FHWA Bridge Maintenance:
Traffic, Safety & Environmental

Course No: S04-012

Credit: 4 PDH

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VIII. TRAFFIC CONTROL AND WORKER SAFETY PROGRAM

A. TRAFFIC CONTROL FOR WORK ZONES

It is assumed that individuals reading this material have received training on work site traffic control and the topic is on the agenda of safety meetings conducted within maintenance unit. It is because state maintenance workers receive considerable training on this topic, not because it is unimportant, that it will be given very limited attention.

Whenever bridge maintenance work is done on or near the roadway, drivers are faced with changing and unexpected traffic conditions. These changes may be hazardous for drivers, workers, and pedestrians unless protective measures are taken. See Exhibit VIII.1. Drivers do not make a distinction between construction, maintenance, or utility operations. Proper traffic control and safety are needed for all types of work.

Exhibit VIII.1 Hazardous Working Conditions

The need for standard traffic controls is especially important through work sites. Abnormal conditions are the rule, so traffic is particularly dependent on traffic control devices to direct and guide it safely and efficiently through what would otherwise be hazardous areas. The constantly shifting and changing nature of construction and maintenance activities requires frequent readjustments of traffic control devices to handle new situations.

Proper and adequate placement of standard highway signs, pavement markings, barricades, and other traffic control devices on roadways in maintenance areas is a never ending responsibility of the bridge maintenance supervisor. This responsibility includes periodic inspection of existing devices and conditions throughout the construction and maintenance project for compliance with the standards, *Manual on Uniform Traffic Control Devices* (MUTCD).

Traffic control procedures are employed at work sites to:

- Warn motorists and pedestrians of the hazards involved and advise them of the proper manner to travel through the area.

- Inform the user of changes in regulations or additional regulations that apply to traffic traversing the area.

- Guide traffic through or around the work site.

- Delineate areas where traffic should not operate.

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

The MUTCD is approved by the Federal Highway Administrator as the National Standard for all highways open to public travel and for all public roads regardless of type, class or agency having jurisdiction in accordance with Title 23, U.S. Code, Section 109(b), 109(d) and 402(a), and Highway Safety Program Standard 13, "Traffic Engineering Services." The American National Standards Institute also approves it as American National Standard 06.1-1971.

States may either adopt the MUTCD by reference or publish their own manual using the federal manual as a guide. Some states elect to be more restrictive in the use of certain devices. State manuals on traffic devices must be approved by FHWA.

Since drivers must make correct decisions in very short periods of time in potentially confusing environments, it is important that they receive essential information in a timely manner. The key to this need for timely transmission of information is the use of uniformity in the design of traffic control devices and consistency in how devices are employed. To promote uniformity the MUTCD Manual was created.

It sets forth the basic principles that govern the usage of traffic control devices. The MUTCD presents standards for all streets and highways open to public travel regardless of type or class or governmental agency having jurisdiction. The MUTCD is generally accepted as the national standard on traffic control. The MUTCD is published and revised as necessary by the Federal Highway Administration (FHWA).

TRAINING OPPORTUNITIES

The Federal Highway Administration offers a course entitled "Traffic Control for Street and Highway Construction and Maintenance Operations." This course can be presented in one, two, or three days, depending upon the needs of the host agency. The Federal Highway Administration also has a number of videotapes, slide tapes, and movie presentations available in this general subject area.

The Institute of Transportation Engineers has two training packages available that consist of self-instructional texts, workshops, and slide tapes. Series 200 is titled "Traffic Control through Construction and Maintenance Areas" and Series 500 is titled "Traffic Control for Utility Work Areas."

In addition, many states have their own training programs dealing withspecific needs and requirements for their own state.

B. WORKER SAFETY PROGRAM

SAFETY AT THE WORK SITE

There are safety risks with every step that a maintenance worker takes. Some of the main hazards are falls, lead poisoning, traffic related injuries, drowning, electric shock and eye injuries. During phase one of the construction of the San Francisco Golden Gate Bridge, 23 workers died before the workers refused to continue without increased safety protection. During phase two, 10 workers fell from the bridge, but all were saved by safety nets.

Why have a safety program? Because a strong safety program makes financial sense. Also, a safety program that reduces the number of accidents can improve employee moral by showing that workers are not disposable commodities.

A safety program begins with the manager. The program must reflect the manager's conviction, priorities, and goals. Second, workers must clearly understand their goal and know that success will be judged by their safety record. Third, workers must know what is expected of them and the consequences of not meeting those expectations.

Employees must know the rules, policies, and practices if they are to be expected to follow them. Workers have a right to know if their duties bring them into close proximity to hazardous materials. Training is an important part of a safety program.

It is a generally accepted maxim that all accidents are preventable. Accidents are preventable if proper safety equipment is used and safety rules are followed.

SAFETY MEETING

A five-minute safety discussion at the beginning of each day can pay dividends in terms of reduced accidents and increased efficiency. Equipment and rigging requirements change as bridgework progresses from start to finish--from formwork to finished concrete. A daily orientation, therefore, allows a review of the equipment to be used during the day's operations.

USE OF TOOLS

The proper use of tools and equipment will accomplish the work assignment in a workmanlike and safe manner. The following guidelines are useful:

- Do not use defective tools or equipment.
- The proper tools or equipment should be used for each job.
- Safety procedures should be learned and practiced. When in doubt ask for information.
- Assume a personal feeling of responsibility to prevent accidents. Caution to a new worker may prevent an injury. Negligence causes accidents.

SHORING AND FALSEWORK

The term falsework denotes any construction intended for erection use only that is later removed or abandoned. It includes temporary towers, bents, or trestles, fixed and floating platforms, staging, runways, ladders, and scaffolding. On major structures, temporary trestles provide quick access to points of construction. Falsework bents provide temporary supports for erection of superstructure spans. Staging is used to provide working platforms. Ladders should be provided for all towers and safety should be given full consideration in locating and designing falsework. Whenever practicable, falsework should be built of local materials or materials that can later be used in the permanent structure.

TOXIC MATERIALS

The storage of dangerous toxic and corrosive materials should be given special attention. Materials that are especially dangerous should be stored in separate secure areas and issued only to personnel qualified to use them properly.

Manuals or charts that deal with dangerous chemicals and materials that maintenance employees work with should be readily available. Identification, qualities, and precautions should be included as a materials data safety sheet. Training courses should emphasize the importance of using the manuals or charts for reference.

Safety precautions when handling corrosives or irritants require the presence of an adequate supply of water to flush exposed parts of the body. Clothing that may become saturated should be easily removable and the use of aprons, protective goggles, shields, gloves, and a respirator should be encouraged. Some of the more common toxic materials include:

- Acids- The strongest corrosive that maintenance personnel usually handle in their work is sulfuric acid for battery uses. Some materials can cause severe irritation through prolonged contact with the skin or can cause extreme pain and possible blindness when allowed to enter the eye.

- Herbicides and Insecticides- Herbicides and insecticides (including wood preservatives) in concentrated forms may be extremely toxic. Some are so poisonous that a few drops on the skin can be lethal. Handling and mixing of these substances should be regulated in accordance with their rated toxicity. Only qualified personnel wearing rubberized clothing should handle the most toxic materials and hoods that ensure complete protection. Workers should be aware of the hazards.

- Lead- Workers must not eat, chew gum, or use tobacco products when working with lead paints. Workers must not wear lead contaminated clothing home. A worker can be poisoned in 3 to 4 weeks when exposed to high airborne levels of lead. All workers involved with paint removal, including containment maintenance are automatically assumed by OSHA to be exposed to high levels of airborne lead. These workers need to become familiar with their rights and responsibilities under the new OSHA standards published in the May 4, 1993

Federal Register. This document may be found at major community and college libraries, the local branch of the United States Government Printing Office listed in your telephone book, or from the OSHA office of publications, telephone number 202-219-4667.

CONFINED SPACES

Special procedures are necessary when working in a confined space. This situation occurs during the inspection and maintenance of bridge items such as box beam bridges.

OSHA requires entry permits whenever an individual enters a confined space. A confined space is characterized as having limited means of entry and egress, having inadequate natural ventilation, or areas not intended for continuous human occupation.

A confined space entry permit is required when the condition of the workspace contains, or has potential to contain a hazardous atmosphere, material that has a potential for engulfing an entrant, an internal configuration that could trap or asphyxiate or a floor that slopes downward and tapers to a smaller cross section, or any other recognized serious safety health hazard. If operations are to be performed in a confined space with a possible source of ignition, such as riveting, welding, cutting, burning, heating, or any other open flame, a hot-work permit is also required. This permit provides information on fire prevention, protection, and ventilation. The intent of the form is to ensure that all safety precautions are taken.

FALL PROTECTION

Occasionally, maintenance work must be performed on parts of the bridge that are high above the ground or water. When performed properly, this can be safe. However, any carelessness can cause serious or fatal injury. There is no room for inattention or horseplay. It is important that workers are trained properly in how to erect safe work platforms and how to protect against serious injury from falls. The safety section from OSHA and any appropriate department regulations on rigging, scaffolding, ladders, and wire ropes should be reviewed.

Falls from heights are a routine hazard that bridge maintenance workers often face. Precautions must always be taken when working from an elevated work surface. Approximately 1/3 of all elevated falls result in hospitalization. The following methods can be used as precautions to avoid hospitalization and possible death.

- Guardrails
- Safety Belts, Lines, and Lanyards
- Safety Nets

RIGGING

Rigging can generally be performed using one of the three more common types of rope. These include non-wire rope, wire rope and cable.

Non-wire Rope

Generally only No.1 grade manila rope identified by the manufacturer's trademark should be used for rigging. No.1 rope is very light in color; No.2 and 3 grades of rope are darker. When rope is attached to a hook, ring, or pulley block, a thimble should be used in the loop or eye to reduce wear and decrease stress.

Ropes that are judged to be unsafe should be cut into short hand lines so that they can not be used for lifting loads. Some organizations require replacement of rope after 2 years for use in scaffolding. It is important to know the breaking strength of rope that is used for rigging. Manila rope that is loaded to 50 percent of its breaking strength (a safety factor) may be expected to fail within a few hours. If loaded to 75 percent of its strength it may fail within a few minutes. Synthetic ropes have rather slippery fibers. Splices in these ropes should have at least 5 tucks. Braided sash cord is not intended for hoisting.

Rope should be inspected daily to ensure that lines are in good condition. Dirt on the surface does not indicate that the rope is in a poor condition when the inside is bright and clean as a new rope. When the inside of the rope is dirty or the rope has lost its elasticity, it should not be used on scaffolding. Broken yarns inside mean that the rope has been overloaded and should not be used.

Wire Rope and Cable

Wire rope is stronger and has a longer usable life than manila rope. It is, however, heavier and harder to handle. To obtain the best results from wire rope, it must be used and stored properly. The best grade of wire rope is called improved plow steel rope, and this is the type that should be used. A wire rope is Regular Lay when the wires are twisted in one direction to form the strands and the strands are twisted in the opposite direction to form the rope. This is the preferred wire rope for general purposes.

A wire rope is a piece of flexible, multi-wired, multi-strand, machine made, piece of construction equipment. Usually, a wire rope consists of a core member around which multi-wired strands are laid, or helically bent. Cores can be composed of either fiber or wire. The purpose of the core is to support and position the outer strands. Any number of multi-wire strands may be laid around the core. The most popular arrangement is six strands as this gives the best balance. The number of wires per strand may vary from 3 to 91. The most popular are 7, 19, and 37 wire strands.

SCAFFOLDING

Tubular scaffolding is manufactured scaffolding similar in construction to an Erector Set. Scaffolding can be built from the ground up by putting the pieces together. The pieces, of course, have adjustments for irregular ground and they can be firmly placed, providing a very satisfactory working platform. Tubular scaffolding is generally made out of steel.

Wooden scaffolding is sometimes necessary. When this is the case, a competent carpenter who is familiar with building and OSHA regulations for the construction of this type of scaffolding

should be used. Scaffolding should be of ample strength and secure against slipping or overturning. Loose boards should not be allowed to project beyond their supports. Screws instead of nails should be used in tension to hold scaffolding or falsework. They should always be driven all the way in.

Swinging or suspended scaffolding is used for bridgework when there is no base available for erecting the two types of scaffolding described in the foregoing paragraphs. Boson's or boatswain's chairs or workbaskets are used to access hard-to-reach areas.

HOISTING

The term "hoist" is defined as a machine for raising or lowering heavy or bulky articles. Many serious accidents are caused by the unsafe operation of construction and weight handling equipment. Either untrained operators or the failure of the operators and other workers on the job to recognize and respect the dangers inherent in power-driven equipment contribute to these accidents. Statistics show that 75 percent to 80 percent of the injuries that occur around power equipment are due to pure carelessness. Familiarity or long acquaintance with construction equipment often breeds indifference to the dangers involved.

Hooks

The strength of standard hooks should be taken from the manufacturer's recommended standards for safe loading. If there is any doubt, the hook should be measured by a structural engineer who should determine the safe loading characteristics for the hook. Hooks should always be inspected before use. Do not use hooks that have been distorted or bent; do not use hooks with cracks, nicks, or gouges. Never side-load, back-load, or tip-load a hook. Make sure the hook supports the load.

Eye Bolts

Always inspect eyebolts before use. Never use eyebolts that show signs of wear, damage, bends, or elongation. Never machine grind or cut eye bolts. Never exceed load limits provided by the manufacturer. Never cut a bolt to seat the shoulder against the load. Always counter sink the receiving hole or use a washer to seat the shoulder. Always screw eye bolts down completely for proper seating. Always tighten nuts securely against the load.

Slings

Slings are used to hold material while it is hoisted. Loads on slings should be within the rated capacity of the sling. The sling should have suitable characteristics for the type of load, hitch, and environment. Consideration should be given to the angle of width, which may affect lifting capacity. Diameter of pins and hard shapes may also affect capacity of the lift sling.

WORK SITE SAFETY REVIEW

All highway maintenance related work is dangerous because of its proximity to traffic and the nature of the activities requiring the use of a wide variety of tools and heavy equipment. This is particularly true for bridge maintenance work since the area where the work is performed is likely to be restricted and a great deal of the work must be done manually. As a result every precaution should be taken to reduce unnecessary risks. The following questions summarize key points in regard to the use of tools and equipment that should be reviewed by workers when visiting work sites.

- Does the general appearance of the work site demonstrate that tools are used and then replaced or are tools scattered around the area?

- Are oxygen and acetylene cylinders stored properly in an upright position?

- Are safety glasses, masks, and hearing protection used when appropriate? As an example, safety glasses should be used when chipping concrete or paint; masks should be used when sand blasting or spray painting; and ear protection should be worn when using a jackhammer.

- Are proper tools of the correct size available and being used?

- Are tools being used correctly for the purpose for which they were designed and made?

The dangers inherent in bridge maintenance activities that were previously described are often made even more severe by the necessity of performing work at a considerable height from the ground or surface of the water. This not only requires that personnel be protected when working at such heights but that tools, equipment, and material are safely and efficiently transported to the work level. The supervisor should be particularly alert to practices and procedures that create unnecessary hazards.

IX. ENVIRONMENTAL CONCERNS

Environmental regulations increase the cost of bridge maintenance and repair, in both capital outlay and time requirements. Federal, state, and specific local requirements regarding the environment will typically affect bridge maintenance activities. Bridge maintenance supervisors must be aware of environmental requirements, especially permitting requirements, and consider them in their plans.

A. REGULATIONS

There are a number of federal regulations relating to the environment and control of hazardous materials. Those that could relate directly to bridge maintenance are briefly listed.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA)

Commonly called Superfund. CERCLA regulates hazardous waste encountered at inactive or abandoned sites, or problems resulting from spills that require emergency response.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

Enacted in 1976. Four programs are currently established under RCRA:

1. Subtitle C, which regulates hazardous waste;
2. Subtitle D, which regulates solid, nonhazardous waste;
3. Subtitle I, which regulates underground storage tanks that hold petroleum products or hazardous substances; and
4. Subtitle J, which regulates the disposal of medical waste.

As an alternative to EPA management, RCRA encourages states to develop and operate their own hazardous waste programs. For a state to have jurisdiction over a hazardous waste program, the state must receive EPA approval of their proposed program. The state must show that their program is, at a minimum, as stringent as the EPA program. In many states, the approved program is identical to the EPA program.

HAZARDOUS AND SOLID WASTE AMENDMENTS (HSWA) OF 1984

Amended RCRA, significantly expanding the scope and requirements of RCRA.

SOLID WASTE DISPOSAL ACT (SWDA)

Enacted in 1965 for the primary purpose of improving solid waste disposal methods. This act was amended in 1970 by the Resource Recovery Act, and again in 1976 by RCRA.

CLEAN AIR ACT (CAA)

The Clean Air Act established National Ambient Air Quality Standards (NAAQS) for six toxic pollutants. Primary responsibility for meeting the requirements of the CAA is at the state level.

Each state must submit a State Implementation Plan (SIP), which outlines how the state will achieve and maintain the NAAQS. Bridge maintenance activities affected by the CAA include storage and transfer of specified fuels and solvents.

CLEAN WATER ACT (CWA)

The Clean Water Act requires a permit for any discharge into the nation's waterways. The CWA limits the concentration of toxic constituents or conventional pollutants in effluents discharged into a waterway. A National Pollution Discharge Elimination System (NPDES) permit must be obtained. Many agencies require maintenance activities to have a spill control and countermeasure plan, as a means of preventing CWA violations.

FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

FIFRA regulates pesticides only. FIFRA provides controls as to whether and how certain products are manufactured or sold in the first place.

B. LEAD BASED PAINT REMOVAL

A number of states are experiencing difficulty in removing lead based paints on deteriorating structures as shown in Exhibit IX.1. The cost of removal operations has increased in response to recent legislation and requirements for containment and disposal of waste containing lead, as well as worker safety. Several issues have emerged, all relating to lead-based paint removal. Maintaining worker safety and minimizing exposure to lead are of paramount importance during maintenance activities. These issues are addressed in Session X-B: Toxic Materials. Lead-based paint removal methods that meet current regulatory requirements have become expensive and are still developing. These methods are covered in Session XIII-E: Spot Painting. A third issue, discussed in this session, is the containment and disposal of the removed lead-based paint material.

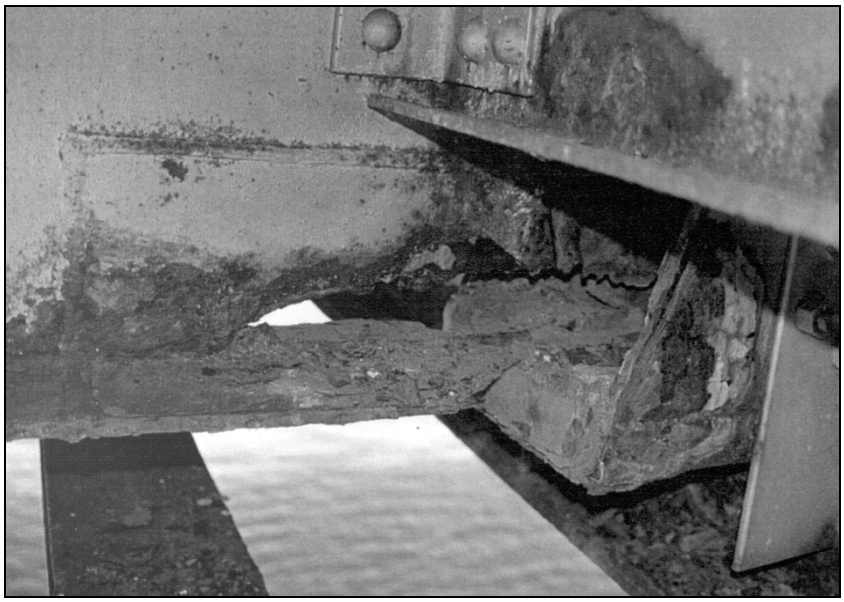

Exhibit IX. 1 Structure with Lead Paint

SOLID WASTE DISPOSAL

In March 1990, the Environmental Protection Agency (EPA) issued a final rule that expanded the number of chemicals regulated and implemented a new procedure for testing toxicity characteristics of waste (Federal Register, Volume 55, No.61, 40 CFR Parts 261, 264, 265, 268, 271, and 302). This rule requires that a new test procedure be used to classify waste materials to be disposed of in a landfill.

The new testing procedure became effective in September 1990 and lists 39 chemical constituents and their regulatory levels. The regulatory levels must be measured in accordance with the new test procedure, known as the TCLP. This test procedure measures the toxicity of the leachate, and not the solid waste itself . The TCLP was developed in recognition that landfills are a common final resting place of disposed material. Consequently, the leaching characteristic of a hazardous substance can have an impact on the integrity of water resources and groundwater; If the levels exceed those set by EPA, the hazardous waste generator must treat the waste to reduce the leachate concentration of hazardous material prior to disposal in a landfill.

The lead-based paint residue that is a byproduct of the removal process must be collected as it is removed from the structure. If the TCLP test indicates that leachable lead levels exceed 5 ppm (parts per million), the waste is considered hazardous. The waste must then be treated to reduce the leachable levels to below 5 ppm before the waste can be disposed of in a landfill.

Disposal of the waste, if classified as hazardous, must meet the RCRA requirements, which vary depending upon the amount of waste generated per month.

CONTAINMENT OF LEAD-BASED PAINT REMOVAL RESIDUE

The containment structure shown in Exhibit IX.2 is typically used during removal to prohibit contaminants from coming into contact with the soil or water. Any lead- based paint removal activity also prompts the application of the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund).

EPA has established a reportable quantity (RQ) of 4.5 kg (10 pounds) for lead and characteristic hazardous wastes containing lead. (May 8, 1992 Federal Register, pages 20014-20024.) Exhibit IX.2. Containment Structure If an amount greater than or equal to the RQ of a hazardous substance is released to the environment within a 24-hour period, CERCLA requires that the National Response Center (1-800-424-8802) be contacted. The CW A also requires that discharges of hazardous substances to navigable waters in excess of the RQ be reported to the National Response Center.

AIR QUALITY

The Clean Air Act of 1990 covers the emissions of air-borne lead and particulate matter. Although it does not address abrasive blasting projects specifically, some states have developed ambient air monitoring requirements for abrasive blasting. The air monitoring requirements may be part of a State Implementation Plan (SIP), a requirement of each state that outlines the state's plans to attain or prevent the deterioration of acceptable air quality.

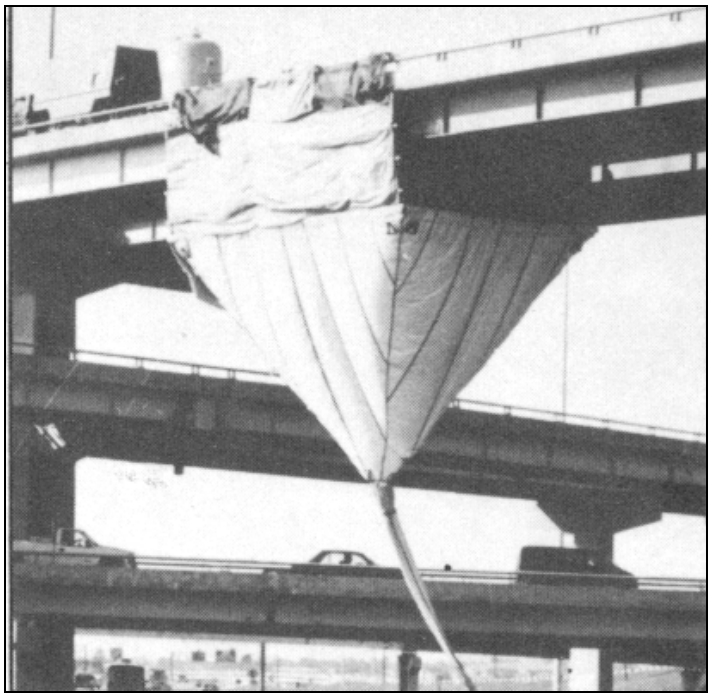

Exhibit IX. 2 Containment of Lead Paint Removal

Typically, the SIP covers a broad spectrum of activities including the control of industrial pollution, transportation plans to reduce carbon monoxide emissions, and others. The states have the authority to target certain types of emitters and impose controls. Two pollutants related to blasting of lead paint, which are regulated by the CAA are particulate matter (PM10), and lead (Pb).

The requirement to monitor the air quality for exterior emissions may be based upon the SIP or may be implemented in response to public health concerns. The contractor and owner will be held responsible for polluting the air as a result of fugitive emissions. Also, airborne emissions can lead to liability issues for injuries resulting from contact with the contaminants. The reportable quantity limit of 4.5 kg (10 Ibs.) release for lead contaminated waste also includes release into the air .

High volume pumps, called PM 10 samplers (shown in Exhibit IX.3) can monitor particulate levels. (The PM10 designation refers to particles less than or equal to a nominal 10 microns.) The air is passed through a high volume pump with a filter, and is collected for analysis. A total suspended particulate (TSP) sampler is used to collect suspended particles of 100 microns or less and samples are analyzed for lead content. Before an abrasive-blasting project is initiated, air quality agencies responsible for the affected jurisdiction should be contacted. If ambient air monitoring is not conducted, even if state regulations do not require monitoring, the contractor and the owner of the structure may be open to litigation and fines.

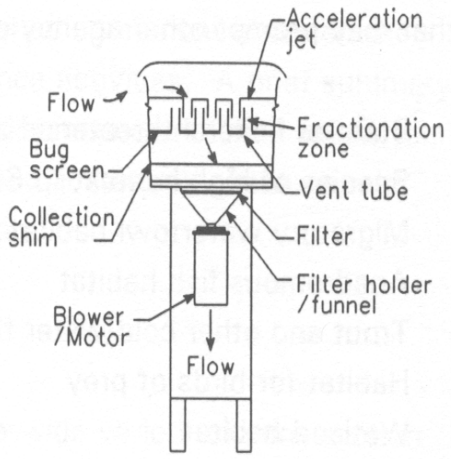

Exhibit IX. 3 Air Monitoring Equipment

The Clean Air Act states that an average of not more than 1.5 Micrograms per cubic meter of lead may be released into the atmosphere over a 90-day period. The National Ambient Air Quality Standard states that not more than 450 Micrograms per cubic meter of particulate matter, less than 10 microns in size, can be released on average during an 8-hour workday.

C. OTHER ENVIRONMENTAL CONCIERNS

In addition to specific regulations for the removal and disposal of lead paint, there are a variety of regulations and permitting requirements that can impact bridge rehabilitation and repair activities. Each state may have its own specific regulations. Also, some regional areas are protected by specific regulations. For example, the Chesapeake Bay Area is protected by specific regulations concerning sediment and erosion controls and control of activities that may impact water quality of the bay.

Prior to initiating repair activities, confirm whether environmental permits are required and review proposed repair methods to ensure the method is appropriate and environmentally sound, where practical. A few of the major areas of environmental concern are listed in the following discussion. A note of caution: this list is not a comprehensive list. There may be additional requirements in the specific location where bridge repairs are required. Also, these requirements represent current regulations, which of course, are always subject to change by federal, state, and local governments. Among the possible threshold conditions that may prompt other agency contact and jurisdiction are:

- State or Federal threatened and endangered species
- Species of high interest to State of Federal agencies
- Migratory waterfowl habitat
- Anadromous fish habitat
- Trout and other cold-water fish habitat
- Habitat for birds of prey
- Wetland habitat
- Riparian habitat

- Migratory corridors
- Wintering areas and other critical feeding sites
- Important reproductive habitats
- Public water supplies, including important aquifers
- Islands and other coastal barriers
- Hazardous waste sites
- Regulatory flood ways and other floodplain areas
- Commercial fish and shellfish production areas
- Important sport fishing areas
- Highly erosible soils
- Listed or proposed wild and scenic rivers
- Navigable waterways
- Significant historic resources
- Resource agency holdings or interests, such as refuges, parks and habitat areas.

STREAMBED DISTURBING ACTIVITIES

33 Code of Federal Regulations Part 330 regulates activities that potentially disturb streambeds. The US Army Corps of Engineers is responsible for implementing this regulation. Among other things, it stipulates a category of permits called Nationwide Permits (NWP) that can be used for small disturbances in a streambed.

Some states have an internal review process to ensure that the maintenance activity is within the NWP requirements; so there may be no actual contact with the Corps. Rather, there is an established agreement between the Corps and the State DOT to cover bridge maintenance activities. In many states, this has led to close working relations between bridge maintenance supervisors and the state environmental engineers assigned to help them.

A brief summary of NWPs common to bridge maintenance are listed below for information purposes. Knowing these restrictions and limitations of the permits may assist in the development of a maintenance plan. However, since the specifics of these permits are subject to change, and since individual Corps Districts may have tougher regional guidelines, it is a good idea to check with your state's Environmental Engineer early on in the planning of maintenance activities.

NATIONWIDE PERMITS AND GENERAL CONDITIONS

Several of the Nationwide Permits that are likely to apply to bridge repair activities are summarized below. The exact terms of these permits are modified periodically, but the general terms and conditions usually stay the same. A comprehensive list of NWPs and their specific terms can be found on the Internet at http://www.wetlands.com/coe/nwp3index.htm. However, this list does not include any regional limitation imposed by the Corps Districts.

1. **Aids to Navigation:** The placement of aids to navigation and regulatory markers that are approved by and installed in accordance with the requirements of the U.S. Coast Guard.

2. **Structures in Artificial Canals:** Structures constructed in artificial canals within principally residential developments where the connection of the canal to a navigable water of the

United States has been previously authorized.

3. Maintenance: Authorizes:

- The maintenance and repair of existing, currently serviceable fills and structures as long as the facility is not put to a different use. Currently serviceable means the facility is not so degraded as to essentially require reconstruction. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards may be authorized if the resulting adverse environmental effects are minimal.
- Dredging in channels and the placement of rip rap within 200 feet of the structure, but only to restore the waterway in the immediate vicinity of the structure to the approximate dimensions that existed when the structure was built.
- Repair, rehabilitation, and replacement of structures destroyed by storms, fires, etc., as long as the work occurs within two years of the destruction (unless the project sponsor can justify delays due to contracting, funding, or other reasons.)

6. Survey Activities: Survey activities including core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, soil survey and sampling, and historic resources surveys.

13. Bank Stabilization. Bank stabilization activities necessary for erosion prevention provided the activity meets all of the following criteria:

- No material is placed in excess of the minimum needed for erosion protection;
- The bank stabilization activity is less than 500 feet in length;
- The activity will not exceed an average of one cubic yard per running foot placed along the bank below the plane of the ordinary high water mark or the high tide line;
- No material is placed in any special aquatic site, including wetlands;
- No material is of the type, or is placed in any location, or in any manner, so as to impair surface water flow into or out of any wetland area;
- No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored trees and treetops may be used in low energy areas); and,
- The activity is part of a single and complete project.

Bank stabilization activities in excess of 500 feet in length or greater than an average of one cubic yard per running foot may be authorized if the activity complies with the other terms and conditions of the NWP and the adverse environmental effects are minimal both individually and cumulatively. This NWP may not be used for the channelization.

14. Linear Transportation Crossings. Authorizes minor fills for roads crossing waters of the US, including wetlands. The current Nationwide 14 allows (for public projects) up to 1/2 acre of loss of Waters of the U.S., including wetlands in non-tidal waters, and 1/3 acre in tidal waters. A Pre-Construction Notification (PCN) is required for an impact over 1/10 acre, or in special aquatic sites (i.e. wetlands). If the fill involves special aquatic sites (wetlands, mudflats, vegetated shallows, coral reefs, rifle and pool complexes, sanctuaries, and refuges), the Corps' District Engineer should be notified through a PCN. In Norfolk District, regional

conditions reduce the limit in non-tidal waters to 1/3 acre, and have limited the length of fill required for the crossing to 200 feet.

15. U.S. Coast Guard Approved Bridges. Discharges of dredged or fill material incidental to the construction of bridges across navigable waters of the United States, including cofferdams, abutments, foundation seals, piers, and temporary construction and access fills provided such discharges have been authorized by the U.S. Coast Guard as part of the bridge permit. Causeways and approach fills are not included in this NWP and will require an individual or regional Section 404 permit.

18. Minor Discharges: Authorizes very minor fills of 20 cubic meters (25 cubic yards) or less. Discharges over 10 cubic yards or any amount in a special aquatic site require notification to the Corps' District Engineer with a delineation of any affected special aquatic sites.

25. Structural Discharges: Authorizes discharges of material such as concrete, sand, rock, etc. into tightly sealed forms or cells where the material will be used as a structural member for standard pile supported structures, such as bridges.

31. Maintenance of Existing Flood Control Facilities: Authorizes discharges of dredged or fill material for the maintenance of existing flood control facilities, including debris basins, retention/detention basins, and channels.

33. Temporary Construction, Access and Dewatering: Authorizes temporary structures, work and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites. The Corps of Engineers or the U.S. Coast Guard must authorize the associated primary activity, or it must be for other construction activities not subject to the Corps or U.S. Coast Guard regulations.

WATER QUALITY

The Clean Water Act requires that any discharge of a hazardous substance to navigable waters, which is in excess of the reportable quantity (RQ) established for that substance, be reported the National Response Center. There may be additional requirements if the water is a resource for drinking water, or provides wildlife habitat.

Sediment and erosion can occur as a result of bridge maintenance activities such as removing vegetative cover, or construction associated with earthwork. The quality of water in the stream, including increased turbidity can be a result of maintenance activities such as placing fill at settled bridge approaches. A sediment and erosion control plan is required if it is anticipated that soil will be disturbed during maintenance activities. The regulating authority must certify the plan minimizes the impact to water quality and aquatic environments.

For maintenance repairs underwater, EPA issues permits (through Nationwide Permits listed above) Construction activities should be designed to minimize effluents from the repair procedure. By utilizing water-tight cofferdams, water pollution can be minimized. The cofferdams themselves should be designed to be environmentally sound. Materials used should be nontoxic and clean, especially if applied under wet conditions.

When maintenance is required on movable spans with facilities for operators, bridge improvements must often include new sanitary facilities that do not discharge pollutants directly into the water. Incinerator or digester toilets may be considered if connecting to an existing sewer facility is impractical.

STREAM CLASSIFICATIONS

There are a number of environmental classifications that may impact bridge maintenance activities. Additional requirements may be placed on structures that fall in areas of unique habitat. For example, maintenance activities disturbing trout streams must be coordinated with the U.S. Fish and Wildlife Service or the appropriate state or local agency. There may be requirements to perform bridge maintenance activities during certain times of the year to avoid spawning activity in the stream.

Streams may be classified as a "Scenic River" by the state. Certain maintenance activities over a water body classified as scenic may be controlled by additional restrictions.

HAULING AND DISPOSAL REGULATIONS

Local governments stipulate hauling regulations. Be sure that hauling activities are coordinated with the approving or permitting agency. Often hauling routes and times of day that hauling activities can occur are prohibited.

HAZARDOUS WASTES

Another issue impacting maintenance activities is the disposal of incidental waste associated with bridge repair. Oil, gasoline, hydraulic fluid, and various cleaners must be disposed of properly, in accordance with federal, state, and local requirements.

Hazardous waste denotes a regulated waste, requiring meeting EPA's minimum standards for treatment, storage, and disposal. Toxic Waste is a phrase used by the media and the public. Toxic means a substance has the ability to cause harm

Bridge repairs that may involve excavation have the potential to come into contact with earlier spills, dumps, containing hazardous materials left behind. If this occurs, or is suspected, the discovery must be reported to the appropriate authority, and additional action may be required.

Hazardous waste spills can occur through the actual maintenance activity, through faulty equipment or accidental spills. An attempt should be made to confine maintenance activities to areas where spills can be easily intercepted prior to penetrating the soil or entering the stream.

CULTURAL RESOURCES

Repairs can impact the historic integrity of a bridge that is listed on the National Register of Historic Places. (An example of one is pictured in Exhibit IX.4). This Register is maintained by the US Department of the Interior, and is supported by individual State Historic Preservation Officers (SHPO). Some states have their own register of state historic sites. For these, the SHPO may regulate maintenance activities. Maintenance activities on a listed or nominated structure should include notification of the appropriate agency to ensure that the historic integrity of the

structure will not be impacted. If rehabilitation is proposed for an historic bridge, the process is guided by the Secretary of the Interior's Standards for Rehabilitation (available on the Internet at http://www2.cr.nps.gov/tps/secstan1.htm.).

Exhibit IX. 4 Historic Masonry Arch Bridge

NOISE CONTROL

Local ordinances for noise may restrict construction activity hours of operation. Some jurisdictions may require a permit for heavy construction activity related to noise generation.

CREOSOTE TREATED TIMBER

The disposal of treated timber products has recently become a concern for states that use creosote or other treated timbers in their bridge structures. The wood from these bridges can be disposed of in several different ways:

(1) The disposed wood can be used as a treated wood product for another use, such as fence posts, or as landscape timbers.

(2) The wood can be used as a fuel, with the proper permits from local and state authorities. (Note: There are a few special facilities dedicated to fuel production from incineration of treated wood products only. Because these have not proven economically self-supporting, user fees are required.)

(3) The wood could be recycled for use as a wood fiber source. There are several methods available to remove the preservatives. The wood fiber could be used for other products such as wood and paper products. There is a process for making wood cross-ties utilizing wood fiber from disposed cross-ties. In this process the preservative is not removed, since the product will function in a similar way.

(4) The wood can be disposed of in a landfill

As long as treated timbers are being used for their intended purpose, they are exempt from EPA pesticide regulations (FIFRA). When the timbers are no longer suitable for use in a structure, the timbers could be provided to other users, converting their use from bridge beams to other purposes. Once the product is no longer being used for its intended purpose, it would fall under the RCRA and TCLP regulations.

The product, treated wood, does not fall into the category of hazardous waste itself. However, some of the characteristics within the product .QQ fall into a hazardous waste category. Therefore, the toxicity characteristic leaching procedure (TCLP, described above for lead-based paint removal) would be applied. EPA's Permit Policy Compendium, Directive No. 9441.1990 (20) includes a memorandum addressing the issue of creosote treated timbers. The memorandum dated July 3, 1990 to Paul Burkholder from David Bussard states that creosote treated timbers are not likely to fall into the category of hazardous waste.

Currently, the TCLP data that has been collected indicates that treated wood does not exceed EPA's regulatory limits. Regulated chemical compounds that could be found in wood products are pentachlorophenol; arsenic and chrome as components of CCA waterborne preservative; benzene (a possible trace compound in creosote and petroleum oil carriers); and creosote, with possible traces of pyridine and creosotes, which are measure in four different ways. Treated wood products are not a hazardous waste, and therefore can be disposed of in a landfill. However, each waste generator must decide how to handle their own waste materials. This may require confirmation of the leaching characteristic by testing a representative sample in accordance with TCLP requirements.

WORKER SAFETY

While taking precautions to ensure that the environment is undamaged, it is equally important to ensure that bridge maintenance workers are not exposed to environmental hazards. Most states have a Safety Engineer or equivalent person that help yard supervisors comply with OSHA requirements, and an Environmental Engineer or equivalent that helps with EPA compliance. Bridge maintenance supervisors should strive to develop a close working relationship with these people, and work with them to develop a policy for ensuring worker safety, including environmental concerns.

While worker safety in general is beyond the scope of this chapter, it is important to point out that workers, by law, have a right to know when they may be exposed to working conditions that are known to be harmful to them. As a minimum, bridge maintenance supervisors should have an up-to-date book of material safety data sheets (MSDS) available at all times. MSDS not only provide important “right-to-know” information about the products that are being used, but also contain instructions as to how to respond to an emergency situation involving the product.

In addition, the maintenance supervisor should would with state safety officials to develop a hazards communication and training program (HAZCOM). This should include a policy of instructing workers about environmental and other hazards they may encounter on the job, and training them to respond to these hazards appropriately.

D. CONCLUSION

Environmental issues, regulations, and controls are constantly changing as more information is gathered about the ways our environment is impacted by the actions we take. One thing is certain, concern about the environment is here to stay and to be successful in implementing a maintenance program, and environmental awareness is critical. Improper safeguards against pollution or the lack of appropriate permits can delay maintenance activities, and even worse, result in fines, law suits, or other penalties being assessed.

When in doubt, contact a reliable source or agency to determine the appropriate action. Be sure the required permits are obtained prior to starting work. By planning ahead and giving thorough consideration to potential environmental impacts, maintenance activities can proceed without time delays and with minimal impact on the environment.