

## **Section 32: DIVING SAFETY**

### **INTRODUCTION**

This section details the basic requirements and procedures for safe diving by King County employees. These requirements apply to employees whose job tasks include bridge foundation inspections that require working in water using “underwater apparatus which supplies compressed breathing gas at the ambient pressure.” This section is intended to comply with applicable sections of Washington Administrative Code (WAC) 296-37 for surface-supplied air diving of no more than 30 feet deep (no decompression), in a very slow to still waterway, with shore access.

### **RESPONSIBILITIES**

Safety and Claims Management will support departments by:

- Providing technical support to managers and supervisors in updating the diving safety program,
- Assisting departments in meeting the medical clearance requirements of WAC 296-37, and
- Assisting departments in sourcing competent diving trainers.

Each Department whose employees dive to perform work duties is responsible for:

- Contacting Safety and Claims Management to evaluate tasks that may come under this section,
- Ensuring that employees receive:
  - initial medical examinations,
  - annual medical examinations, and
  - medical examinations following an injury or illness requiring in-patient hospitalization,
- Ensuring that their employees are properly trained in dive-planning and use of diving equipment,
- Ensuring proper sanitation and maintenance of all diving equipment,
- Ensuring that this written Diving Safety Program is tailored to the needs of department employees as necessary, and
- Revising and updating the hazard evaluation as needed (i.e., any time work process changes may affect employee exposure).

Employees are responsible for:

- Using required safe diving equipment in compliance with this program,
- Notifying management of equipment malfunction or job circumstances where safe diving protocol might need to be reviewed,
- Ensuring the care and maintenance of their assigned diving equipment,
- Notifying management if their medical status changes and requires an updated medical evaluation for safe diving, and

- Documenting any injury associated with a dive event.

**MEDICAL EVALUATION**

The medical certification of diving employees is required by WAC 296-37 to reasonably assure that divers are both mentally and physically qualified to do the assigned task safely.

An initial medical evaluation is required to determine if employees have any physical condition that may limit or restrict their qualification for diving. The initial and annual medical examinations shall consist of:

- (i) Medical history;
- (ii) Diving-related work history;
- (iii) Basic physical examination;
- (iv) The tests below:

<b>Test</b>	<b>Initial Examination</b>	<b>Annual Re-examination</b>
Chest x ray	x	
Visual acuity	x	x
Color blindness	x	
EKG: Standard 12L <sup>1</sup>	x	
Hearing test	x	x
Hematocrit or hemoglobin	x	x
Sickle cell index	x	
White blood count	x	x
Urinalysis	x	x

<sup>1</sup> To be given to the employee once, at age 35 or over.

Additional tests such as stress electrocardiogram, oxygen sensitivity, carotid sinus sensitivities, electroencephalography, special blood studies, etc., may be conducted at the discretion of the physician.

Medical examinations conducted after an injury or illness requiring in-patient hospitalization shall be appropriate to the nature and extent of the injury or illness as determined by the examining physician.

Employees medically determined to have certain ailments or conditions on initial examination are automatically disqualified from diving under this program, including:

- History of epileptic disease or syncopal attacks
- Cystic or cavitory disease of the lungs or obstructive disease of the lungs or recurrent pneumothorax
- Chronic inability to equalize sinus and middle ear pressure
- Significant central nervous system (CNS) disease or impairment
- Certain cardiac abnormalities, e.g.: Pathological heart block, valvular disease, interventricular central defects.
- Certain joint disorder about the shoulder, hip, or knee
- Chronic alcoholism
- Psychotic disorders
- Drug addiction
- Significant hemoglobinopathies
- Significant malignancies
- Pregnancy
- Significant osteonecrosis

On initial examination, an employee may be disqualified from diving for conditions that the Doctor believes may put them at risk, including but not limited to:

- Diabetes
- Morbid obesity
- Perforation of tympanic membrane
- History of neurological decompression sickness
- Grossly impaired hearing
- History of severe motion sickness
- Seriously impaired pulmonary function
- Pulmonary fibrosis
- Peptic ulcer
- Chronic hepatitis
- Sickle cell trait
- Disabilities (or chronic conditions) requiring continuous control by medication.

An employee may be temporarily disqualified on an initial examination for the following reasons:

- Acute alcoholism
- Drug intoxication
- Acute gastrointestinal syndrome
- Acute infection: skin, upper respiratory, ear, etc.
- Recent incident of serious decompression sickness.

## **RECORD KEEPING**

The physician shall furnish written reports of the medical examination to Safety and Claims Management. The report shall include:

- (i) The results of the medical examination, and
- (ii) The examining physician's opinion of the employee's fitness to be exposed to hyperbaric conditions, including any recommended restrictions or limitations to such exposure (see WAC 296-37-585).

The employee shall be provided a copy of the physician's written report. King County shall not lift any restrictions placed on an employee without the consent of the attending physician.

Safety and Claims Management will maintain records of all medical evaluations.

## **TRAINING**

Members of the dive team must receive formal technical diving training and be certified prior to initial diving. Such training shall include the following elements:

- Basic Diving Principles
- Surface Diving Equipment
- Decompression Procedures (when applicable)
- Planning Dive Operation
- Specific Equipment Training
- Standard Hand Signals
- First Aid/CPR

### **Maintenance of Qualifications**

Each diver or attendant must complete an annual review of the training elements unless they have 30 or more field diving days in the prior 2-year period.

Maintenance of qualification must be verified by field experience as documented by:

- Employment records
- Field operations records
- Training review records
- Written statement from previous employers verifying diving activities (new employees)
- Written statement from diving officers or commanding officers (new employees).

Divers must be proficient in the skills required to perform the primary task necessitating diving. For instance, divers diving for the purpose of inspecting bridge foundations must be licensed or certified to inspect bridge structures by appropriate authorities.

## **DIVING PROCEDURES**

### **Composition of a Dive Team**

The dive team shall consist of the following positions:

1. **Designated Person In charge or Dive Supervisor**

The designated person in charge (DPIC) is responsible for the safe and efficient conduct of the entire project. S/he will plan and institute a site specific safety briefing prior to each dive with all crew members and associated personnel in attendance. The briefing shall include the description of the pending operation: dive team assignments; location, depth and planned bottom time for the dive; review of pertinent drawings and/or photos; discussion of equipment, tools and materials that may be required during the operation; discussion of job hazard analysis (JHA); review of the emergency procedures; and assignment of specific responsibilities to each dive team member.

2. **Diver**

The diver is a certified employee working in water using underwater apparatus which supplies compressed breathing gas at the ambient pressure. The diver is under the direction of the Dive Supervisor and shall perform all tasks as required and directed by Dive Supervisor/ DPIC.

3. **Standby Diver**

A diver at the dive location properly equipped and available to assist a diver in the water. A standby diver is required on all dive teams. A standby diver must be ready to reach the primary diver within five minutes of an emergency. When two divers are in water together, they can be considered as standing by for each other if one can reach the other within three minutes.

4. **Tender**

The tender tends the diver's umbilical--The composite hose bundle between a dive location and a diver which supplies the diver with breathing gas, and includes a safety line between the diver and the dive location. The tender assists the diver in and out of water and operates deck equipment as required or directed by the DPIC. The tender is also the time keeper and responsible for monitoring bottom time.

In certain situations such as entry into wreck, tunnels, other confined spaces, a second diver tending the primary diver at the point of entry will be required.

All diving personnel must be qualified and current in their certification. Each diver shall be continuously tended while in the water by a separate dive team member. Note that the Dive Supervisor can perform the tender's tasks on a two-person dive team.

## **Equipment and Clothing**

- All equipment used in diving operations must be in excellent operation condition and systematically tested prior to use.
- Equipment must be inspected and determined to be in good operating condition prior to each dive and continually maintained in such condition throughout the operation.
- All hoses leading to and from the diver which are exposed to potential damage as a result of falling objects, personnel, traffic, etc. must be protected.
- All surface-supplied diving must be performed with the diver wearing a harness where the hose is attached by a quick release mechanism that cannot be accidentally released.
- Dive team members must wear appropriate PPE.
- Divers must wear protective clothing whenever barnacles, marine growth, marine life or other sharp or abrasive surfaces present a potential hazard.
- Provision must be made to control body heat loss during the dive.
- Divers must carry a sharp knife at all times while in water to free themselves from any life-threatening entanglements.
- All pressure gauges should be checked periodically during a dive to assure their accuracy.

## **Pre-dive Check List shall include:**

- Emergency aid contacts: A list shall be kept at the dive location of the telephone or call numbers of accessible hospitals and available physicians;
- An operational decompression chamber (if not at the dive location) when required;
- Available means of transportation, for instance, Aid car from the Fire Department.
- The nearest U.S. Coast Guard Rescue Coordination Center.
- First-aid supplies.
- An American Red Cross standard first-aid handbook or equivalent, and a bag-type manual resuscitator with transparent mask and tubing shall be available at the dive location
- An assessment of the safety and health aspects of the following:
  - Diving mode;
  - Surface and underwater conditions and hazards;
  - Breathing gas supply (including reserves);
  - Thermal protection;
  - Diving equipment and systems;
  - Dive team assignments and physical fitness of dive team members (including any impairment known to the employer);
  - Repetitive dive designation
  - Decompression and treatment procedures (including altitude corrections);
  - Emergency procedures.

- Coordination with other activities in the vicinity which are likely to interfere with the diving operation.
- Employee briefing.
- Dive team member be briefing on:
  - The tasks to be undertaken;
  - Safety procedures for the diving mode;
  - Any unusual hazards or environmental conditions likely to affect the safety of the diving operation; and
  - Any modifications to operating procedures necessitated by the specific diving operation.
  - Inquiry into the dive team member's current state of physical fitness,
  - Discussion with the dive team member of procedure for reporting of physical problems or adverse physiological effects during and after the dive.
  - Confirmation of Equipment inspection.
    - Compressor intake located in an area free from contamination.
  - Placement of warning signal when diving from surfaces other than vessels in areas capable of supporting marine traffic.
- Accurate and positive determination of depth of dive.
- Absence of overhead work while diving is in progress.

### **Water Entry**

A safe means of ingress and egress from the water shall be provided for diving personnel and a means of rescuing surface personnel in the event of a fall into the water.

### **Diving Operation**

Having met the pre-dive planning, equipment and personnel checks, the actual diving operation may be undertaken.

### **Post-dive procedures**

- After the completion of any dive, the Diving Supervisor shall:
  - Check the physical condition of the diver;
  - Instruct the diver to report any physical problems or adverse physiological effects including symptoms of decompression sickness;
  - Advise the diver of the location of a decompression chamber which is ready for use; and
  - Alert the diver to the potential hazards of flying after diving.
- Record of dive.
  - The Diving Supervisor shall record and maintain the following information for each diving operation:
    - Names of dive team members including designated person-in-charge;
    - Date, time, and location;
    - Diving modes used;

- General nature of work performed;
- Approximate underwater and surface conditions (visibility, water temperature and current); and
- Maximum depth and bottom time for each diver.



# RECORD OF DIVE

Diver: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

Project: \_\_\_\_\_ Work Order # \_\_\_\_\_

Location: \_\_\_\_\_ Platform/Vessel: \_\_\_\_\_

Dive Supervisor/DPIC: \_\_\_\_\_ Standby Diver: \_\_\_\_\_

Diver Tender: \_\_\_\_\_ Standby Tender: \_\_\_\_\_

Air Temp. \_\_\_\_\_ Water Temp. \_\_\_\_\_ Underwater Visibility \_\_\_\_\_ Current \_\_\_\_\_

Diving Mode: \_\_\_\_\_

Primary Compressor \_\_\_\_\_  Back-Up Compressor \_\_\_\_\_

Maximum Depth \_\_\_\_\_ Bottom Time \_\_\_\_\_

Description of work performed: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Dive Supervisor/DPIC Signature: \_\_\_\_\_ Date \_\_\_\_\_ Time: \_\_\_\_\_

Diver Signature: \_\_\_\_\_ Date: \_\_\_\_\_ Time \_\_\_\_\_

# Record of Site-Specific Safety Meeting

Project: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

Location: \_\_\_\_\_ Work Order: \_\_\_\_\_

Description of work plan: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Job Hazard Analysis Performed: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Job Hazards Discussed: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Dive Team (Crew) Suggestions/Action Taken: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Nearest Emergency Facility:

Hospital/clinic: \_\_\_\_\_ Phone #: \_\_\_\_\_

Address: \_\_\_\_\_

Attendees:

Print Name

Signature

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Meeting Conducted by \_\_\_\_\_ Signature: \_\_\_\_\_

DPIC: \_\_\_\_\_ Signature: \_\_\_\_\_