such information is expected to provide details of typical locations where ACMs may have been used in Idaho bridges.

Bridge Information Sources

Data for all ITD bridges are currently saved under two main platforms, ProjectWise and File360. File360 is a specific platform that is used to store and save all documents related to bridges such as bridge plans and specifications, including current and older data for any specific bridge. File360 is also used to identify bridge location, county, construction date, renovation date, etc. All bridges in Idaho are identified by a "Bridge Key" which is a unique number for each bridge built in Idaho. The second platform, ProjectWise, is used to store all information, such as contracts, plans, reports, and any other documents, related to bridge projects. The Project Manager provided our team with written instructions on how to navigate both systems to find required bridge information. The team used both systems for this study.

The Project Manager also provided our team with two Excel files that contained additional information on all bridges in the State of Idaho. The first file contained all Bridge Keys, material, design, location, year built, route, and owner. The second file included data for all bridges scheduled for demolition or future construction by ITD for the period FY 2020 to 2026.

The following sections present the methodology used to achieve the goals of the project. The ACM related information was collected from several sources which included search of ITD archives, review of as-built bridge plans, use of ProjectWise and file 360 to locate ACM inspection reports, and finally, the information provided by the various ITD district offices.

ITD HQ Archive

In July 2019, our team visited the headquarters of ITD in Boise and used the archive of the Bridge and Environmental Sections that contain hard copy reports and other documents related to bridges. We spent over 24 hours sorting and reviewing all files, including bridge design related documents and environmental reports to locate any hard copies of asbestos inspection reports using Bridge Keys, construction date, project Fiscal year, and Project Keys.

The documents we sorted and reviewed did not contain any asbestos-related reports. We then sent an email to all districts requesting copies of any asbestos testing reports with the goal of adding these to ProjectWise. Based on the discussion with ITD-TAC members, it became apparent that the documentation of asbestos containing material reports have been kept in various places across ITD headquarters and within the six district offices. Four of the six districts responded to the request and sent 18 reports. These are discussed in following sections of this report.

ITD Bridge Database

We developed a method to select a representative sample of bridges owned by ITD to review their specifications and drawings, and to identify any ACMs at the suspicious locations (listed below). The bridge samples were selected to cover four main categories year built, district location, bridge material and system.

This method yielded a total of 253 representative bridges for review, covering the six (6) districts in Idaho. The review of all bridges focused on certain bridge elements and locations. The following list of 19 items was extracted from the literature review and refined for use in this study. Each item is labeled as an attribute to be checked for ACMs while reviewing ITD bridge as-built plans and specifications. The list included various materials that were popular in bridge construction from 1918 to 1980.

1. Black bearing pads.
2. Gray sheet bond breaker in the Pier-deck joints.
3. Bridge barrier rail assemblies.
4. Brown joint filler material between wing-walls and deck/approach slabs.
5. Black/grey slip sheet (bond breaker material) between top of abutment back-walls and deck slabs.
6. Light grey joint sealer caulk on deck joints through the parapets.
7. Black tar/mastic sealer on top-of-deck longitudinal joints.
8. Black expansion joint material.
9. Gray expansion joint material.
10. Gray epoxy-like material (used in bridge bents).
11. Block pipe insulation.
12. Tan crack sealer (used in bridge bents).
13. Black coating on precast concrete piles.
14. Cement asbestos.
15. Cementitious lining in piping.
16. White coating on foam tank jacketing.
17. Deck waterproofing membrane.
18. Coating on concrete and steel structures.
19. Plain concrete aggregate.

The selection of the material types and structural systems was based on the bridge categories used in existing bridge designs found in the ITD districts. The data for existing bridges was provided by the Project Manager.

Figure 3.1 shows a flow chart of how bridge plans were selected and reviewed using the notation listed in Table 3.1. The review of bridge plans started with the bridge construction year followed by the district number and then the bridge material and finally by the bridge system design. The flow chart is an example of one set of plans that were reviewed by the research team. The review of bridge plans started with the year the bridge was built (first decade 1918-1928), followed by first district. Under district one, several bridges with various materials and structure systems were selected. This process was repeated for all the six districts and 62 years, which resulted in 253 bridges requiring a review.

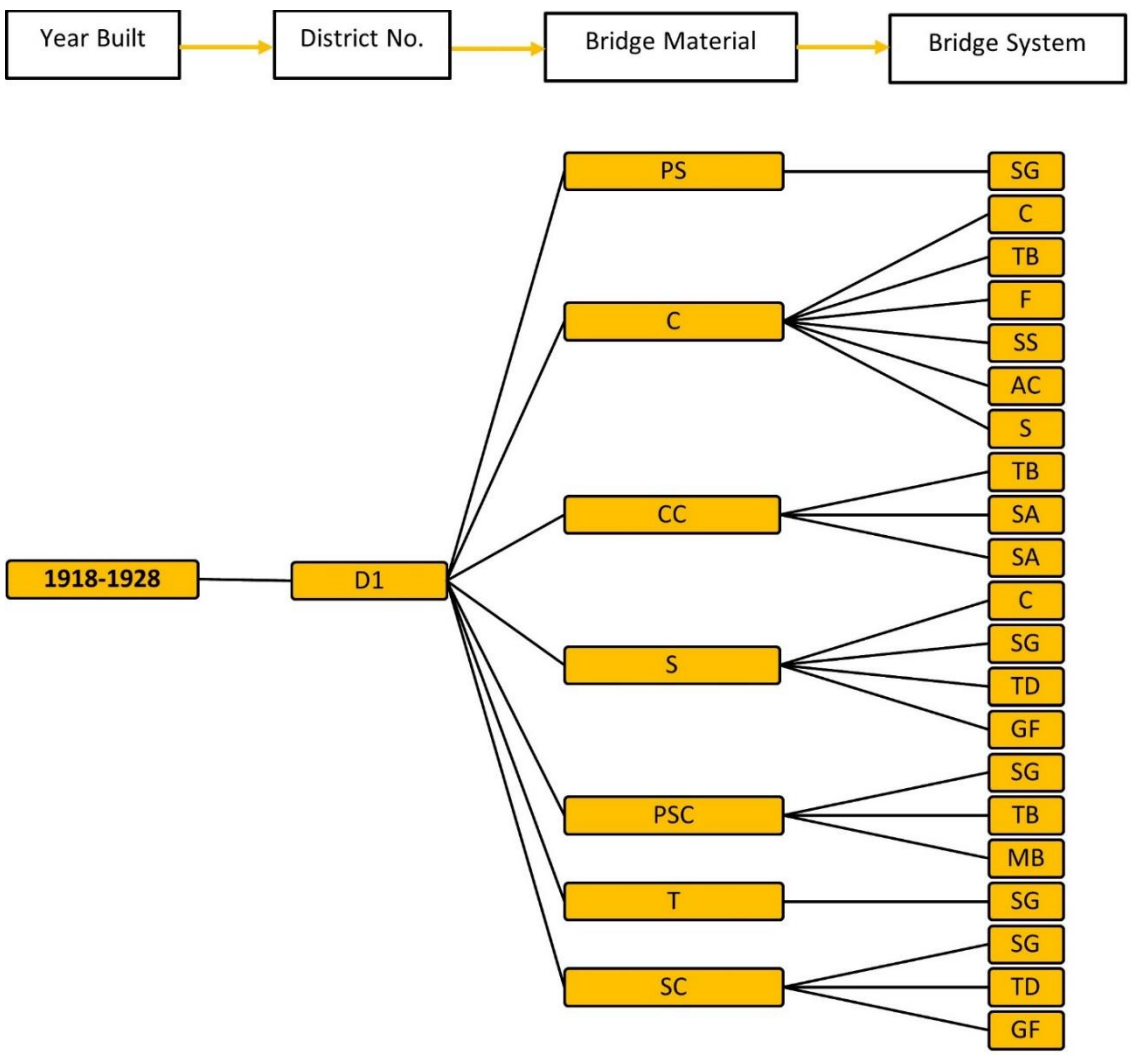

Figure 3.1 Flow chart showing the attributes used in review of as-built bridge plan

Table 3.1 Summary of Bridge Attributes

Bridge Materials	Design Type
PS: Prestressed Concrete	SG: Stringer/Girder
PSC: Prestressed Concrete Continuous	C: Culvert
C: Concrete	T: Tee Beam
CC: Concrete Continuous	TD: Truss-Deck
S: Steel	F: Frame
SC: Steel Continuous	BB: Box Beam
T: Timber	S: Suspension
	SA: Slab
	SS: Single Spread Box
	AC: Arch Deck
	CB: Channel Beam
	GF: Girder floor beam

An Excel file was created containing all the bridge information reviewed by the team. The as-built plans for the 253 bridges reviewed revealed that ACMs were not used at any of the suspicious locations. However, the as-built plans do not incorporate changes, revisions, repairs, or modifications over time. Each bridge should be at least inspected prior to demolition or renovation by a certified asbestos inspector to confirm the absence of asbestos. Figure 3.2 shows a snapshot of the developed database. The data file has been sent to ITD as a separate file and saved under the folder RP 283_ProjectWise.

Our team reviewed an additional 190 bridge plans eligible for future construction activities (FY 2020 to FY 2026). The team followed the same procedure of reviewing the bridge plans in File360 and ProjectWise as discussed in the previous section. The same suggested location attributes were used to search for information related to asbestos. The Excel file for these 190 bridges has been saved in ProjectWise. The Excel file has some bridge records that are listed as “N/A”. These bridges do exist, but the team was unable to locate any relevant information for these bridges in the database.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Bridge Key	Bridge Year	Bridge Type	Checked By	Date Checked	Drawing Number	Project Key	District Number/ County code	Black Bearing Pads	Pier-Deck Joints	Bridge Barrier Rail Assemblies	Brown Joint Filler Material Between Wing-Walls and Deck/Approach Slab
2	30875	1967	Concrete Underpass	Amanda	03/31/2019	10190	01247	1	neoprene pads (dwg. 7)	Two-component Elastometric Polymer Type Sealer (dwg. 1)	none	none
3	10020	1928	Concrete Culvert	Tony	04/02/2019	545	00213/00717	1	none	none	none	none
4	12220	1964	S: SG	Amanda; Kevin	6/17/2019	10235	01744	1	none	none	none	none
5	18690	1960	PS: SG	Tony; Amanda; Kevin	6/17/2019	7938	8389	1	none	unspecified	no coating	none
6	10015	1970; Repaired 2014	Prestressed Concrete Stringer/Girder	Kevin	6/6/2019	13088	01507	1	3/4" Neoprene Pad 60 Durometer (dw 5)	Joint Filler Type III, (dw 11)	Std #10 Gage Guard Rail	none
7	10020	1927	Concrete Stringer/Girder	Kevin	6/7/2019	545	00213	1	None	None	None	None
8	10030	1988; Repaired 2011	Concrete Continuous Tee Beam	Kevin	6/7/2019	15346	03393	1	None	None	Alcoa Design No.2001	None
9	10035	1961; Repaired 2019	Steel Continuous Truss-Deck	Chaney	6/10/2019	14122	01420	1	None	None	FP61 Specifications, Article 422-2.5 (dw 34)	None
10	10095	1958	Concrete Frame	Chaney	06/14/2019	7724	01337	1	None	None	None	None
11	10095	1958	Concrete Frame	Chaney	06/14/2019	7723	01337	1	None	None	None	None
12	10115	1977	Prestressed Concrete Stringer/Girder	Chaney	06/15/2019	14964	01594	1	Elastomeric Bearing Pad (dw 6)	None	None	None

Figure 3.2 Snapshot of part of the Asbestos Excel file for bridges built between 1918 and 1980

Asbestos Inspection Reports

The team and the project manager sent emails to all six districts requesting a copy of available asbestos inspection reports (AIRs). Also, the team navigated ProjectWise and conducted an intensive search for additional asbestos testing reports that were not provided by the district offices. We started with a broad search using the word “asbestos” which resulted in 1600 files. All files identified by the search were sorted and grouped according to district. All the results found in the asbestos reports were then summarized in an Excel file that has been sent to ITD.

While reviewing the asbestos testing reports, we found major differences between the way the reports were classified and formatted. Some reports were classified using Bridge Keys, and others by Project Keys. The format of testing reports was also significantly different between districts and even within a district. Some reports listed the number of samples and their locations while others did not. Another inconsistency was found where a contractor submitted various asbestos tests for several bridges in one report.

Figures 3.3 and 3.4 are two examples of the inconsistency in testing report formats. As shown in Figure 3.3, the asbestos samples were collected from various locations (deck joint, concrete deck, and from pipe insulation). The report shows no detected asbestos. This AIR lacks information such as project number and did not show clear photos of the bridge view nor the locations of suspicious ACM. On the

other side, Figure 3.4 presents another asbestos inspection report that shows the type of asbestos' samples but did not present the location of the samples. The team strongly recommends that districts use a uniform template to maintain consistency in reporting the findings from asbestos tests.

Figure 3.5 presents a snapshot of the Excel file which summarizes all the available AIRs. The Excel file has been designed to include bridge name, bridge key, year built, project number, county name, ACM sample locations, number of samples, description of samples, and bridge design. This Excel file will be shared with all districts where they can add future AIRs to it. The compilation of all AIR in one central location will enable all future ACM testing and results to be reachable and available to ITD personnel.

CERTIFICATE OF ANALYSIS

Client: Tetra Tech
618 South 25th Street
Billings MT 59101

Client: TET143

Report Date: 6/8/2016
Report No.: 511495 - PLM
Project: IDOT KN13949 Bridge #18240
Project No.: 114-551944

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 5948960 **Client No.:** 18240-M18.1A	**Description:** Grey Cementitious **Facility:**	**Location:**
Percent Asbestos: *None Detected*	Percent Non-Asbestos Fibrous Material: None Detected	Percent Non-Fibrous Material: 100
Lab No.: 5948961 **Client No.:** 18240-M18.1B	**Description:** Grey Cementitious **Facility:**	**Location:**
Percent Asbestos: *None Detected*	Percent Non-Asbestos Fibrous Material: None Detected	Percent Non-Fibrous Material: 100
Lab No.: 5948962 **Client No.:** 18240-M18.1C	**Description:** Grey Cementitious **Facility:**	**Location:**
Percent Asbestos: *None Detected*	Percent Non-Asbestos Fibrous Material: None Detected	Percent Non-Fibrous Material: 100
Lab No.: 5948963 **Client No.:** 18240-M30.1A	**Description:** Black Asphalt **Facility:**	**Location:**
Percent Asbestos: *None Detected*	Percent Non-Asbestos Fibrous Material: None Detected	Percent Non-Fibrous Material: 100
Lab No.: 5948964 **Client No.:** 18240-M30.1B	**Description:** Black Asphalt **Facility:**	**Location:**
Percent Asbestos: *None Detected*	Percent Non-Asbestos Fibrous Material: None Detected	Percent Non-Fibrous Material: 100
Lab No.: 5948965 **Client No.:** 18240-M30.1C	**Description:** Black Asphalt **Facility:**	**Location:**
Percent Asbestos: *None Detected*	Percent Non-Asbestos Fibrous Material: None Detected	Percent Non-Fibrous Material: 100

Figure 3.3 Sample of an archived asbestos inspection report

Sample Identification	Location	Material	Results - Quantity
A	South Bridge Deck Joint-	Gray Foam/Rubber	ND
B	North and Middle Bridge Deck Joint	Gray Foam/Rubber	ND
C	North Abutment	Felt/Fiber Board	ND
D	Pipe Insulation (east side)	Tan/White/Silver Fibrous Insulation	ND
D-2	Pipe Insulation (east side)	Tan Mastic	ND
E	North Abutment	Concrete	ND
F	East Sidewalk	Concrete	ND
G	Bridge Deck	Concrete	ND
H	South Curb Approach	Concrete	ND

Figure 3.4 Sample of an archived asbestos inspection report

	A	B	C	D	E	F	G
1	**Bridge location/Address**	**Report Year**	**Bridge Key**	**Project key**	**Year Built**	**District**	**County**
2	Burlington Northern RR Bridge Structures	2018	14256	13851	N/A	1	N/A
3	S. FK. Coeurd'Alene River @ 3rd Street	2013	17376	12873	1930	1	Shoshone
4	SH-3 Elk River Hwy-Cedar Creek	2016	10085	Fie no. 1142	1935	1	Shoshone
5	SH-6 Santa Creek	2016	18855	File no. 221	1927	1	Benewah
6	SH-20 Little Hangman	2016	14910	File no. 1348	1959	1	Benewah
7	SH-57 Kalispell creek	2016	14900	File no. 16439	1948	1	Bonner
8	US-95 Round Prairie Creek Bridge	2016	18780	Dw o. 17555	1932	1	Boundary
9	US-11 Texas Creek	2016	10303	File no. 1081	1950	1	Clearwater
10	SH-13 Butcher Creek	2016	10530	File no. 305	1932	1	Idaho
11	Schweitzer Cuttoff Bridge Sandpoint	2017	30150	19774	N/A	1	Bonner
12	Concrete girder overpasses Huetter Road GS I-90 MP 9.21	2018	16795	19326	1969	1	Kootenai
13	SH-97 OVER I-90; WOLF LODGE IC	2016	18936	13382	1960	1	Kootenai
14	US -95, SMITH CREEK TO SHEEP CREEK (EAST FORK SHEEP CREEK)	2017	18566	13408	2017	1	Benewah
15	I-90 Kingston IC #43 Bridge	2017	20495	19133	N/A	1	Shoshone
16	Maggie Creek Bridge	2018	10440	13884	1949	1	Idaho
17	Concrete Bridge over 4 mile creek	2018	18520	00874	1944	1	Latah

Figure 3.5 Snapshot of Excel file summarizing the asbestos inspection reports compiled by this study

This chapter presented the methodology used in the assessment of ACMs in Idaho bridges. The goal was to review bridge as-built plans for bridges built between 1918 and 1980 and for bridges eligible for construction renovation or demolition (FY 2020-FY 2026). In addition, a comprehensive search for all asbestos testing reports has been conducted. The assessment included collecting ACMs-related information from various sources across the state of Idaho. The team has used the ITD archive, bridge information platforms (ProjectWise and File 360), and reports collected from the six districts.

4. Results and Discussion

The main project goals aimed at (a) assessing the prevalence of ACMs in Idaho bridges, (b) summarizing the practices pursued by ITD to address ACMs if found in bridges, and (c) proposing recommendations on changes that ITD should implement to its processes for checking/testing for ACMs in Idaho bridges. The main tasks of this project were:

(a) Reviewing a representative sample of as-built plans of bridges built between 1918 and 1980.

(b) Assessing as-built plans for bridges that have construction activities (demolition, strengthening, etc.) scheduled from 2020 to 2026.

(c) Searched the Idaho bridge database through File360 and ProjectWise to locate available asbestos inspection reports for bridges and saved them in a central location under ProjectWise. The following section presents the results of this study and recommendations to be implemented for asbestos inspection of bridges.

Bridges Built between 1918 and 1980

After reviewing 253 as-built plans for bridges built between 1918 and 1980, no signs of asbestos related information were found in the specifications or bridge drawings. The team focused on reviewing the as-built plans especially at the suspicious locations listed in Chapter 3. Table 4.1 summarizes all the materials used in various locations in Idaho bridges. Our review of the as-built plans of 253 bridges did not identify any locations where ACMs may have been specified or used for the construction.

There is a possibility that more bridges that have since been demolished were tested and their records are in an archive somewhere. The bridge(s) might have been replaced and the availability of records pertaining to an older bridge that no longer exists are probably very hard to find as time passes as it was demolished and that construction project was closed and archived.

Table 4.1 Summary of Materials used in Idaho Bridges

Bridge Component/Location	Material Found
Black Bearing Pads	Elastomeric bearing pad Neoprene Bearing Pads Durometer 60 Neoprene Bearing Pad bonded to a sheet of Tetrafluorethylene Bronze (self-lubricating with Lubrite on faces), Lead, and Masonry Bearing Plates Grout Pad Steel Bearing Plates
Pier-Deck Joints	Unspecified Two component Elastomeric Polymer Type Sealer Neoprene Pads Pre-formed joint filler type II or III Cold Poured Rubber Hot Poured Rubber Joint Filler 5"×1/4" Premoulded Asphalt Joint
Bridge Barrier Rail Assemblies	No coating Type I & III and IV rail Aluminum caulking compound Two-Component Elastomeric Polymer-Type Sealer Poured Concrete Rails Concrete with 3" Extra Strong Black Steel Pipe Handrail 3" Extra Strong Black Steel Pipe Handrail Steel Beam Type Plate Guard Rail #10 USS Ga. Precast Concrete Posts Thrie Beam to W-Beam Guardrail Aluminum bridge "Alcoa" design No. 2001 Steel Beam Concrete Parapet with Standard Metal Rails
Brown Joint Filler Material Between Wing-Walls and Deck/Approach Slab	Elastic Joint Filler Joint filler types II and III 3/4" Elastic Joint Filler 1" Joint Filler Elastic Joint Filler (AASHO M-213-65) Cold Poured Rubber & Expansion Joint, Type I and Type II 1-1/4" Cold Poured Sealer; Preformed Expansion Joint Filler, Type I
Black/Grey Slip Sheet Between Top of Abutment Back-Walls and Deck Slabs	Sealant (special provisions were listed on the drawings). Two Component Elastometric Polymer Type Sealer

Bridge Component/Location	Material Found
Light Grey Joint Sealer Caulk on Deck Joints Through the Parapets	Joint Filler type 3 Unspecified Joint filler Type III; AASHO M-153-65 Two-Component Elastomeric Polymer-Type Sealer Formula No 10-TT-P38 Paint, Type A Grout Expansion Joint Filler Silicone Sealant ASTM C920 Type M 1/2 Preformed Joint Filler, Type III - Typical AASHO M-153-65
Black Tar/ Mastic Sealer on Top-of-Deck Longitudinal Joints	Asphalt overlay with membrane deck sealer 1/2" Preformed Expansion Joint Filler (Type II & III)
Black Expansion Joint Material	Joint filler (Type II) (and Type III)- Typical AASHO M-153-65 Non-Extruding Joint Filler Neoprene w/ nylon fabric Original joints used "elastite” Expansion Joint Filler type III. Two-Component Elastomeric Polymer-Type Sealer Cold poured sealer Hot poured rubber joint filler Neoprene Strip Seal, Premoulded Asphaltic Filler Evazote Joint Material
Deck waterproofing membrane	Asphalt Overlay with Membrane Deck Seal Concrete Waterproofing System Type C Deck Seal Concrete - Latex Modified Concrete Asphalt Overlay with Membrane Deck Seal Betaseal TF Epoxy Overlay
Coating on concrete and steel structures	Zinc Chromate Paint Coat of white lead Coating on Timber Piles Asphaltic Paint on Steel under Timber Blocking Gray lead paint on concrete Galv. Metal Cap Shields (two coats concrete grey paint) Epoxy Bonding Agent on deck slab Red Lead and Aluminum Paint on handrails Prima Lub Adhesive used to bond neoprene strip seal to steel extrusions Basic Lead Silico Chromate TT-P-615 Type II

Table 4.2 shows the number of bridges that were reviewed for each district. Similarly, Table 4.3 shows the distribution of bridges scheduled for repairs during the FY 2020 to FY 2026period that were reviewed by this study.

Table 4.2 Distribution of the 253 bridges built between 1918 and 1980 reviewed by this study

District	No. of Bridges
1	43
2	34
3	57
4	41
5	31
6	47

Table 4.3 Distribution of the 190 bridges eligible for construction between 2020 and 2026

District	No. of Bridges
1	41
2	41
3	28
4	26
5	34
6	20

Asbestos Inspection Reports

All 89 asbestos inspection reports located across the six highway districts were carefully reviewed by the research team. As some of these reports included more than one bridge, the final summary consisted of reports for a total of 114 bridges. These details are summarized in the Excel file: “Test Reports Summary”, which has been provided to ITD and added to ProjectWise. The reports were completed by various contractors using different formats. One of the objectives of this project was to develop a standardized template for use by all districts for any bridge that is reviewed and inspected for the presence of asbestos. This template, discussed in Chapter 5, should create a consistent format for the reporting of inspection results.

The review of the 89 reports revealed that most of the contractors collected samples of asphalt and cementitious materials from the bridge deck with a few reports showing samples taken from other

locations such as expansion joints. It is our understanding that during bridge demolition and rehabilitation, concrete and asphalt dust is the major factor that affects personnel safety. This may be the justification why most of the samples for asbestos testing were taken from bridge decks. We believe that contractors should consider other locations such as expansion joints, bridge support materials, and connections as potential sources of ACMs. These locations are very important and must be considered for sampling and testing for ACM materials based on work done by other state DOTs. Table 4.4 summarizes the distribution of the 89 asbestos inspection reports across the six districts. All reports were completed and submitted between of 2008 and 2019. None of the 89 reports indicated the presence of any asbestos and all bridges were clear from ACM.

Table 4.4 Summary of 89 asbestos inspection reports grouped by district

District	No. of Reports
1	8
2	4
3	15
4	24
5	21
6	17

Summary

Using information available in HQ and district archives, File360, and ProjectWise, this study reviewed:

- A sampling of 253 bridges with representative attributes.
- Plans of 190 existing bridges which are scheduled for maintenance in the next six years.
- A total of 89 Asbestos inspection reports submitted between 2008 and 2019.
- Because some of the 89 reports reviewed multiple bridges, asbestos reports are available for a total of 114 bridges.

After reviewing this information, the research team did not locate any presence of ACMs which may have been used for construction of bridges prior to 1980 in Idaho.

5. Template for Asbestos Inspection Reports

The asbestos inspection reports reviewed by the researchers showed major differences and shortcomings in formatting and the information provided by the contractor. For example, some contractors submitted reports without listing the bridge location or asbestos sampling locations. Others submitted reports that did not have the bridge key or the Project Number. In response to this inconsistency, the team proposes the use of a standardized ACM testing report template. The proposed template is intended for ACM assessment of ITD bridges in the future. All contractors should be asked to use the proposed template, which will allow the data to be added to ProjectWise.

Component Attributes

The twelve component attributes for the proposed template are discussed next.

1. Scope of Service

The following statement shall be provided:

"The Scope of Services (Scope) for the asbestos inspection included sampling suspect asbestos containing materials (ACMs) according to EPA Regulations 40 CFR Part 763 Subpart E Asbestos Hazard Emergency Response Act (AHERA), and 40 CFR 61 Subpart M, National Emissions Standards for Hazardous Air Pollutants (NESHAPs) to identify ACMs present at site structures prior to demolition."

2. Inspection Certification

The inspector's name and his/her inspection license certification must be provided in the report. Additional information such as the laboratory name and certification as well as the testing method used should be added to this section.

3. Project Description

In this section, a full description of the bridge under consideration shall be provided. This information will consist of items such as bridge name, bridge key, mile post (MP), year built, structure type, bridge material, bridge spans, number of spans, district location. The contractor should also include a suitably scaled figure using either bridge plan sheet(s) or a site map to show where samples were taken. The contractor may use Google Earth to show bridge location.

4. Description of Sample Locations

In this section, the contractor should provide an enlarged view of the bridge in Google Earth with the sampling locations marked clearly. In addition, the contractor should provide digital pictures of the sampling locations clearly showing the construction element from which the sample was taken.

5. Visual Inspection

In addition to the laboratory testing, the inspector should perform visual inspection to help identify homogeneous areas, which are defined as areas where the suspect material appears to be uniform in texture, color, and wear. Materials other than natural wood, glass, and metal should be considered suspect. Examples of suspect materials are listed in Table 4.3.

6. Physical Assessment

Every ACM potential location across a certain bridge should be visually assessed to determine its condition (good, damaged, or significantly damaged) and to assess whether the suspect material should be classified friable or non-friable. Friable ACM is defined as material that could be smashed or reduced to a powder by hand pressure, has been pulverized, or otherwise deteriorated to the extent that the asbestos is no longer likely to be bound within its matrix.

7. Sample Collection

Based upon the visual inspection, sampling strategies for suspect ACMs should be established per EPA Regulations, AHERA 40 CFR Part 763 Subpart E. It is suggested that random sampling should be performed on each identified suspect ACM.

8. Material Sample Analysis

Following the testing of samples for asbestos, the results should be tabulated as shown below. It is important that sampled ACMs be clearly labeled if found to contain asbestos.

Table 5.1 Sample material analysis table in ACM template

Sample Number	Material	Location	Asbestos Detected	Friable/ Non-Friable	Condition	Approximate Area (ft^2)
00001	Asphalt pavement	Top of pier cap 3-south end	Not detected	Non-Friable	Good	60
00002	Black rail guards	At each rail post	Not detected	Non-Friable	Good	200

All the collected samples of suspect ACM should be delivered under a chain of custody protocol for analysis. Polarized Light Microscopy (PLM) is the only approved and recommended method of asbestos bulk sample analysis as detailed in EPA's Test Method for the Determination of Asbestos in Bulk Building Materials (EPA 600/R-93/116). PLM exploits the exclusive optical and crystallographic properties of asbestos material for identification purposes. These properties, include refractive indices, birefringence, sign of elongation, and extinction angle, are characteristically unique to each form of asbestos minerals. The "progressive sampling" terminology should be used, where as soon as the first sample of any material on a the bridge tests positive for asbestos, the remaining samples should not be analyzed for asbestos. The report should contain an Appendix to present the laboratory analytical results and copies of the chain-of-custody forms.

9. Regulations

The current EPA, OSHA, and NESHAP regulations define material containing greater than 1 percent of asbestos by weight an ACM. Materials that contain asbestos in their composition may either be classified as an assumed ACM or be sampled by an AHERA accredited inspector and analyzed to determine the percentage by weight of asbestos contained in their composition and subsequently be classified as an ACM or non-ACM. EPA NESHAPs regulations require identification, classification, and strict consideration of existing building materials prior to beginning any renovation or demolition activity. NESHAPs regulations are concerned with regulated ACM (RACM) including:

- Friable ACM: ACM that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
- Category I non-friable ACM that will be or has been subject to sanding, grinding, cutting, or abrading; Category I non-friable ACMs include asbestos-containing packing, gaskets, resilient floor covering, asphalt roofing products.
- Category I non-friable ACM that has become friable.
- Category II non-friable ACM that has a high probability of becoming, or has become crumbled, pulverized, or reduced to a powder by forces expected to act on the material during demolition or renovation activities. Category II non-friable ACMs include any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. Under 40 CFR 61.141, bridge concrete is considered Category II non-friable ACM if it contains more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

As an alternative to the NESHAP definitions, OSHA categorizes ACMs into four classes depending on whether construction plans call for the removal, repair and maintenance, or maintenance only. The OSHA definitions, according to OSHA 29 CFR 1926.1101, are:

- Class I asbestos work means activities involving the removal of thermal system insulation TSI and surfacing ACM and PACM.
- Class II asbestos work means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile, and sheeting, roofing and siding shingles, and construction mastics.
- Class III asbestos work means repair and maintenance operations where asbestos is likely to be disturbed.
- Class IV asbestos work means maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

10. Asbestos Analytical Results

The results of the asbestos testing should be listed in this section. ACM results shall be presented in a table format with the following information:

- Analysis type (PLM)
- Sample number
- Sample color
- Description of the material
- Layer type (concrete deck, asphalt, mastic, joint, column, girder, etc)
- Laboratory number
- Asbestos results (detected/Non-detected)

Figure 5.1 shows an example of how ACM results should be reported in this section.

PLM Analysis Summary: **Job Number:** **201610720** Key #16685

Sample Number	Layer	Color	Apparent Layer Type *	Lab Number	Apparent Sample Type *	Positive Layer Yes or No
			Asbestos Results			
Sample # **1**				2016-10720- 1	Cementitious	Positive Layer? No
	Layer # 1	gray	concrete		*no asbestos detected*	
Sample # **2**				2016-10720- 2	Cementitious	Positive Layer? No
	Layer # 1	gray	concrete		*no asbestos detected*	
Sample # **3**				2016-10720- 3	Cementitious	Positive Layer? No
	Layer # 1	gray	concrete		*no asbestos detected*	
Sample # **4**				2016-10720- 4	Cementitious	Positive Layer? No
	Layer # 1	gray	concrete		*no asbestos detected*	
Sample # **5**				2016-10720- 5	Cementitious	Positive Layer? No
	Layer # 1	gray	concrete		*no asbestos detected*	
Sample # **6**				2016-10720- 6	Cementitious	Positive Layer? No
	Layer # 1	gray	concrete		*no asbestos detected*	
Sample # **7**				2016-10720- 7	Cementitious	Positive Layer? No
	Layer # 1	gray	concrete		*no asbestos detected*	

* Apparent Sample Types and Apparent Layer Types are as they appeared to the analyst. Since many types of materials appear similar after sampling damage, the apparent type of material may not be the actual type of material.

Figure 5.1 Example of how AIR testing results should be presented by contractors

11. Evaluation Limitations

This section of the report should present any limitations that were experienced by the asbestos inspector in completing a thorough assessment of the bridge for ACMs. The inspector should explain all the limitations that may have prevented the sampling of suspect locations for ACMs.

12. Appendices

ACM report should include appendices containing information on the following:

- Laboratory and Personnel Certifications
- Photographic Documentation (overall location of samples, specific element where the sample is taken and a close-up photo of the exact location of the sample).
- Asbestos Analytical Summary Table, Analytical Results, and Chain of Custody Documentation.

6. Summary, Conclusions, and Recommendations

Starting in 1970 and continuing today, the U.S. government has regulated the use of asbestos containing materials (ACM), as well as other materials. The Environmental Protection Agency (EPA) has mandated that each state perform asbestos testing for bridges before any demolition or major construction activities. It is likely that some ITD bridges constructed between 1918 and 1980 may contain asbestos minerals and will have to be inspected before the start of any construction activities. Such asbestos containing materials (ACMs) may be present in coatings of timber bridge members, concrete, pavement materials, beam seats, joints, railings, and in some of the paints used for steel members. This project's aim was to review bridge-plans and inspection reports with a view to determining the extent of possible ACM use in ITD bridges. Additionally, the research team was asked to develop a "standardized" template for collecting information from asbestos inspection reports (AIRs).

Summary

To meet the project's objectives, using available information in HQ and district archives, File360, and ProjectWise, the research team:

1. Performed a literature review and identified potential locations where ACMs have been encountered during bridge inspections, as reported by other state agencies.
2. Reviewed the bridge-plans for 253 ITD bridges built before 1980 to determine if asbestos containing materials were specified in their construction. This sampling was representative of a variety of bridge types constructed between 1918 and 1980, and the locations were well dispersed throughout the six highway districts. The information from the bridge plans was summarized in an Excel file.
3. Reviewed plans for 190 bridges scheduled for maintenance in the next six years.
4. Reviewed 89 asbestos inspection reports which covered a total of 114 ITD bridges.
5. Created a repository of all asbestos testing reports, along with a summary Excel file, in the ProjectWise platform for future access by ITD personnel.
6. Prepared guidelines for a standardized template for reporting asbestos inspection results for bridges scheduled for rehabilitation or demolition. This standardization will allow the relevant information to be quickly added to the AIR summary file.

Conclusions

On the basis of the reviewed information, the research team is able to make the following conclusions:

- The study did not identify the presence of ACMs in any of the bridge plans reviewed for the sampling of 253 bridges built between 1918 and 1980, and the 190 bridges scheduled for work in the next six years.
- A review of bridge plans is unlikely to identify the use of ACMs.
- Only a thorough asbestos inspection of the bridge is likely to identify the use of ACMs.
- A review of the available 89 asbestos inspection reports (AIRs), for 114 ITD bridges, did not indicate the presence of ACMs.
- The quality and content of the reviewed AIRs was variable, and often lacked critical information.
- To overcome problems with the quality of the submitted AIRs and the extent of information collected, a standard IIR reporting template is necessary.

Recommendations

Following the review of literature, ITD bridge-plan, and asbestos inspections reports, the following recommendations are proposed:

1. All submitted AIRs for bridges should be added to the repository created in ProjectWise.
2. Each AIR file should be identified by the name: **"[BRIDGE KEY]_[DISTRICT No]_asbestos report"**. Such a consistent file naming approach will allow easier access for ITD personnel.
3. The data from each AIR should be added to summary Excel file in the ProjectWise folder.
4. The template discussed in Chapter 5 and presented in Appendix C should be adopted for all future asbestos inspection reports (AIRs). The contractors/inspectors should specifically list the locations on bridges where the asbestos samples were collected for testing. In addition, the report must contain specific information to identify the bridge under consideration, bridge type and material.
5. The development and implementation of a data entry interface for the summary Excel file should be considered to facilitate the addition of new data collected by future AIRs.

Cited Works

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Appendix A. Example Template from Ohio DOT

OHIO DEPARTMENT OF TRANSPORTATION

Asbestos Inspection Reporting Form

Date

County

Route

Section

PID

Requesting ODOT District Office

Regulating OEPA District Office and Address

Date of the Asbestos Inspection

Name and Address of the company conducting the asbestos inspection

Name, signature and asbestos hazard evaluation number of the person writing the report

Description sampling locations and how each location was determined (use additional pages if needed)

Excellence in Government

ODOT is an Equal Opportunity Employer and Provider of Services

Name, signature and asbestos hazard evaluation number of each person who selected samples from the structure (use additional pages if needed)

Name	Signature	Asbestos Evaluation #

Supporting Information
Laboratory Analytical Report
Blueprint, diagram or written description with the following:

- Type, location and amount of confirmed regulated asbestos containing material
- Location and collection date of each bulk sample
- Location and amounts of suspected asbestos containing material, both friable and non-friable

NOTE: The OEPA Notification of Demolition and Renovation Form with the appropriate Sections I, II, III, IV, VI and VII must be completed by the licensed asbestos hazard evaluation specialist and included with the report submission to ODOT prior to submission to OEPA or the local air authority with jurisdiction.

Appendix B. Summary Excel Files

Summary Excel Files

The bridge data and asbestos inspection report information collected by this study is summarized in the following three Excel files:

1. Summary of the review of a sampling of 253 bridges.
   Asbestos Database_1918-1980.xlsx

2. Summary of the review of 190 bridges scheduled for work in the next six years.
   Asbestos Database_FY20-26.xlsx

3. Summary of asbestos inspection report information for 114 bridges.
   Asbestos Reports Summary_Final.xlsx

These Excel files have been provided to ITD and are available in ProjectWise.

Appendix C. Asbestos Inspection Report Template

Pre-Demolition/Construction Asbestos Report

Bridge Key #

Bridge Address #

FINAL REPORT

PREPARED FOR:

Name #

Title #

Idaho Transportation Department – D#

District Address #

PREPARED BY: #

Date: #

TO: [name, and title]
[address of the person who is in contact with the contractor]

RE: Renovation or Pre-Demolition Asbestos Inspection Report

Bridge Key: #

Bridge Address: #

ASBESTOS INSPECTION REPORT

Please include the following sections in your letter/report:

1. Scope of Service
2. Project Description
3. Asbestos Inspection
4. Description of Sample Locations
5. Visual Inspection
6. Physical Assessment
7. Sample Collection
8. Material Sample Analysis
9. Regulations
10. Asbestos Analytical Results
11. Evaluation limitations
12. Appendices