The Diving Medical Advisory Committee

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Safe Diving Distance from Seismic Surveying Operations

DMAC 12 Rev. 2.1 – June 2020

Supersedes DMAC 12 Rev 2 which is now withdrawn

Background

Guidance note DMAC 12 Revision 1 was issued in 2011, taking into account changes in seismic procedures since the original guidance published in 1979 and very limited reports from diving contractors on their experience of simultaneous operations. Recent incidents have demonstrated that significant adverse effects may be experienced by divers at distances of up to 27km (16.8 miles) from the seismic source, which is a considerably greater distance than was previously recognised. This revision takes these reports into account. There is limited understanding of the effects of seismic pressure waves on divers and hence the guidance given in this document is a pragmatic solution. It is recognised that further revisions may be required as more knowledge and experience is obtained.

1 Seismic airgun activity results in the transmission of acoustic waves through the water which the diver experiences as vibration or a noise analogous to a piling hammer. Multiple reflections of this acoustic wave from the sea surface, seabed and other structures may result in this sounding like a low frequency rumble.

2 The intensity of the pressure wave experienced by the diver is principally dependent on the power of the seismic airgun array and the distance between the diver and the seismic airgun, but other factors may have important effects. These factors might include the water depth at which the seismic activity takes place, the presence of thermoclines (layering due to changes in temperature), the depth of the diver versus the depth of the thermocline, seabed conditions, salinity and the sea state. Reflections from the surface and seabed may increase the intensity; this effect generally increases as water depth decreases.

3 Not all seismic surveys are the same (e.g. ocean bottom cable surveys (OBC), streamer(s), vertical seismic profile surveys (VSP), site surveys, etc.) and there are differences in the types and purpose of source arrays used around the world, e.g. airguns, boomers, sparkers, etc.

4 The multiple factors involved make it difficult to determine a safe or tolerable distance for diving operations.

5 The duration of a diver's exposure and frequency of discharge may limit tolerance.

Guidance

1 Where possible, plans should be made to avoid overlapping seismic and diving activities. Where this is not possible, the activities should be prioritised and a simultaneous operations (SIMOPS) plan developed.

2 Where diving and seismic activity are scheduled to occur within a distance of 45km (28 miles), it would be good practice for all parties to be made aware of the planned activity where practicable. This should include clients/operators, diving and seismic contractors.

3 Where diving and seismic activity will occur within a distance of 30km (18.6 miles) a joint risk assessment should be conducted, between the clients/operators involved and the seismic and diving contractors in advance of any simultaneous operations. The risk assessment should consider ramp-up trials as well as other risk control measures e.g. reduction in source sizes, changes to firing intervals, timeshare/prioritisation etc. Seismic operators should consider whether a source output modelling study should be undertaken to predict sound pressure levels at diving locations. If so, these sound pressure levels should be considered together with other relevant factors in the risk assessment.

4 The maintenance of effective communication and co-operation between the seismic vessel and the diving vessel is essential. If the risk assessment generates a requirement for a ramp up trial, it should define the start point or location at which the trial commences taking into account the planned movement of the vessel and an appropriate predetermined communication plan between seismic party manager and diving supervisor.

5 The minimum safe distance, as determined from the risk assessment or testing outlined above, should not be compromised by either party.

6 There should be regular effective communication between the seismic vessel and diving vessel so that those in control of seismic and diving operations are aware of each other's work programmes. A communications check should be conducted between vessels at a pre-defined regular frequency in order to reduce the chance of an unknown communications failure.

7 Should any member of the diving team in the water suddenly experience discomfort, the seismic source should be turned off immediately or the bell run terminated if a request is made to do so. The SIMOPS plan should include contingency arrangements for this situation.

8 Following the risk assessment and any ramp-up trials local factors may change. This combined with individual diver susceptibility may produce the need for further risk assessment and a management of change process.

9 The health impact of exposure to noise in the underwater environment is difficult to assess. A diver's exposure should be terminated if the noise level:
- interferes with diver communications;
- is considered to exceed acceptable noise exposure levels;
- induces discomfort; or
- places the diver at risk in any other way.

Diving operations may continue if none of these criteria for terminating diving operations are present, including diving within 30km (18.6 miles) of seismic surveying operations.

10 Diver reports suggest that communications problems may often provide the earliest and most reliable/objective indication that the underwater noise from a seismic source has reached an unacceptable level. It is therefore strongly emphasised that the seismic source must be turned off immediately or the bell run terminated if the noise level compromises communications between the diver(s) and diving supervisor. In order to conduct diving operations safely there must always be good communications between the divers in the water and the supervisor in dive control.

11 When simultaneous operations are conducted, the diving contractor should generate and submit a short online *Report of Simultaneous Seismic and Diving Operations* at www.dmac-diving.org/data.

DMAC will periodically review the data gathered from such reports.

12 Organisations which provide consent for seismic operations may wish to take into account the potential impact of seismic activity on divers and consider whether a requirement for monitoring the area for new diving activity is appropriate.

13 Diving contractors and clients/operators should seek to ensure they are aware of planned or consented seismic operations using all reasonable means. For example, in some jurisdictions survey consent details are made publicly available e.g. the UK Kingfisher Bulletin; the Norway NPD Seismic Survey Notification System etc.

Other Activities

This guidance aims to reduce the potential risk to divers from seismic operations. However, it is recognised that other activities such as pile-driving, the use of explosives underwater and beneath the seabed etc. may generate noise levels that could pose a risk to divers. These activities should be planned and assessed in accordance with the principles above and it must be recognised that simultaneous operations may not be possible if the noise level interferes with diver communications, is considered to exceed acceptable noise exposure levels, induces discomfort or places the diver at risk in any other way.

Specific guidance on the effects of sonar transmission on commercial diving activities may be found in DMAC 06 *The effects of sonar transmission on commercial diving activities*.

There is no evidence to indicate that down-well fracking operations produce any underwater noise.