_DIVING METHODOLOGY

GENERAL:

Access and proper documentation are critical aspects of any underwater inspection. The harsh marine environment including fast currents, poor visibility, debris, and marine growth often make it difficult to find an engineer or other personnel qualified and experienced to perform the hands-on inspection. Our personnel are extensively experienced and have the equipment to address all of these issues. Diving operations are conducted in accordance with OSHA regulations.

EXISTING DOCUMENTATION:

All available plans and previous inspection reports are reviewed to determine the configuration of the channel and substructure units, previous conditions, areas of special concern, history of the structure, and how changing conditions may have affected the structure. This work is essential in the proper and thorough evaluation of the marine facility.

DIVE PLAN:

Each site is visited to determine the most appropriate method of access, type of equipment, extent of inspection, and personnel required. A dive plan is then established, including a schedule and sequence to perform the work in the most efficient and safest manner. Proper planning, along with the right equipment, trained and certified personnel is vital for safety since conditions in the field are adverse and ever-changing.

SPECIAL CONSIDERATIONS:

Currents and visibility have an affect on the quantity and quality of underwater inspections. Short slack tide periods also reduce the time in which critical inspections can be performed. Diver control of equipment, i.e., photographic and measuring devices are hindered in excessive current.

Proper planning of underwater inspection is critical to maximize efficiency. Entering the water prior to slack low tide, when currents begin to reduce, extends inspection time. Inspecting during low tide also decreases the amount of underwater work. The tidal zone should be inspected while above water. Photography should be performed after slack low tide, while cleaner sea water provides for better visibility and documentation. In areas of excessive marine growth, cleaning tools from brushes to water blasters can be used to expose the surface for inspection and reveal defects.

EQUIPMENT:

The inspections are performed using surface supply hard-hat equipment. Surface supply hard-hat diving provides continuous, unlimited air supplied from the surface directly to the diver through an umbilical hose. Hard wire communication, video and safety line are also provided with the umbilical. The hard-hat worn by the diver provides communication, full visibility, comfort and safety to optimize underwater time.

A properly sized and equipped dive platform, such as powerboat, barge, or rowboat is used to provide working space, personnel, and equipment for inspection and diver support. In some cases, diving in shallow waters can be done off the shoreline.

Video equipment, consisting of underwater camera and lights connected to the surface for tape recording and monitoring is provided for documentation and viewing. Digital time and voice are continuously recorded on the tape to track position and report conditions. Direct voice communication to the surface provides versatility and safety during the inspection. An underwater 35mm camera is also used to document conditions and to provide photographs in the report.

Miscellaneous tools such as measuring tapes, calipers, probing rods, picks, hammers, core bits, and Ultrasonic Thickness measuring devices assist in the inspection.

INSPECTION:

The inspection is executed after all preparation work, dive plan, delegated personnel, and equipment have been collected and organized.

The subaqueous portions of all the structures receive a visual and tactile inspection by the engineer/diver inspectors. The type, approximate size, conditions, and rated information (if applicable) of the designated structures is documented and set forth in the inspection report.

General inspection data to be collected includes documentation as to the presence of void, holes, impact damage, loss of section, displacement, missing elements, previous repairs, scour, erosion, loss of fill, marine growth, marine borers, and debris.

Inspection of concrete structures includes all surfaces of the unit in contact with the water. Sounding of the concrete is made when and where necessary for delaminations and probing to determine the depth of cracks as well as their width, length, and location. The rating of concrete and masonry units includes the following items: cracks, spalls, exposed reinforcing, soft concrete, sulphate attack, honeycombing, rust spots, and grout loss.

The inspection of timber structures includes all surfaces in contact with the water. The diver will inspect the tidal zone first, and if major deterioration is found, the timber will be cleaned further as required for proper inspection. Probings will be made to determine the extent and location of any rot and/or deteriorated wood. The following items may be noted: splitting, rot, presence of marine borers and preservant if any, fasteners, bracing, and percent of bearing on top to framing members. One (1) inch diameter core samples may be taken in selected locations to further determine the condition of the pile and presence of marine borers.

The inspection of steel structures includes all surfaces in contact with the water. The inspection will include cleaning of the marine growth and oxidation, location and size of any holes, severe pitting or significant loss of cross sectional area. If requested by the client, ultrasonic thickness measuring devices will be used to determine the thickness of the steel elements. Details and condition of the steel and connections shall be listed in the inspection notes.

UNDERWATER PHOTOGRAPHS:

All significant deterioration and damage of the substructures is documented. Where visibility allows, the underwater photography is conducted using a 35mm camera, with close-up attachments and underwater strobe. Underwater color video may be obtained. Where visibility is limited, a black water box is used to document conditions.

DOCUMENTATION OF BOTTOM MATERIAL:

In addition to scour information, a channel bottom description is provided for each dive inspection. The inspection may include probing of the bottom material to determine the type of material and depth of silt or mud. Comments include the relationship of bottom material to scour activity, if any is found. Flow velocity measurements are also taken to determine the impacts of siltation, both existing and proposed.

FATHOMETER SURVEY METHODOLOGY

GENERAL:

Fathometer surveys shall conform to the applicable section of the New York Department of Transportation Underwater Inspection and Evaluation of N.Y. Bridges Guideline Manual dated 1/10/92 including Appendix FT-1 dated 9/1/93. The survey shall include the entire width of the channel and consist of continuous depth readings across the channel at 20 ft. intervals for 100 ft. upstream and downstream of the bridge fascia. A contour map shall be prepared of the channel bottom with 1 ft. contour lines, locations of substructure units, and elevations tied to a known datum on the bridge or NGVDS. A report shall be prepared documenting the results of the survey, identifying areas of scour, comparisons to the previous fathometer survey, and the contour map. Additional items shall be preformed such as depth recordings at 5 ft. intervals in the vicinity of the substructure unit and water velocity measurements.

METHODOLOGY

The previous Fathometer Survey and Diving Report if available shall be reviewed to identify existing scour areas, bridge geometry and datum. The survey crew shall establish the baseline and vertical datum in the field. The substructure units and fathometer x-section points shall be located.

Positioning and depth recordings on major waterways shall be performed with the use of (GPS) Global Positioning System. This state-of-the-art system first developed by the military, and now in use in survey applications, uses satellites to locate transmitter positions with a high degree of accuracy. The system components consist of a transmitter, receiver, total station/data collector, digital depth finder with paper recorder, and lap top computer all tied together electronically. The depth recorder is mounted on a boat with a transmitter and travels along the channel x-section. The total station with GPS establishes a position coordinate and water depth at predetermined intervals. The system operates while rapidly collecting more points than required to create a data file. The data file is then down loaded into the computer . The water depths are converted to elevations and a contour map is created using survey software.

Once the contour map is prepared, the areas of scour are identified, the map and data are compared to previous surveys and significant changes identified. A report is then prepared and submitted.

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