OSHA Regulation

OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

DIRECTIVE NUMBER: CPL 02-00-151  EFFECTIVE DATE: June 13, 2011
SUBJECT: 29 CFR Part 1910, Subpart T – Commercial Diving Operations
Contributing Factors
Diver Fatalities - 2008 to 2013

Ranked in Order of Frequency

1. **Insufficient Number of Dive Team Members**
   - 2008 to 2013 - 54 Diver Fatalities
   - 24 Due to Insufficient Number of Dive Team Members

2. **Physical Condition of Diver**
Contributing Factors
Diver Fatalities - 2008 to 2013
Ranked in Order of Frequency

3. Equipment Malfunction
   ▪ Leading Cause of Malfunction – Improper Maintenance
4. Training Deficiencies
   ▪ Failure to Recognize and Avoid Underwater Hazards
   ▪ Poor Response when Hazards Encountered
5. Differential Pressure
Contributing Factors
Diver Fatalities - 2008 to 2013
Ranked in Order of Frequency

6. Entanglement
7. Entrapment
8. Explosion
9. AGE (arterial gas embolism) / Decompression Sickness
Qualifications – What to Ask

- Divers’ qualified to perform water tank and coating evaluations
- Divers’ properly certified
- Divers’ training records
- Copies of Company and Personal Dive Logs
- Divers’ retain current CPR/1st Aid/O2 administration training
- Divers’ have current Accident Management Training
- Examples of previous site-specific dive plans available
Qualifications – Know Water Tanks?
Selecting a Storage Tank Engineer/Inspector

AWWA M42

- Registered Professional Engineer with
  - extensive experience in water storage tank engineering and inspection
  - experienced personnel
Selecting a Storage Tank Engineer/Inspector

- Extensive knowledge of
  - industry standards
  - traditional engineering disciplines
  - specialized training
  - tank construction practices
  - surface cleaning and cleanliness standards
Selecting a Storage Tank
Engineer/Inspector

- Effective communications skills to
  - interpret specifications
  - resolve potential issues
- Climbing abilities and knowledge of
  - proper rigging
  - safety practices
  - respect for heights
Ask Prospective Consultants...

- Number of Years Inspecting Tanks
- Registered Professional Engineer on Staff?
- Water Industry Involvement
- Number of Tanks Inspected Annually
OSHA Requires
Verification of Competency
Qualifications
Diver Properly Certified?

Last Name: Selig
First Name: Joshua A.
Born: 28 July 1990
Certificate #: 20150764
Expires: 23 October 2017
DCBC Since: October 2015
Endorsements: See over

Restricted Surface Supplied Diver
Qualifications
Company and Personal Training Records
Qualifications
Company & Personal Dive Logs

<table>
<thead>
<tr>
<th>Date</th>
<th>Tank Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tank Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diver's Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Previous Dive #:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surface Interval:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Repetitive Factor (RF) In:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. Depth:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Left Surface:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reach Bottom:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leave Bottom:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reach Surface:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dive #1</th>
<th>Dive #2</th>
<th>Dive #3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diver ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tables Used:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCS/SA or Surface Supply:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Breathing Apparatus:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Breathing Medium:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ball Out Pressure:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ball Out Checks:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-Return Valve Checks:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cameras Checks:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Repetitive Group (RG) Out:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tender's Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Back up Diver's Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description of Dive Activities:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supervisor Signature:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supervisor Printed:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
Dive Logs

- Should be 2 types “COMPANY” and “PERSONAL”
- Must be current
- List at least last 12 months of dive activity
- Ensure dive experience is real
- Verify that personnel are not subject to unsafe dive practices
Qualifications
Accident Management Training

Divers Alert Network
Qualifications
CPR/1st-Aid/O2
Qualifications
Dive Plans

Project Summary:
Work Operations: Evaluation of 8 Tanks by Diving. All tanks hold potable water. Individual
Tank Information contained in Appendix A.
Client:

Tank Locations:
Date Prepared: September 14, 2016

Key Personnel:
Project Competent Person: Joshua Selig, P.E. 317/271-3100
TIC Dive Coordinators: Joshua Selig, P.E. 317/271-3100
TIC Safety Director: Jennifer D. Cooen, CHMM, CRPSI - 317/271-3100 or W377603333
Managing Principal: Gregory R. "Chip" Stein, P.E. 317/271-3100 and Stephan W. Meier,
S.E. P.E. - 631/376-0745

Contents:
I. Signature Sheet
II. Anticipated High Risk Activities
III. Training
IV. Crew Roles and Responsibilities
V. Safety Equipment Matrix
VI. Emergency Action Planning
VII. Fall Protection and Prevention
VIII. Ladders
IX. Confined Space Entry
X. Hazardous Materials
XI. Energy Control
XII. Physical Hazards
XIII. Diving
Appendix A - Individual Tank Information
Appendix B - Equipment Checklist
Appendix C - Blank Emergency Action Planning Forms
Appendix D - Blank Confined Space Permit
Appendix E - SDS
Appendix F - Local Hospitals and Nearest Monoplace Hyperbaric Chamber
Site-Specific Dive Plan

- Anticipated High-Risk Activities
- Crew Roles and Responsibilities
- Required Equipment
- Emergency Planning
- Locations of Nearest Hospitals and Monoplace Hyperbaric Chambers
- Safety Data Sheets (SDS)
- Address other safety hazards
High-Risk Activities
Crew Roles and Responsibilities
Team Size
Dive Team Size

- Minimum of 4 Certified Commercial Divers
- Enough Equipment On Site to Suit Up 3 Divers
- 2 Divers in Water
- 2 Tenders
- Dive Supervisor or Designated Person in Charge
Required Equipment
Equipment Check List

- Two-Way Communication Radios w/ Tether Line
- Buoyancy Compensators (BCD)
- Personal Fall Arrest Equipment
- Full Face Masks
- Dry Suits
- Main Air Tanks, Emergency Air Tanks, BCD Air Tanks
- Dive Tables
- Weights
- Bag-Type Manual Resuscitate w/ Mask and Tubing
- Emergency O2 Tank
- Tarps
- Raft
- Disinfectant
- Safety Goggles
- Chemical Gloves
Emergency Planning
Nearest Hospital and Monoplace
Hyperbaric Chamber
Safety Data Sheet (SDS)
Additional Hazards to Address in Dive Plan

- Permit-Required Confined Space
- Lockout-Tagout
- Disinfection
- Ladders
- Walking/Working Surfaces
- Physical Hazards
Permit-Required Confined Space

- Written program
- Employee training
- Designated crew roles/ responsibilities
- Emergency response
- Permits
- Continuous air monitoring
Logout/Tagout
Logout/Tagout
Disinfection

- Applicable standards:
  - AWWA C652
Disinfection
Disinfection
Exterior Ladders
Condition of Interior Ladders
Working at Heights
Physical Hazards

- Illumination
- Heat Stress
- Cold Stress
- Material Hoisting and Lifting Procedure
- Handling Air Cylinders
Decompression/Time and Air

### DCIEM

#### A: AIR DECOMPRESSION

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>No-Decompression Bottom Times (minutes)</th>
<th>Decompression Required Bottom Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>20'</td>
<td>30 A 100 E 200 J 300 J 500 J 700 J 728 M</td>
<td>300 400 500 600 700 800 900 1000</td>
</tr>
<tr>
<td>30'</td>
<td>45 A 100 E 150 J 300 J 700 J 1000</td>
<td>100 J 200 J 300 400 500 600 700 800 900 1000</td>
</tr>
<tr>
<td>40'</td>
<td>60 A 100 E 200 J 300 J 700 J 1000</td>
<td>300 400 500 600 700 800 900 1000</td>
</tr>
<tr>
<td>50'</td>
<td>75 A 100 E 200 J 300 J 700 J 1000</td>
<td>100 J 200 J 300 400 500 600 700 800 900 1000</td>
</tr>
<tr>
<td>60'</td>
<td>90 A 100 E 200 J 300 J 700 J 1000</td>
<td>300 400 500 600 700 800 900 1000</td>
</tr>
</tbody>
</table>

**Decompression Stops**
- At 15' Intervals
- In minutes

#### B: SURFACE INTERVALS

<table>
<thead>
<tr>
<th>Duration</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>50'</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>100'</td>
<td>12</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>150'</td>
<td>18</td>
<td>16</td>
<td>14</td>
<td>12</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

**Repetitive Diving (All given for Surface Intervals)**

#### C: REPEETITIVE DIVING

<table>
<thead>
<tr>
<th>Duration</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>50'</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>100'</td>
<td>12</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>150'</td>
<td>18</td>
<td>16</td>
<td>14</td>
<td>12</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

**Decompression Stops after No Diving**

- Add Depth Correction to Actual Depth of Atitude Dive
- Add Depth Correction to Actual Depth of Atitude Dive (in feet)
Over 100 Ft of Water Depth

Decompression Chamber On-Site
What to Know Prior to Hire

- Are divers qualified to perform water tank and coating evaluations?
- Are divers properly certified?
- Verify divers’ training records.
- Review copies of Company and Personal Dive Logs.
- Do divers have current CPR/1st Aid/O2 administration training?
- Do divers’ have current Accident Management Training?
- Review examples of previous site-specific dive plans available.
Facilitating a Safer Dive

- Provide Keys to All of the Roof Manholes
- Keep Water Levels High
- Isolate the Tank Early
- Let Inspectors Know if the Tank Has an Interior Ladder
Dive Safety Checklist

- Up-to-Date Company & Diver Dive Logs
- CPR/First-Aid & Oxygen Administration Training
- 4-Member Dive Team
- Comply with OSHA Hazard Communication Requirements
- Lockout & Tag All Valves
- Previous Dive Plans
- Commercial Diver Certification
- Sufficient Equipment to Suit-Up 3 Divers
- Comply with OSHA Confined Space
- Compliance with New OSHA Subpart D – Walking Surfaces (effective January 17, 2017)
Additional Recommendations

- Extensive Experience in Water Tank Engineering & Inspection
- Diver is Employee of Registered Professional Engineer
- Tank Isolated System while Diver in Tank
- Potential for 5-Member Dive Team
Critical Components of Safe Water Tank Dive Inspection

- Crew Size – Minimum of 4 Certified Divers
- Prior to Mobilization - Site-Specific Emergency Plan
- Lock-Out/Tag-Out Procedure & Verification
- Qualifications & Tank Expertise
Dive Evaluation
Sample RFQ
Available

Clarke@TankIndustry.com
www.TankIndustry.com
Thank You for Your Time

Questions?