HSC

Health and Safety Commission

The Medical Examination and Assessment of Divers (MA1) September 2007

Contents:

INTRODUCTION

1. This document outlines HSE's medical standards for diving at work as of May 2005. These are used by Approved Medical Examiners of Divers (AMEDs) who are medical examiners approved by the Health and Safety Executive (HSE) to perform statutory diving medical examinations and assessments under the Diving at Work Regulations 1997.

2. The standards are based on the need to maximise the diver's in-water safety, and to take account of the mental and physical requirements needed to meet any reasonably foreseeable underwater emergency and the physiological effects of raised environmental pressure. Under the Diving at Work Regulations 1997, all divers at work must have a valid certificate of medical fitness to dive, issued by an HSE Approved Medical Examiner of Divers. The AMED has a duty to come to a decision on an individual's medical fitness to perform work activities while diving. The certificate of medical fitness to dive is valid for as long as the medical examiner certifies, up to a maximum of 12 months. It must be renewed before expiry if a diver wishes to continue diving at work.

3. Where an annual medical assessment is carried out less than a month before the expiry of the current medical certificate to dive, the start date of the new certificate may begin from the expiry date of the current certificate.

The role of the medica examiner

4. Medical examiners need to be knowledgeable about the many different types of diving work as well as diving physiology and the various diving illnesses that may be met. They are therefore required to have undergone specialised training in underwater medicine to appropriate standards and to demonstrate that they have kept themselves up to date with developments in both diving medicine and diving practice. HSE requires AMEDs to undertake five days of initial training and then two days of refresher training within five years of initial approval and then over each subsequent five year period with the five year period running from the date of the last refresher training.

The Diving at Work Regulations 1997

5. The Diving at Work Regulations 1997 are accompanied by five Approved Codes of Practice (ACOPs) covering:

   - Commercial Diving Projects Inland/Inshore;
   - Commercial Diving Projects Offshore;
   - Media Diving Projects;
   - Recreational Diving Projects;
   - Scientific and Archaeological Diving Projects.

   Each of these ACOPs has been tailored to fit the needs of these different sectors of the diving industry.

6. Divers at work, who dive under the Media, Recreational, Scientific & Archeological Diving Project ACOPs using approved recreational diving qualifications may have had a medical examination required by their recreational diving organisation. The AMED may use discretion in deciding whether some investigations already undertaken need to be repeated. The AMED needs to take into account the divers medical history and time lapsed since the last recreational medical examination and current health status. If information from a previous sports medical examination is unavailable or not current the AMED is entitled to repeat the investigation.

Initial medical examination

7. At the earliest possible stage, it is in their own interest that people considering a career in diving should complete a medical questionnaire that looks at whether anything in their medical history would preclude them from a long-term career in diving. After completion of the questionnaire by the candidate diver it needs confirmation by the diver's GP. The GP is not required to physically examine the diver to confirm the medical history. General advice to the GP on medical standards for diving is contained on the HSE Diving Website. The medical questionnaire should be examined by the AMED. The presence of a disqualifying medical condition at this stage may avoid the expense of inappropriately proceeding to a full initial HSE medical examination. Copies of the medical questionnaire are contained in Annex A.

8. The initial medical is considered the most important one. It is more likely to pick up medical issues and gives the AMED an opportunity to counsel potential divers about the significance of any underlying medical issues (such as a clinically progressive condition) in relation to the divers future career. Female candidate divers need to be made aware that they should not dive if pregnant. See paragraph 23. Before the initial examination is carried out prospective divers should have arranged for their general practitioner to confirm the medical questionnaire detailing their medical history. The diver is responsible for any costs associated with this questionnaire being confirmed by the relevant GP. At subsequent annual assessments further reports will only be required if there is a relevant clinical problem that requires further evaluation.

9. After being accepted on to a commercial diver training and/or assessment course, but before beginning training, all trainees must submit themselves for a full medical examination with an HSE medical examiner of divers. The medical examiner must make potential divers aware of any health problems that may affect their future employment prospects or their long-term health. A permanent record of these initial test results must be recorded on MA2 and used for comparison at subsequent annual medical assessments. Annex B can be used to facilitate such comparison over time.

Annual medical examination

10. At intervals not exceeding 12 months, all divers covered by the Diving at Work Regulations 1997 must see an HSE medical examiner of divers so that their fitness to dive at work over the following 12 months can be assessed (see also paragraph 3 above). The medical examiner's decision will be based on a careful assessment of any medical condition in relation to the safety of the diver and the requirements of the work activities that the diver will perform while diving.

11. The medical records from the initial medical examination and any subsequent annual medical examination must be available for comparative purposes at each successive examination. There is therefore a requirement for divers to produce at the time of the annual medical assessment, copies of their previous medical examination (MA2) unless, of course, they return to the medical examiner who conducted the previous medical examination. AMEDs may decline to undertake a medical examination on a diver who presents without a copy of MA2 or details of the last medical examination undertaken. AMEDs may issue the diver with the relevant Fact sheet contained in Annex C.

RETURN TO WORK AFTER ANY SERIOUS INJURY OR ILLNESS INCLUDING DECOMPRESSION ILLNESS

12. Any condition or injury occurring during a diver's career may influence fitness for work. Under certain specific circumstances such as any cardiac, pulmonary, neurological or otological disorder including neurological decompression illness or any condition requiring the diver to be off work for more than 14 days, a diver must present themselves to a medical examiner for re-examination for an assessment of their fitness to return to work. For example, minor head injury with post- traumatic amnesia of less than 30 minutes requires a finding of temporary unfitness for 28 days and then re-examination. See paragraph H9. This is a specific examination related to the possible effects of the particular illness or injury, and does not replace the requirement for an annual medical assessment. AMEDs may issue the diver with the relevant Fact sheet contained in Annex C.

Recommended times away from diving

13. The recommended minimum times away from diving after successful treatment with no sequelae are:

SIMPLE DECOMPRESSION ILLNESS, LIMB PAIN, SKIN "BEND" LYMPHATIC SWELLING, FATIGUE etc	
Uncomplicated recovery	24 hours
Recurrence/relapse requiring further recompression	7 days

NEUROLOGICAL DECOMPRESSION ILLNESS	
Altered sensation in limbs only	7 days
g. Audiovestibular, motor	28 days

Other	

Pulmonary decompression Illness	28 days

14. Because of the nature of their diving patterns and profiles and the lack of supervision, it is recommended that the time away from diving for those diving at work in the recreational sector should be longer. The Diver's Alert Network (DAN) Website recommendations on diving layoff times for recreational divers are found at:

http://www.diversalertnetwork.org/medical/faq/faq.asp?faqid=137

15. In anything other than a case of simple decompression illness, the review must be carried out by an AMED in consultation with the treating Hyperbaric doctor and\or a diving medicine specialist and a decision made about fitness, the timing of return to diving work and further investigations as appropriate. See paragraph F11. Existing and current guidance on medical confidentiality and the requirements of the Data Protection Act 1998 should be followed.

16. Further advice including names of diving medicine specialists and HSE's Diving Medical Adviser (DMA) contact details can be obtained from HSE's diving administration during normal office hours on 0131 247 2102. E-mail: Maureen.fairbairn@hse.gsi.gov.uk

Certificate of medical fitness to dive

17. On completion of the initial or annual examination the medical examiner must give a certificate of medical fitness to dive. The certificate must state:

- the period (which must not exceed 12 months) during which the person issuing the certificate considers the person named in the certificate will remain fit to dive (see paragraph3);

- and any other limitations as to the nature or category of diving to which it relates.

Certification of fitness with restrictions

18. Options exist for restricting certification of diving activity in terms of duration of certification, type and remoteness of diving, frequency of diving and depth. Such restrictions require careful consideration to ensure that they are appropriate to the underlying medical condition, the type of diving undertaken and that they do not unnecessarily restrict employment opportunities. Some limits e.g. maximum depth, are usually not sensible but to exclude a category of diving can make sense. Details of the restrictions identified by the medical examiner should be noted on the certificate of medical fitness to dive (MA2) at the time of issue.

Second opinions and additional advice

19. The medical examiner has a duty to reach a conclusion about fitness to dive. Where doubt about fitness exists, consultation with other HSE medical examiners, appropriate medical specialists, or HSE's Diving Medical Adviser should take place. Advice or

guidance on suitable people to contact for a second opinion is available from HSE's Diving Medical Adviser (see paragraph 16).

Appeal

20. Where someone is found to be unfit to dive, or fit to dive only within limitations, the AMED should inform the diver, in general terms, of the reason for the finding. In these circumstances the person should be advised of their right of appeal by the HSE. AMEDs may issue the diver with the relevant Fact sheet contained in Annex C.

21. The AMED should record that they have made the diver aware of this right of appeal. The diver must apply in writing to the HSE Diving Medical Adviser (see paragraph 16) within 28 days of being informed of the AMED decision, appealing against the AMED decision on unfitness or restrictions. Normally a specialist in the relevant field is consulted. The medical examiner will be kept informed.

Medical Records

22. The medical form (MA2) is in duplicate. The top (white) copy is given to the candidate or diver and the pink copy is kept by the medical examiner. The top (white) copy incorporates the Medical Certificate of Fitness to Dive. The pink MA2 copy should be retained for seven years.

GENERAL MEDICAL CONSIDERATIONS GENDER

Gender

23. In general the same fitness criteria apply to both male and female divers. The major difference between female and male divers relates to possible harmful effects that exposure to increased pressure may have on a foetus. Consequently a diver who is pregnant or who suspects that she may be pregnant should not dive.

Age

24. There is no lower or upper age limit for medical fitness to dive. In an older person evidence should be sought for necessity, and motivation. A diver must retain the physical capacity to undertake work underwater, even though offset by greater experience. This will normally require greater than average fitness as age increases.

HIV Infection and impaired immunity

25. A positive test need not mean the end of diving. In an HIV positive individual, the development of any new medical condition will require re-assessment of fitness. The development of signs and symptoms of AIDS is likely to lead to a finding of being unfit to

dive because of the physical problems of the condition and need for regular medication. Cases should be considered on their individual merit.

26. A diver with impaired immunity for other reasons such as splenectomy needs careful consideration. Such a diver may need restriction as to the type of diving undertaken. The risk of infection even with prophylactic antibiotic usage and access to medical care needs consideration in relation to foreign travel, diving in microbiologically contaminated water and working in saturation conditions. See paragraphs 28-29 and 31-34.

Communicable diseases

27. Diving may commence once the underlying condition has resolved. In cases of doubt as to the person's fitness after such an illness (such as the presence of complications), the certificate of fitness should be withheld until the doctor involved in the clinical care of the patient has been consulted.

Medication

28. Medical fitness to dive using medication depends upon the type of diving, underlying pathology, effects of medication on fitness to dive and the consequences of its abrupt cessation during diving activities.

29. The assessment must include that of the underlying condition for which medication is being taken in the first place and this may be the most important consideration. The extent of organ function and symptom control with medication use is likely to be relevant. The assessment should also consider the length of time the individual has been on the medication (eg. adaptation to side-effects) and the consequences of treatment cessation in the event of its loss. Consideration should be given to the potential for unexpected side effects as a result of interaction with increased pressure.

Smoking

30. Divers should be discouraged from smoking, although it is not a bar to diving. The onset of smoking related diseases such as chronic obstructive pulmonary disease, ischaemic heart disease, peripheral vascular disease etc will disbar.

The Disabled Diver

31. When conducting a clinical risk assessment it is important to relate it directly to the individual. Each disability will present with a unique set of characteristics, which will need a detailed and individual assessment. Complex cases may require the input of a diving medical specialist. As well as considering the safety of the disabled diver and those who may be affected by the disabled diver, the size of the diving project, use of safety divers and the nature of the diving environment need consideration. Restrictions to diving such as depth, frequency, type, location etc must be justified on safety and functional grounds.

32. Because of the enormous range of potential disabilities and functional loss that may present from potential or existing divers it is impossible to give definitive advice. The effects of medication, functional loss and adaptations and whether the condition is progressive or associated with remissions and relapses need consideration. Functional

loss in an existing experienced diver, who has demonstrated a continuing ability to dive safely, may be acceptable due to behavioural and functional adaptation but such a functional loss may be unacceptable in a potential diver wishing to start a career in diving.

33. The decision on fitness to dive at work must take into account not only the safety of the diver (whether disabled or not) but also the safety of others involved in the diving project. Divers going to the aid of a diver in trouble may be put at additional risk in relation to their own safety.

34. The requirements of the Disability Discrimination Act 1995 should be followed. It is necessary to assess each disabled diver application on its own merits and come to a conclusion rather than to decline to examine the diver without further assessment.

A. PSYCHIATRIC ILLNESS

A1. The primary consideration in all cases must include the risk to the individual's safety and/or that of those around them, taking into account the risk of recurrence of psychiatric or psychological disorders. Special consideration should include the various stresses associated with the type of work, remote location and risks involved.

A2. Individuals should be free from psychiatric illness and cognitive impairment. They should not be suffering from psychological or personality problems or disorders that would interfere with their in-water safety or that of others. Particular attention should be paid to anxiety disorders due to the clear link between anxiety/panic and diving accidents.

A3. Disorders, which, while quiescent, still exclude passing an individual as fit to dive, are:

- schizophrenia
- bipolar affective disorder
- recurrent depression
- disorders asymptomatic due to treatment.

A4. The following disorders which, if resolved and where there have been no further episodes for 2 years or more, may allow passing an individual as fit to dive. Obtaining a specialist report may be appropriate to confirm the diagnosis and prognosis:

- adjustment reactions
- single episodes of depression. More severe episodes may need to be regarded in the same way as recurrent depression
- deliberate self harm
- anxiety disorders. Some anxiety responses may be specific to the diving environment, therefore resolution on land may not equate with resolution in-water

- isolated psychotic episodes

A5. The use of psychotropic medication should exclude passing an individual as fit to dive. The use of such medication for the management of chronic pain needs individual assessment and input from a diving medical specialist. See Medication section, para 28 and 29.

A6. A diver may be fit to dive where the following disorders do not interfere with in-water safety:

- Phobias. Most simple, specific phobias would not preclude an individual from being passed as fit. However, agoraphobia and/or claustrophobia do exclude a diver from being passed as fit.

- Severe pre-menstrual syndrome (also known as pre-menstrual dysphoric disorder PMDD). A diver with PMS\PMDD may be passed as fit with the proviso that they are told not to dive whilst suffering from the effects of PMS\PMDD.

Alcohol, drug or substance misuse

A7. Alcohol dependence and drug or substance misuse is incompatible with diving. With any history of current misuse, there must be doubt about fitness for diving. A lengthy period of stability (such as twelve months) off the misused substance, without medication or relapse, should be sought as a minimum. Obtaining a specialist report may be appropriate to confirm the diagnosis and prognosis:

B. RADIOGRAPHY

B1 Legislation limiting radiation exposure is contained in the Ionising Radiation (Medical Exposure) Regulations 2000. (IR(ME)R2000).

B2. Routine chest radiography at the initial medical examination is not required. Chest X-ray should now only be performed if, following history and physical examination, there is a recognisable clinical need (such as the detection of suspected chest pathology) and the examination will produce useful clinical information to aid the decision making process around fitness for diving activities.

B3. However a PA CXR is still required for submarine escape trainees at initial examination.

B4. For saturation divers (diving at depths of 50 metres or more, in the water for over 4 hrs) routine long bone x-rays are no longer required before undertaking saturation diving. In the case of suspected dysbaricosteonecrosis, long bone radiography and\or MRI scanning will be indicated.

C. RESPIRATORY SYSTEM

Clinical examination of the respiratory system should be normal.

C1 HSE recommends the use of the 'British Thoracic Society's (BTS) guidelines on respiratory aspects of fitness for diving' for assessing the diver. These guidelines were published in Thorax' 2003; **58**:3-13.

See: http://www.brit-thoracic.org.uk

C2. The following conditions may be contraindications to diving or require additional investigation:

- Acute respiratory disease such as pulmonary infection
- Chronic lung disease that results in a reduction of exercise capacity eg. chronic obstructive pulmonary disease, sarcoidosis, cystic fibrosis, tuberculosis, pulmonary fibrosis.
- Previous spontaneous pneumothorax unless treated by bilateral surgical pleurectomy and associated with normal lung function and thoracic imaging performed after surgery.
- Previous traumatic pneumothorax unless healed and associated with normal lung function, including flow-volume loop and thoracic imaging.
- Previous chest surgery or pneumomediastinum
- Presence of large bullae or cysts due to increased risk of barotrauma.
- Chronic obstructive pulmonary disease carries a theoretical increased risk of barotrauma and reduced exercise tolerance. Subjects will probably be advised against diving on the basis of reduced pulmonary function (FEV1 <80% predicted).
- Sarcoidosis has been associated with pulmonary barotrauma. Diving is contraindicated in subjects who have active sarcoidosis. Those with resolved sarcoidosis demonstrated by normal chest radiography and pulmonary function testing may be fit for diving.
- Those with active tuberculosis should not dive. After curative treatment they may dive if lung function and chest radiography are normal.
- Diving is contraindicated in those with cystic fibrosis and pulmonary involvement.
- Fibrotic lung disease reduces lung compliance and impairs gas transfer and is therefore a contraindication for diving.

C4. In cases of doubt about fitness, an opinion should be sought from a diving medical specialist.

D. ASTHMA

The British Thoracic Society's guidelines and specific recommendations on asthma should be followed.

D1. Subjects with asthma should be found unfit to dive if they have wheeze precipitated by exercise, cold or emotion.

D2. Subjects with asthma may be permitted to dive if they are on either step 1 or 2 of the BTS guidelines and they:

- Are free of asthma symptoms
- Have normal spirometry (FEV1 >80% predicted and FEV1/VC >70% predicted) and
- Have a negative exercise test (<15% fall in FEV1 after exercise)

D3. Subjects with asthma should monitor their asthma with regular twice daily peak flow measurements and should refrain from diving if they have:

- Active asthma-that is, symptoms requiring relief medication in the 48 hours preceding the dive
- Reduced PEFR (more than 10% fall from best values)
- Increased peak flow variability (more than 20% diurnal variation)

E. OBESITY

E1. Obesity is important in diving because of its relationship to fitness, risk of decompression illness, and fit of wetsuit and weights and co-existing disease such as diabetes, hypertension and sleep apnoea.

E2. The height and weight of the diver measured in underwear and bare feet should be measured and recorded at every medical examination and the Body Mass Index (BMI or kg/m2) calculated.

E3. Dietary and fitness advice at BMIs>27 is recommended in the hope of pre-empting restriction when BMI 30 is reached.

E4. Where the BMI reaches 30 further estimation of fat content should be made using suitable means such as skin calipers or skin impedance. A body fat content in excess of 30% may be considered a reason for rejection until weight has been satisfactorily reduced, particularly if associated with a lack of overall physical fitness.

E5. Use of a restricted duration of Certification (such as 6 months) may be appropriate if used to warn the diver of the significance of the current BMI and trend and if it would act to

motivate a reduction in weight through dietary and lifestyle changes. Discretion is appropriate if the elevated BMI is associated with increased lean body mass.

F. CARDIOVASCULAR SYSTEM

F1. The function of the cardiovascular system should be such that the diver is able to sustain strenuous muscle activity at depth. There should not be an increased risk of loss of consciousness or incapacitation compared to the healthy general population.

F2. Any organic heart disease is a cause for rejection unless considered by a cardiologist to be haemodynamically unimportant. That includes all types of cardiomyopathy, ischaemic heart disease, haemodynamically important valvular disease, cyanotic heart disease and other shunts.

Ischaemic Heart disease

F3. Symptomatic ischaemic heart disease is incompatible with diving. The requirement for medication to control symptoms is a contraindication but preventative medications such as aspirin or lipid lowering agents are acceptable.

F4. At the initial examination an individual found incidentally to have ischaemic heart disease should be declared unfit.

F5. An individual who is symptom free following conventional coronary bypass surgery remains unfit to dive. An individual who has had percutaneous coronary intervention (angioplasty) or minimally invasive surgical revascularisation might be considered fit if:

- the procedure has been demonstrated to produce revascularisation;
- they remain symptom free;
- they have a normal cardiac stress exercise test to the relevant cardiological levels and they can meet the physical requirements.

F6. Individuals who have undergone revascularisation as above will require careful assessment by a cardiologist with an interest in diving medicine who will decide about the need for further follow-up.

DYSRHYTHMIAS

F7. Any dysrhythmia that might cause incapacity in water will disqualify.

F8. Disorders of cardiac rhythm, except for sinus arrhythmia and infrequent ventricular extrasystoles, require specialist evaluation and are likely to be a cause for rejection, particularly at the initial medical examination.

Pacemaker

F9. In most cases the indication for pacing is likely to be a contraindication to diving. Careful assessment of the type of diving and type of pacemaker involved will be required and, of necessity, will require specialist cardiological advice.

Patent foramen ovale

F10. Examination for the presence of an intracardiac shunt is not a requirement for either the initial or the annual examination.

F11. However, examination for patent foramen ovale should be performed in a diver who has suffered neurological, cutaneous or cardiorespiratory decompression illness, particularly where there is a history of migraine with aura or where the dive profile was not obviously contributory, since it may contribute to an assessment of the overall risk to the diver of continuing to dive. A positive finding is not necessarily a reason for a finding of unfitness. However, the opinion of a cardiologist with an interest in diving medicine is recommended.

Valvular Heart Disease

F12. Auscultation of the heart should be normal. Murmurs are acceptable only if deemed to be physiological. Where doubt exists referral for specialist opinion or further investigation such as echocardiography should be undertaken.

F13. Atrial or ventricular septal defects, aortic or mitral stenosis are contraindications to diving. Coarctation is a contraindication. Other valvular conditions including bicuspid aortic valve and mitral valve prolapse require cardiac evaluation. Cardiac function in terms of exercise capacity should be normal.

Blood pressure

F14. At the preliminary examination the resting blood pressure for a young diving candidate should not exceed 140 mmHg systolic or 80 mmHg diastolic, using the fifth phase as an indicator and with the patient supine. For older candidates the effect of age should be taken into account. The possible impact of a rise in blood pressure during a diver's potential career should be considered.

F15. At subsequent annual examinations, mild hypertension* would not be a contraindication provided that:

- either no medication was required, or the medication taken, had no implications for diving safety
- there was no evidence of end organ damage.

F16. Where doubt exists consult a cardiologist with an interest in diving medicine.

*British Hypertension Society (BHS) definition: systolic BP = 140-159 mmHg, diastolic BP = 90-99 mmHg. The latest BHS guidelines on hypertension are available at: http://www.bhsoc.org

ECG

F17. A resting ECG should be performed at the initial examination. Any abnormality should be discussed with a cardiologist.

F18. At subsequent annual medical examinations a resting ECG is required only for divers aged 40 and thereafter every five years unless there is a clinical indication for more frequent testing such as the presence of risk factors.

F19. Any significant change in the ECG will require further evaluation.

Peripheral Circulation

F.20 The peripheral circulation should be capable of providing adequate peripheral perfusion even in cold conditions. Clinical evidence of impaired circulation will require further evaluation. Peripheral vascular disease may predispose to cold injury. Contraindications include:

- Varicose veins associated with circulatory impairment eg.varicose eczema
- Conditions known to be associated with impaired organ perfusion

G. EXERCISE TESTING

G1. Following a review of the validity of exercise testing in 2004, the use of an appropriate step test is recommended. The step test is preferred over the bicycle ergometer and other methods for its simplicity, cost, convenience and because it is adequate for the purpose. There is no ideal single exercise test to measure aerobic and physical demands and the capacity required for all the possible combinations of work such as diving activities, equipment configuration, gas mixtures and emergencies.

G2. Another advantage of an annual step test is to create a baseline for future comparisons allowing feedback to the diver on his\her fitness. It should therefore, also be considered a health promotion tool as it is a reminder to the diver to keep fit.

G3. Whichever step test is used, the appropriate protocol for testing and calculation of VO2 max must be followed in a standardised manner. The candidate must be adequately fit and an assessment of maximum oxygen uptake should be carried out. The majority of divers will be able to achieve an exercise level equivalent to 13 mets or 45 ml/kg/min (lean body mass) oxygen consumption. The results of the test should be considered together with other aspects such as resting pulse, blood pressure, BMI and lung function. Measurement of peak expiratory flow rate (PEFR) before, 5 and 10 minutes after the step test provides a useful screen for exercise induced wheeze (see paragraphs D1and D3).

G4. The same review considered the safety of exercise testing. Several possibilities for diver cardiac risk assessment were considered. HSE uses the ‘So far as is reasonably practicable’ (SFAIRP) approach to such issues. This legal concept does not mean that every measure that could possibly be taken to reduce risk must be taken. Sometimes,

there is more than one way of controlling a risk. A disproportionate cost of controlling a risk can be taken into account.

G5. HSE recommends that all divers be considered at risk of a cardiac event during step testing. This approach avoids the difficulties of using assessment tools which may not be sensitive or specific enough to identify individuals with risk factors and which have their own problems with false positive (resulting in unnecessary investigations and attendant risks) and false negative results.

G6. The AMED has a responsibility to conduct a clinical risk assessment of the risk and suitability of undertaking step testing. This risk assessment will need to take into account diver issues such as medical history, clinical examination and investigation results, fitness and the presence of cardiac risk factors as well as the AMED's own situation in terms of clinical knowledge, geographical location, lone working, access to emergency aid etc. It is not possible to specify all of the elements of the risk assessment because of the widely differing nature of AMED locations, working environments, medical speciality and training etc. AMEDs should consider the approach contained in the Resuscitation Council (UK) document: 'Cardiopulmonary Resuscitation Guidance for clinical practice and training in Primary care July 2001' found at: http://www.resus.org.uk. Those undertaking step or exercise testing of divers may wish to be adequately trained in basic life support and resuscitation skills and may consider having access to resuscitation equipment such as an automated external defibrillator (AED). Relevant training and skills must be kept up to date in line with current guidance. Access by ambulance crew and vehicles in times of emergency also needs to be considered. There should be a clear procedure to follow in the event of a collapse.

G7. The prudent AMED may wish to conduct the history taking and a physical examination of the diver, including examination of the cardiovascular system, assessment of any cardiac risk factors, BP, resting ECG (if clinically relevant) before proceeding to step testing. A cardiac screening tool, which may be used prior to step testing, is outlined in Annex D.

H. CENTRAL NERVOUS SYSTEM

H1. The assessment of the central nervous system is one of most important elements of the preliminary and subsequent medical assessments. A careful history is essential. Specifically a history of visual, hearing, balance, coordination, sensation, bladder, bowel or sexual dysfunction should be sought. A history of predisposition to episodes of impaired consciousness or awareness, convulsions, disturbances of speech, vision or motor control are incompatible with diving. Problems with dysequilibrium and balance should be specifically asked about. Conditions that may mimic decompression illness or jeopardise safety must be sought and excluded.

H2. Assessment of central nervous system function includes both physical and psychological aspects. The diver must be psychologically capable of undertaking diving activity. Thus the diver's manner, attitude, verbal and intellectual response forms part of the examination. Where any doubt exists specialist clinical psychological assessment may be required.

H3. The central nervous system should be clinically and functionally normal. The neurological examination should be detailed and include an assessment of cranial nerve function, the motor and sensory systems as well as balance, coordination, gait proprioception,

vibration sense and 2-point discrimination. Deep tendon reflexes, plantar responses and abdominal reflexes should also be elicited. The baseline clinical findings should be recorded in detail so that any subsequent variation from normal can be easily detected.

H4. Any form of epilepsy other than febrile convulsions occurring before the age of 5 years is a contra-indication to diving. However when a diver has been fit-free for 10 years without medication or treatment they may be considered for fitness to dive though expert assessment and possibly further investigations will be required. Recurrent unprovoked loss of consciousness of unknown aetiology or recurrent episodes of fainting is also contra-indications to diving.

H5. Neurological diseases such as stroke, multiple sclerosis or Parkinson's disease, are a contra-indication to diving.

H6. Severe motion sickness, severe migraine particularly with complicated aura and excess daytime somnolence preclude diving.

H7. A history of previous intracranial surgery is not an absolute contra-indication to diving provided there is no history of subsequent epilepsy, increased risk of a seizure or persisting neurological deficit. However, expert assessment is recommended.

H8. A history of significant head injury carries a risk of post- traumatic epilepsy and the person needs careful assessment with input from a diving medical specialist in order to determine their risk compared to the normal healthy population. The epilepsy risk assumes significance when there has been a depressed skull fracture, an intracranial haematoma, unconsciousness or post- traumatic amnesia greater than 30 minutes or when focal neurological signs have accompanied the injury. Post-traumatic amnesia is defined as the time from the injury until the point from which there is continuous recall.

H9. Minor episodes of head injury (less than 30 minutes unconsciousness or post-traumatic amnesia) are a reason for temporary unfitness for a period of 4 weeks subject to a review by a medical examiner. See paragraph 12. However minor head injuries may lead to persisting post-concuss ional symptoms and divers should not be allowed to return to work until these have resolved.

I. MUSCULOSKELETAL SYSTEM

I1. The diver must have the appropriate degree of mobility, strength and dexterity for the diving activities and work to be undertaken. The disabled diver will require a careful and individualized clinical risk assessment. See the section on 'disabled diver,' paragraphs 31-34.

I2 Divers with a history of low back pain require careful assessment because of the risk of sudden incapacitation and sciatic pain mimicking decompression illness.

J. ENT

J1. There should be no nasal or sinus symptoms of disease and the nasal airway should be free from signs of obstruction. Diving can be allowed after successful treatment or natural

resolution of acute nasal and sinus infections. Chronic nasal and sinus infections may be reversible and diving can be allowed after successful treatment. The use of oral or topical medication such as decongestants, antihistamines, steroids etc. requires careful consideration and advice from a relevant diving medical specialist is usually required.

J2. Any condition that produces obstruction of the nasal passages such as nasal polyps, deviated septum should be treated and diving can be allowed after confirmation of successful treatment.

J3. Laryngocele is a reason to disqualify until corrected. Any condition causing an incompetent larynx is a contraindication. The presence of tracheotomy or a tracheostome is a contraindication for diving.

J4. The ear canal must be free from obstruction such as wax. Narrowing of the ear canal such as exostoses should not prevent diving unless severe enough to limit or prevent ear equalisation.

J5. The tympanic membrane must be intact. Movement of the tympanic membrane on ear clearing should be sought. In doubtful cases referral for a tympanogram may be required to demonstrate normal middle ear pressures.

J6. Diving should not be permitted after middle ear barotrauma until any middle ear fluid has been reabsorbed. Tympanic membrane erythema and retraction should have resolved.

J7. Individuals with long standing scarred tympanic membranes, well healed perforations or surgically healed perforations can be allowed to attempt to dive if they have normally mobile tympanic membranes, normal Eustachian tube function and no retraction or thinning of the tympanic membrane due to previous disease.

J8. All active infections of the ear canal and middle ear are contraindications until resolved. Diving medical specialist advice may be required with cases of chronic ear canal or middle ear disease such as cholesteatoma.

J9. Previous mastoidectomy is a contraindication to diving unless it was a simple mastoidectomy, which is well healed with no complications and has an intact posterior wall. Tympanic membrane and middle ear function must also be normal.

J10. Previous stapedectomy is a contraindication to diving.

J11. Individuals with Meniere’s disease and other vertiginous conditions should not dive.

J12. Hearing should be of a level that permits normal conversation to be understood. An audiometric assessment covering the range of 500 Hz to 6 KHz is required at the initial examination. Thereafter an audiogram should be repeated after an episode of aural barotrauma. In addition further audiograms may be carried out according to a hearing conservation programme. Saturation divers may need advice and regular follow up.

K. VISION

K1. Visual acuity with or without correction and colour vision must be adequate for the type of diving activity such as the requirement to read a watch, computer, depth gauge, tables, instrumentation etc. Visual acuity in both eyes of 6/9 is likely to be adequate. Colour vision is important for specific inspection tasks. Appropriate colour vision screening and confirmatory tests, if required, should be used.

K2. Divers requiring optical correction can use a prescription faceplate if using a facemask. Soft, gas permeable contact lenses are suitable while hard impermeable lenses are unsuitable unless fenestrated. There is a risk of infection with all contact lenses and it may be difficult to maintain sterility in a saturation environment. The use of disposable lenses may reduce this risk.

K3. The risk associated with diving after ophthalmic surgery requires careful evaluation and individual assessment in conjunction with the surgeon and\or diving medical specialist. Certain procedures may involve the instillation of gas into the globe and divers should not dive until all gas has been reabsorbed. Experience to date has not demonstrated difficulties for divers following radial keratotomy.

L. DENTAL

L1. The diver requires a high standard of dental health. It is necessary to retain a mouthpiece and the presence of dental cavities may be associated with barotrauma. Unattached dentures should be removed during any diving activity.

L2. The diver should attend a dentist at a frequency dependant upon current Department of Health guidelines and their own dental status. In cases of doubt concerning dental health, a certificate of dental fitness should be obtained.

M. ENDOCRINE SYSTEM

M1. Diving results in numerous neurological reflexes and hormonal responses. It is unlikely that those suffering from endocrine conditions leading to impaired thermoregulation, cardiac or muscular insufficiency would be found fit. A proven or suspected abnormality will require detailed assessment.

Thyroid disease

M2. Patients with thyroid disease who have been demonstrated to be in a stable state (such as treated thyrotoxicosis or hypothyroidism) may be fit to dive provided that they have no cardiovascular complications of the disorder. Gross thyroid disease is a contraindication to diving but, on replacement therapy, stable hypothyroidism can be compatible with professional diving even when a dose or two of thyroxine is missed.

M3. Patients with any other endocrine disorder must be referred to an endocrinologist and results discussed with a diving medical specialist for detailed individual assessment.

M4. Use of cortisol replacement replacement for whatever reason is a contraindication for diving because of the risk of collapse associated with illness, injury or stress.

Diabetes

M5. The detection of glycosuria requires investigation. Any diver with diabetes mellitus, whether insulin, tablet or diet controlled, must be referred to a diving medical specialist for detailed individual assessment.

M6 If any form of diabetes is found at the time of initial assessment before diver training, the individual may be unlikely to have a career as a professional diver because of the certainty of later disqualification due to complications. Diabetics should generally not become professional divers. Under certain circumstances they may train under medical supervision and then become divers for limited diving operations. The diver must have good control and no diabetic complications at this stage.

M7. Once diabetes is diagnosed in a working diver, an automatic disqualification is no longer acceptable because of disability discrimination legislation. The nature of the work, the diving environment, and the degree of control achieved by treatment and the safety of the diver need consideration. Each case should have a detailed and individual assessment, which is likely to involve a diving medical specialist.

M8. The presence of, or development of, diabetic complications such as atherosclerosis, cardiomyopathy, proliferative retinopathy, peripheral vascular disease, diabetic foot syndrome, nephropathy and neuropathy will disqualify. Evidence of poor control with hypoglycaemic episodes is likely to lead to disqualification.

N. GENITO-URINARY SYSTEM

N1. A history of renal disease or of urinary tract investigation will be reason for more detailed assessment. The presence of genito-urinary or renal tract disease associated with abnormal renal function is usually a cause for rejection. Cases of renal calculi and colic should be judged on an individual basis after specialist investigation. The presence of a sexually transmitted disease will debar until adequately treated.

N2. Dipstick urinalysis for blood, protein and glucose should be undertaken at the initial and annual medical examination. Abnormal results will require investigation.

O. GASTRO-INTESTINAL SYSTEM

01. Gastro-intestinal function should be normal with no increased tendency to vomiting, dyspepsia, reflux, bleeding, perforation, diarrhoea or pain. Hepatic and pancreatic function should be clinically normal. Inflammatory bowel disease, gall bladder pathology and pancreatitis are contraindications to diving. The presence of an abdominal wall hernia should be a contraindication until repaired. Dyspepsia will require investigation.

02. A previous history of peptic ulceration requires careful assessment. Objective evidence of ulcer healing and symptom resolution is necessary before fitness can be considered. The requirement for regular continued H2 blocker therapy for the control of peptic ulceration is

not acceptable. The risk of recurrence after the successful completion of a course of triple therapy is sufficiently low to permit a return to diving.

03. For saturation diving, successful surgical treatment of peptic ulceration could permit a return to diving after careful consideration.

04. The presence of a stoma is likely to be compatible with limited types of diving activity of short duration.

P. SKIN

P1. The skin barrier should be functionally intact and without increased susceptibility to infection.

P2. Any condition that may affect thermal control is a contraindication. The prolonged periods in water and exposure to high humidity especially in saturation environments increase the risk of disabling skin infection and can exacerbate many pre-existing dermatoses. Severe exfoliative disorders are contraindications. Acute or chronic infections are a cause for temporary unfitness until controlled.

Q. HAEMATOLOGY

Q1. The presence of sickle cell disease (HBSS) or syndrome (including HbSC, HbSO, HbSD and HbS, Beta Thal) and Thalassemia major are contraindications to diving. A small number of individuals can have sickle cell syndrome and be unaware of it. However all such individuals will be anaemic and detected with full blood count testing. Local Haematology laboratory recommendations on normal haemoglobin levels for the relevant population should be used.

Q2. Carriers of the sickle cell and thalassemia trait are not believed to be at significantly increased risk during diving and may therefore be found fit to dive.

Q3. At the initial examination a full blood count should be performed. A sickle cell test is not required. Any abnormalities found will require further investigation. No blood tests are required at subsequent annual examinations unless clinically required.

A summary of routine investigations required at the initial and annual examination is found at Annex E. Some investigations may be required more frequently based upon clinical need, risk assessment or for Health Surveillance purposes.

ANNEX A

MEDICAL QUESTIONNAIRE-TO BE COMPLETED BY THE CANDIDATE DIVER AND GP TO CONFIRM MEDICAL HISTORY (NO EXAMINATION IS REQUIRED)

QUESTION	YES	NO
Have you ever had or do you now have:		
Diabetes?		
Disease of the heart and circulation, including hypertension, angina or MI, chest pains, arrhythmias?		
Asthma?		
Lung disease such as COPD?		
Spontaneous or traumatic pneumothorax?		
Injury or surgery to the chest?		
ENT or sinus problems?		
Significant gastrointestinal problems?		
Mental illness?		
Claustrophobia or severe motion sickness?		
Epilepsy?		
Migraine?		
Neurological illness such as strokes or multiple sclerosis?		
Syncope or recurrent fainting?		
Skin disease?		
Anaemia or haematological conditions?		
Currently pregnant?		
Prescribed or other medication?		

The candidate diver is responsible for any fee levied for confirming the medical history

Candidate diver: I certify that the above answers are correct.

Surname:…….First Name:…….. DoB: ……

Address: ……

Signature……Date:……..

GP: I confirm the medical history:

Practice Stamp:

Signature: ..... Date: .....

If GP or candidate diver has any comments on the medical history, please use another sheet.

ANNEX B

MA2 ANNUAL RESULTS LOG

Date of examination

Result									
FEV_1									
FVC									
FEV_1/FVC%									
Weight									
BMI									
Hb*									
Smoker?									
BP									
Cardiac Screen									
Cardiac Screen									
ECG*									
Step test									
Audiometry*									
Urinalysis									

***As required**

ANNEX C

DIVER FACT SHEET

1. Pre-employment matters

Diving is physically and mentally demanding. Good health is absolutely essential. At the earliest possible stage and before committing yourself to diver training you need to complete a medical questionnaire to see if there is anything in your medical history that might preclude you from a career in diving. Complete this questionnaire and then arrange for your own GP to confirm your medical history. Your GP may simply confirm your medical history from your notes and is entitled to charge you a fee for this service and the details should be discussed beforehand. Both your GP and the candidate diver are required to sign that the information supplied on the health questionnaire is accurate and up to date. You can access the medical questionnaire from the HSE Diving Information Website (http://www.hse.gov.uk/diving/information.htm) or from Maureen Fairbairn, diving administration, during normal office hours on 0131 247 2102. E-mail: maureen.fairbairn@hse.gsi.gov.uk . This medical questionnaire and the consequent initial medical examination by an AMED should be completed before you commit yourself to the significant cost of undertaking diver training.

2. Existing diver health issues

If you have been unable to work as a diver due to any illness or injury lasting more than 14 days or the illness or injury relates to heart, lung, neurological or ENT problems including neurological and other decompression illness you are required to present yourself to a medical examiner of divers (AMED) for re-examination and assessment of your fitness to return to work. This is a specific examination related to the possible effects of your illness or injury on diving safety and ability to work as a diver. This examination does not replace the requirement for an annual medical examination.

3. Certificate of Medical Fitness to Dive (MA2)

You must bring the previous MA2 documentation to the AMED at your next annual medical. The AMED will give you the top (white) copy of MA2 at the end of the medical. The AMED is obliged to review the previous MA2 for the purposes of comparison. The AMED is therefore entitled to refuse to undertake a HSE Medical if you do not produce the last MA2 documentation on the date of your annual medical. HSE Diving Inspectors may also ask to see MA2 documentation to ensure that you are medically cleared to dive.

4. Appeals

If you are found unfit to dive or fit but with restrictions the AMED should explain to you the reasons for this finding, taking into account the advice contained in HSE's medical examination and assessment of divers (MA1). In some cases the AMED may also have

consulted with a diving medical specialist, HSE Diving Medical Adviser or other specialist before deciding upon your fitness to dive. Under these circumstances you are entitled to appeal to the HSE against the decision of the AMED. You must apply in writing to HSE within 28 days to : EMAS\HSE, Diving Medical Adviser, Belford House, 59 Belford Road, Edinburgh, EH4 3UE. Normally a diving medical specialist is consulted. HSE is responsible for funding the cost of the appeal but is **not** responsible for any attendant travel and accommodation costs that you incur because of the appeal. In addition, experience has shown that appeals can take a considerable length of time to be concluded.

Please note that not all appeals will automatically be accepted; if you are found unfit to dive due to a condition that is clearly contraindicated in MA1 for commercial diving (eg. history of epilepsy) then the appeal application is unlikely to be progressed.

ANNEX D

CARDIAC SCREENING TOOL	Yes	No
- If undertaken, is the resting ECG normal?		
- If abnormal ECG, has it been previously investigated?		
- Is there a history of, or evidence of, coronary artery disease?		
- Angina?		
- CABG?		
- Coronary angioplasty?		
Is there a history of, or evidence of, cardiac arrhythmia?		
- Implanted pacemaker?		
- Implanted cardiac defibrillator?		
Is there a history of, or evidence of, peripheral vascular disease?		
- Intermittent claudication?		
- Aortic aneurysm?		
Is there a history of, or evidence of, cardiomyopathy?		
- Heart failure?		
Is there a history of, or evidence of, hypertension?		
> 160/100?		
- End organ damage?		

ANNEX E

Summary of routine investigations required. Investigations may also be required more frequently based upon clinical need, risk assessment and Health Surveillance purposes.

Investigation	Initial Examination	Annual Examination
CXR[1]	**X**	**X**
FBC[2]	✓	**X**
Sickle cell testing[2]	**X**	**X**
Step Test	✓	✓
Resting ECG	✓	**Age 40, then 5 yearly**
Urinalysis	✓	✓
Spirometry	✓	✓
Audiometry[3]	✓	**X**

Notes

1. See paragraph B2 and B3
2. See paragraph Q3
3. See paragraph J12