



Health Aspects of Work in Extreme Climates within the E&P Industry

The Cold

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The Oil Industry International Exploration and Production Forum

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E&P Forum, 25–28 Old Burlington Street, London W1X 1LB
Telephone: +44 (0)171 292 0600 Fax: +44 (0)171 434 3721
Internet site: <http://www.eandpforum.co.uk>

Authors

This report has been prepared for the E&P Forum by a team drawn from the Health Subcommittee of the Safety, Health and Personnel Competence Committee (SHAPCC).

Dr A. Barbey	Schlumberger Limited, Chairman
Dr D. Clyde	Arco International Oil & Gas
Mr M. Covil	IAGC
Dr E. Dahl-Hansen	Esso Norge A.S.
Dr D. G. Dawson	Unocal International Limited
Dr G. de Jong	Shell International Petroleum Maatschappij B.V.
Dr F. Dugelay	Total
Dr W. Howe	Conoco UK Limited
Dr D. S. Jones	Mobil Services Company Limited
Dr J. Keech	BP Exploration Operating Company
Dr W. Murray	RGIT
Dr R. E. Reinertsen	Sintef
Dr J. Rodier	Elf Aquitaine
Dr J. Ross	BG Plc
Mr M. Tomlins	Exploration Logistics Limited
Dr I. Thomas	E&P Forum, Secretary

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- monitoring the activities of relevant global and regional international organisations;
- developing industry positions on issues; and
- disseminating information on good practice through the development of industry guidelines, codes of practice, check lists, etc.

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HEALTH ASPECTS OF WORK IN EXTREME CLIMATES WITHIN THE E&P INDUSTRY: THE COLD

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INTRODUCTION

A set of guidelines on extreme climates has been prepared for member companies. This report covers the problems encountered in cold climates.

Company and contractor have a joint commitment to health risk management stated in health policies, and should develop a health management system which needs to be based on a full and careful appraisal of the health hazards to which personnel will be exposed.

Work in the cold poses a certain number of acute daily problems. As long as the employee is in a protected environment (base, housing, camp) the risk is minimal. However, as soon as he or she steps out into the extreme cold, he or she is exposed to a large number of potential problems.

These guidelines, which target line management as well as the company health professionals, aim at preventing accidents, illness and loss of life by providing useful information.

It is important to remember that these guidelines are aimed primarily at the protection and maintenance of health and that, in certain situations, additional measures may be required to ensure effective and efficient performance.

Staying healthy in the cold for days and weeks is possible, providing one is physically and mentally prepared and has access to the correct equipment. However, one's condition is also dependent on the application of sensible precautions based on knowledge of the local conditions and of personal limitations.

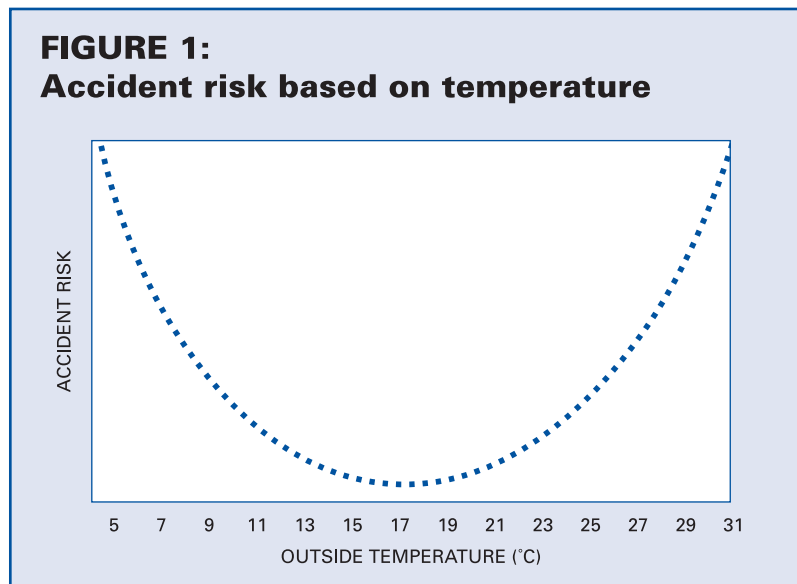
Definition

For the purpose of this document the term 'cold' is not defined by temperature alone. Health-related problems due to cold may appear at temperatures above 0°C (32°F) depending on the situation (duration of exposure, wind factor, humidity, etc.). Therefore, although this document is intended for arctic regions, it is not limited only to these conditions and may also apply to offshore rigs, seismic ships, etc.

THE BASICS OF BODY TEMPERATURE

Atmospheric temperatures as low as -72°C (-97°F) have been recorded in certain parts of the world.

Extremes in atmospheric temperature have major consequences on the body's thermal reaction. The risk of accidents increases when the temperature approaches 0°C (32°F). (See Figure 1).



Adapted from: Ramsey J.D. *et al.*, 1983. *Journal of Safety Research* No. 14, pp. 105-114. Effect of the workplace thermal condition on safe work behaviour.

The body is made up of a central core containing the vital organs (heart, kidneys and brain) which must be maintained at a constant temperature of 37°C (98.6°F), and a peripheral envelope made up of skin, muscles, fat and bones, whose temperature can vary greatly without ill effects (see Figure 2 on page 5). Unconsciousness usually occurs at a core body temperature (rectal) of 31°C (88°F) whereas death is almost certain when body temperature (rectal) goes below 26°C (79°F).

Transfer of heat between the core and the peripheral envelope is performed via the blood. This transfer of heat allows the body to regulate its core temperature.

Every gram of sweat evaporated represents a loss of heat of 540 calories. (A calorie is defined as the amount of energy necessary to raise the temperature of 1 gram of water by 1°C .)

When in contact with the cold, in order to maintain a constant core temperature, the body reacts by:

- Conserving heat: The blood vessels in the envelope constrict, reducing heat loss, and reducing sweating.
- Producing heat: The body produces heat from food and muscular work. Involuntary shivering produces heat by rapid contraction of the muscles. Fitness improves the capacity to shiver. Furthermore, shivering increases appetite, thereby increasing food intake.

Regulation of Body Temperature

Heat Conservation and Production

Fat acts as an insulator. A fatter person potentially conserves heat better than a lean person.

Only correct and complete preparation can prevent death in the cold. Cold injuries increase with exposure to humidity and high winds, as well as contact with moisture or metal, inadequate clothing, age and poor general health.

Heat Loss

The rate of heat loss is a function of the differential of temperature and humidity between the body and the surrounding environment.

The body can lose heat through four different physical methods:

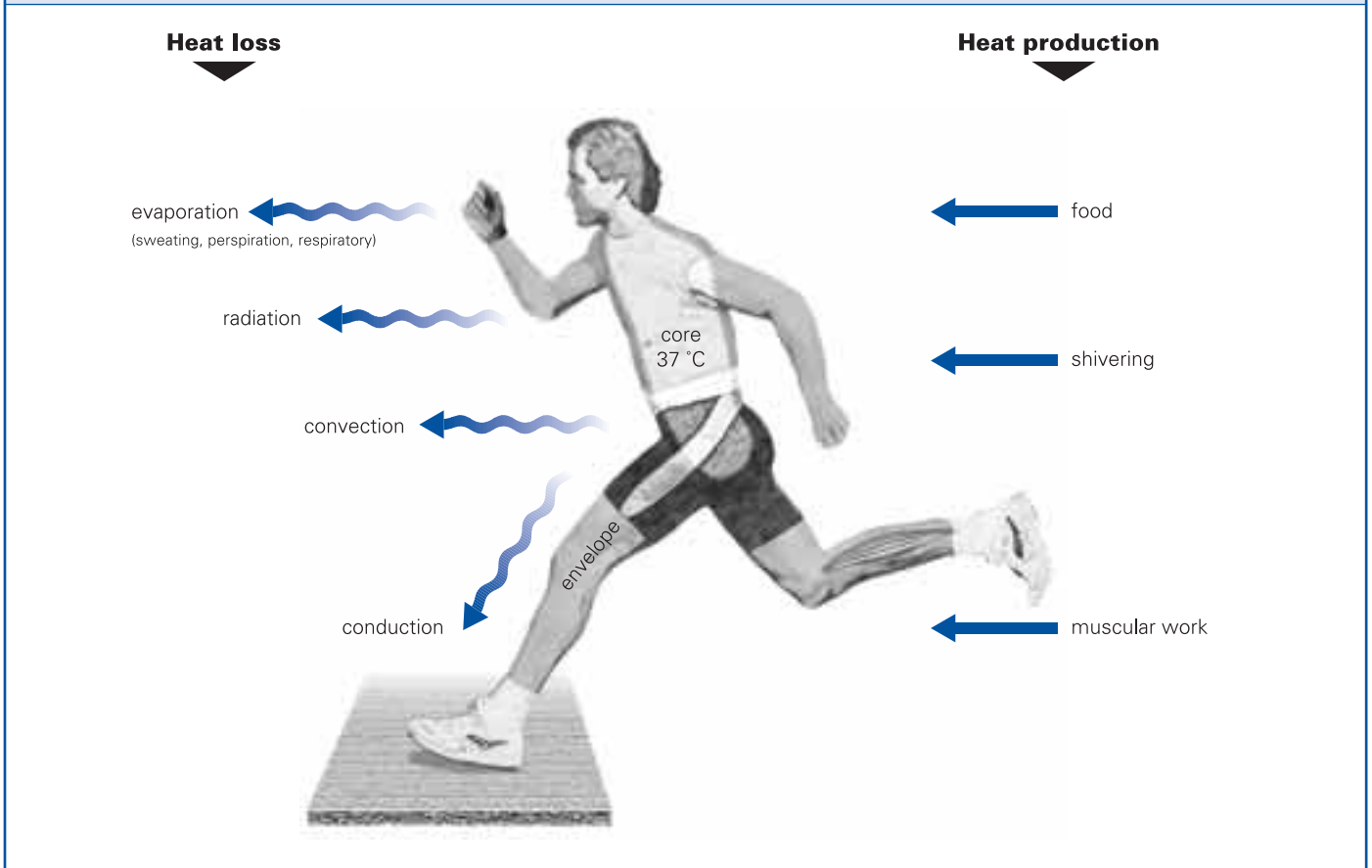
- *Convection* is the transfer of heat by movement of the thin layer of insulating air next to the skin. There is a greater cooling effect by convection as the speed of the air movement around the body increases. This is known as the wind chill factor. As wind speed increases at a given temperature, the risk of frostbite on exposed skin increases.

With increased wind speed, the effective air temperature near the body is colder than the measured air temperature (see table, below). The wind chill factor increases heat loss by convection.

°C	Measured air temperature											
	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind speed (kph)	Effective air temperature											
0	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53
10		3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57
15		2	-4	-11	-17	-23	-29	-35	-41	-48	-54	-60
20		1	-5	-12	-18	-24	-30	-37	-43	-49	-56	-62
30		0	-6	-13	-20	-26	-33	-39	-46	-52	-59	-65
40		-1	-7	-14	-21	-27	-34	-41	-48	-54	-61	-68
50		-1	-8	-15	-22	-29	-35	-42	-49	-56	-63	-69
60		2	-9	-16	-23	-30	-36	-43	-50	-57	-64	-71
Frostbite risk:	Low					High			Very high			

- *Radiation* is the transfer of heat to cooler objects in the surrounding environment. The heat is transferred through space. The objects are not in direct contact with each other.
- *Evaporation* is the transfer of moisture into the air. The evaporation of moisture (sweating, perspiration) from the skin cools the body.
- *Conduction* is the transfer of heat between objects that are in contact with each other. Air is a poor conductor whereas solids conduct well. For example, the body loses heat 20 to 30 times faster in water than in air.

FIGURE 2:
Heat loss and heat production in the cold: a diagrammatic representation of man's thermal exchanges with his environment



In cold climates heat is lost by evaporation, radiation, convection and conduction. Heat is produced by eating food which will be metabolised and by muscular contractions: voluntary (muscular work) or involuntary (shivering, i.e. rapid, involuntary muscle contractions).

Further reduction of heat loss can be obtained by constriction of blood vessels in the envelope. This also reduces sweating.

BEFORE LEAVING—PREPARATION AND PLANNING

Fitness to Work

It is easier to survive in extreme cold when medically fit and in good health. Selection of people who can work in extreme cold requires a medical examination.

Medical Examination

Prior to work in the cold it is recommended that a Level 2 physical, as defined in E&P Forum Report No. 6.46/228, *Health Assessment of Fitness to Work in the E&P Industry* (See Annex 1), be performed by a doctor with knowledge of the extreme conditions.

The same standards as those applied to work on offshore rigs or remote geophysical operations should be applied in order to determine an employee's fitness to work in the cold. (see Annex 2, E&P Forum Report No. 6.30/190, *Health Management Guidelines for Remote Land-Based Geophysical Operations*).

Appropriate Level 3 tests should be performed. Emphasis should be placed on both psychological assessment and a physical fitness test.

Vaccinations

Certain vaccinations may be recommended depending on the time of travel, areas of the world that the employee must transit through or work in and the existence of local epidemics (influenza, diphtheria, etc.). Vaccination against tetanus is recommended for everyone.

Contra-indications to Work in Extreme Cold

Only medical assessment will make it possible to identify certain contra-indications specific to work in extreme cold such as:

- cardio-vascular diseases (see Annex 2);
- Raynauds syndrome (white finger = constriction of blood vessels due to the cold);
- cold induced asthma;
- cold induced urticaria (itching); and
- previous cold injury.

For a more detailed list, refer to Annex 2, E&P Forum Report No. 6.30/190, *Health Management Guidelines for Remote Land-Based Geophysical Operations*.

- Certain conditions may contra-indicate work in extreme cold, e.g. alcohol and drug abuse, heavy smokers who may have respiratory problems, severely obese such as Body Mass Index (BMI) ≥ 35 , and the medically unfit. (BMI = weight in kg / height in m²).

Medications Which May Pose a Problem in Extreme Cold

All medications should be scrutinised by the examining physician as to their effects or physiological impact when working in extreme cold, i.e.:

- medications which alter vigilance, (e.g. tranquillisers, sleeping pills, antidepressant drugs, antihistamines);
- medications which act on blood circulation (e.g. medication for high blood pressure and drugs which act on the heart); and
- medications and other substances which may increase the risk of hypothermia (e.g. alcohol).

Extreme cold is sometimes associated with increased exposure to light, particularly during spring and summer. Therefore, consideration should be given to photosensitisers (medication which increase the skin's reaction to sunshine).

First aid training should be given to all people who will be going to cold climates and not only to designated first aiders.

In addition to routine first aid training, some training should be given on prevention, recognition and treatment of cold injury, hypothermia, ultraviolet radiation injury, carbon monoxide poisoning and effects of alcohol.

First Aid Training for Extreme Cold

LIVING AND WORKING IN THE COLD

On the Base or Camp

Food and Water Hygiene

Normal hygiene and storage are required. Extra vigilance is necessary if ambient temperatures increase (summer season, bringing food indoors), thus increasing the risk of food and water deterioration. The quality of raw food must be guaranteed from its source, through transport and at its final destination.

Excrement and Waste Disposal

The disposal of sewage and rubbish must be designed to protect the health of humans. As the ambient temperature rises, the risk of contamination from flies increases, bringing potential infectious agents back and risking food and water contamination.

Psychological Aspects

Some of the following problems may be heightened in the work environment by climatic conditions:

- boredom and problems including mood disturbance due to isolation and prolonged periods of darkness or light;
- disturbance of sleep and biological (circadian) rhythms;
- substance abuse;
- living together in a group;
- inappropriate work/leave cycles; and
- lack of recreational facilities.

All of these factors may contribute to a lack of motivation and performance.

When Leaving the Base or Camp

This is the period of increased risk. Weather conditions may change rapidly. Be prepared for the worst.

Never travel or work alone. Stay in pairs, each person looking after the well-being of the other. A system for personnel accounting must be organised with notification of departure and arrivals between locations.

Information—Journey Management

Information is an integral part of health management in extreme climates. A correct journey management system should be in place (see Annex 3, E&P Forum Report No. 6.50/238, *Land Transport Safety Guidelines on Journey Management Planning*):

- know the terrain;
- get the weather forecast;
- inform camp of departure and estimated time of arrival;
- have an emergency or evacuation plan; and
- have a remote communications system.

The Vehicle

The vehicle should be equipped with a radio, extra food and water, clothing, a survival kit as well as a first aid kit.

Contents of the Basic First Aid Kit which should be carried in vehicles can be found in Annex 4. A Module 1 first aid kit should be carried in all vehicles.

In extreme cold climates, a hypothermia or survival blanket should be added.

It may be worth considering a portable re-warming system in the vehicle. In profound hypothermia, inhalation re-warming is a safe and active technique that prevents respiratory heat loss. There are commercially available lightweight portable first aid devices that deliver heated, humidified air at all operating temperatures in the field. Steam generated via propane camp-pot or an electric system mixes with ambient air. The inhaled temperature is measured at the mask. Supplemental oxygen and ventilation can also be provided with adaptation of a bag.

Clothing Requirements

Clothing in cold climates is a major factor in survival.

Clothing, however, may cause an additional physiological load, especially if poorly designed. Thermal clothing may add to the encumbrance caused by other Personal Protective Equipment (PPE) and can also reduce the protection offered by the PPE. The encumbered worker will take longer to complete work tasks and even routine activities such as eating and going to the toilet.

The correct combination of activity and clothing is the key to survival under cold conditions. Before making a decision on what type of work clothing to buy or use, an analysis of the worker's job (tools, working materials, etc.) and work environment must be made.

Cold adds to the individual's physical and mental stress. By reducing comfort, cold may lead to reduced performance as well as reduced safety. In extreme situations, cold may also represent a serious health hazard.

Convection and *radiation* are the main methods for heat transfer from skin surface to clothing layers and from the different clothing layers to the external environment. Heat transfer through conduction may be significant for those parts of the body in direct contact with cold surfaces, particularly, when seated or when working in a bent posture. The compression of clothing layers accelerates local heat loss.

Insulation

The insulating capacity of the clothing worn is mainly determined by the amount of air trapped inside and between the surface of the textiles.

Insulation must provide correct protection even when work intensity, and therefore heat production, is at its lowest levels, as in the case of rest periods. During periods of high activity and excess heat production, problems arise due to sweat production and evaporation processes.

Sweat accumulated in garments during work may result in cold stress due to either reduced insulation value of wet clothing or evaporation of the accumulated sweat after cessation of work or exercise. In cold environmental conditions where accumulation of sweat in the clothing is difficult to avoid, it is preferable that the sweat accumulates as far from the skin as possible. This will reduce heat lost by evaporation on the skin during the drying phase and will reduce the accompanying thermal discomfort observed during the following rest period with wet clothing.

Protective Clothing

Protective clothing for work in extreme cold should be designed so that it prevents skin temperature from dropping below 28°C (83°F) (mean skin

temperature) or below 15°C (59°F) (locally) at any time. Several standards and recommendations have been developed for assessment of the required clothing insulation at rest and during physical activity at different environmental temperatures and wind conditions (e.g. ISO 9920, 1995; ISO/TR-11079, 1993). However, real life activity in the cold implies varying conditions and hence varying requirements regarding the need for protection.

A clothing ensemble for work in a cold environment should comprise a multi-layered clothing system with each layer serving a specific purpose.

Thus, an optimal clothing system for varying climatic conditions and changing activity levels consists of three layers with the following main functions:

a. Inner Layer (underwear):	Moisture absorption and transport.
b. Middle Layer (shirt, sweater):	Insulation and moisture transport.
c. Outer Layer (wind breaker, arctic clothing, rain gear):	Protection against the external environment and moisture transport.

a. *Inner Layer*: In addition to its hygienic function, the inner layer is important for the direct cooling of the skin and for absorbing sweat. It must be effective in transporting moisture away from the body's surface to the middle layer for subsequent evaporation. The different water-absorbing and water-transporting properties of textiles are responsible for the amount of sweat accumulated in the different clothing layers.

- Wool is preferred due to its efficient absorption of moisture. Modern woollen underwear, with a knit construction that facilitates moisture transport, should be used for cold work. A non-absorbing innermost layer combined with an absorbing layer reduces discomfort caused by post exercise chilling.
- Cotton is not recommended. Its absorption of moisture results in a reduction of the insulation value.
- Fabrics made of continuous polypropylene filaments are non-absorbent and have high wicking properties that promote the transport of sweat from the skin to the outer surface of the underwear. Furthermore, knitted underwear made of polypropylene may smell unpleasant after wetting.

b. *Middle Layer*: The middle layer should serve as an insulator and provide protection against heat loss. *Thermal insulation* is determined by the thickness of still air trapped in and between layers of fibres and fabrics. There is no practical difference in terms of insulation between clothing made of natural fibres and that made of artificial fibres, once corrected for thickness and construction.

The middle layer should be flexible. Heat load and sweat production should be minimised during work periods by removing or using a thin middle layer. Heat loss during rest periods should be reduced by adding an extra sweater or putting on a thicker one.

A middle layer made of moisture absorbing materials (e.g. wool) will enhance the sweat transport ability of the clothing ensemble, resulting in sweat accumulation as far out in the clothing system as possible.

- c. *Outer Layer*: This layer should protect against the external environment, and must therefore be waterproof, windproof and durable.

Whenever the temperature of the inner side of the outer garment is above 0°C (32°F), garments coated with 'breathable membranes' (e.g. Gore-Tex®, Helly-Tech®) will facilitate water vapour transport. However, at temperatures below 0°C, the water vapour will freeze inside the pores and as a result, no moisture transport will take place through the garment.

For moderate levels of work at air temperatures below -10°C (14°F), breathable and non-breathable materials will perform identically. For warmer air temperatures, breathable membranes will reduce water absorption and result in a more comfortable and lightweight garment.

Furthermore, the outer layer should be flexible enough to provide a wide variation of protection levels due to the dynamics of work and exposure. This may be accomplished by easy donning (jacket with a zipper rather than an anorak), adjustable openings at wrists, neck and front, and a design that facilitates and enhances microclimate ventilation with movements.

Reflective Fibres and 'Space' Blankets

The introduction of *reflective* fibres or layers in a fabric or garment does not improve the level of total insulation. Due to very low vapour permeability of such materials, the reflective surface is rapidly covered with condensed water. For the same reason, the use of aluminised 'space' blankets or bags for conservation of body heat is questionable. The effect on radiation heat loss is negligible. This type of blanket mainly reduces convective heat loss. This can be equally well achieved by the use of windproof cotton material.

Head and Neck Protection

A substantial amount of heat may be lost from the head in a cold environment. It is therefore important to wear an adapted cap or hood. A scarf around the neck can reduce air intruding into the clothing. When working in cold wind, a face mask should be used. For extremely cold conditions, double-layered goggles with foam padding around the edges provide eye protection.

Hand Protection

As a first response to the cold, heat loss is reduced by a reduction of blood flow to the peripheral areas of the body. This physiological adjustment can strongly interfere with the comfort and performance of the hands and feet. With progressive lowering of tissue temperature, discomfort develops. Function as well as performance can be impaired, and eventually completely lost due to paralysis of receptors producing numbness.

Workers should therefore wear gloves and/or mittens for maximum protection against heat loss. Furthermore, for chemical handling operations, adapted chemical resistant hand protection must be used. However, manual dexterity may be reduced by gloves. When there is no need for minute or intricate operations requiring the fingers, mittens are better than gloves since they reduce the exposed surface and thus decrease heat loss. If it is not possible to combine adequate protection with the manual work task, then it becomes necessary to introduce regular work breaks for shelter warming.

Hand skin temperature		Effects of cold on the hands
°C	°F	
32–36	89–97	Optimal hand and finger function
27–32	81–89	Effects on finger dexterity, precision and speed
20–27	68–81	Impaired performance in work with small details, reduced endurance
15–20	59–68	Impaired performance of gross finger work
10–15	50–59	Reduced gross muscle strength and coordination, pain sensation
<10	<50	Numbness, manual performance reduced to simple gripping, pushing, etc.

Foot Protection

Total foot comfort is determined by interaction between socks, soles and shoes. The shoe itself should be made of adapted material that allows ventilation of water vapour, and should fit correctly. It should be large enough to provide room for some trapped air. The feet will swell considerably during a working day, and a Velcro® or lace closure should allow for regulation of the pressure on the foot. The sole of the shoe should be produced from material that allows for easy bending and prevents sliding on a slippery surface.

The material used in the socks should provide insulation and facilitate transport of sweat as far from the skin as possible (use wool alone or in combination with polypropylene, not cotton).

Food and Water Requirements

Cold climates necessitate certain modifications in food and water requirements.

Hot and well balanced meals should be provided.

The cold climate requires an increase in calorie consumption. As much as 4,000 Kilocalories (Kcal) per day may be required with a distribution of approximately 60 per cent carbohydrates, 25–30 per cent fats and 10–15 per cent proteins. Fats should be eaten in the evening and at the end of the day since they increase the body's temperature at night and improve sleep quality.

Rapidly absorbed carbohydrates, such as sugar and sweets, should be eaten while working and when directly exposed to the cold.

Water loss is an important factor in cold climates due to normal body perspiration, nasal dripping, normal diuresis (urine output), vapour lost in respiration and sweating provoked by muscular effort. Water compensation requires drinking at least 4 to 5 litres of non-alcoholic fluids or warm, sweet, non-alcoholic drinks per day. *Drink regularly even if not thirsty.*

Avoid alcohol which reduces one's resistance (contrary to popular opinion) to the cold and which also increases drowsiness. The warming effect of alcohol is only an impression. Alcohol dilates the peripheral blood vessels thereby increasing the blood flow to the surface from the internal organs and thereby actually increasing heat loss.

HEALTH PROBLEMS DUE TO THE COLD

Body temperature (rectal)		The individual's response to hypothermia
°C	°F	
37	98.6	Normal body temperature
36	97	Judgement may be affected
35	95	Definition of Hypothermia threshold DANGEROUS HYPOTHERMIA BELOW 35°C Feels cold, looks cold, shivering
34	93	Change of personality (usually withdrawn—'switches off'). Stumbling, falling, confused Inappropriate behaviour, e.g. sheds clothing Lack of appreciation—'doesn't care'
33	91	Consciousness clouded Shivering stops Incoherent
32	89	Heart stoppage now very much at risk Heat loss will continue unless protected Limbs stiffen
31	87	Moves into unconsciousness
30	86	Unlikely to detect breathing or pulse
28	83	Fixed dilated pupils (no constriction to light)
24	75	Survival unusual if any colder
18	65	Lowest temperature of accidental hypothermia with recovery
9	48	Lowest temperature of deliberate hypothermia with recovery

General Note: In most cases first aid treatment is not sufficient. In some cases referral for medical advice is routinely called for. In all cases the need for medical referral should be considered if first aid measures appear to have failed. Except in extreme emergency the patient should not put weight on a cold injured lower limb.

Non-freezing Cold Injuries

Chilblain

This is an inflammation of the hands and feet due to exposure to cold and moisture. The hands and feet start to swell, become painful and are the site of localised itching. The symptoms may develop some hours after exposure to cold has ceased and may persist for several days. In extreme cases ulceration can occur.

Prevention: The hands and feet should be kept warm and dry.

First aid treatment requires, where practicable, elevation of the affected area above the heart to reduce the swelling. A clean dressing should be applied to the affected area. Gentle rewarming can be undertaken. Simple analgesia (pain killers) may be used as appropriate.

In the susceptible individual, chilblains are likely to recur following exposure to further cold conditions.

Trench Foot

This is caused by continuous exposure to the cold without freezing, combined with constant dampness or immersion in water. It is found most often when wet socks are worn for long periods of time resulting in inflammation, redness, itching, numbness, severe pain and eventually blistering and tissue death.

Prevention is based on wearing well fitting, water resistant, dry footwear.

First aid treatment requires elevating the affected area and keeping it clean, warm and especially dry.

Fingertip Fissures

Deep, intractable and very painful fissuring may occur on the fingertips when exposed to prolonged or repeated cold conditions. A combination of cold and drying of the skin may be responsible. Fingertip fissures may be so painful as to prevent use of the affected fingers.

Prevention requires keeping the hands as warm as possible and maintaining skin hydration through moisturising cream.

Treatment can be difficult, but very good results have been reported with the tissue adhesive Histoacryl®- butyl-2-cyanoacrylate, a medical form of irritating Superglue®.

Freezing Cold Injuries

Frostnip

This is the freezing of the skin and superficial tissue. The skin turns white after exposure to cold wind. This superficial freezing of tissue affects mostly the face (ears, nose, cheeks) and fingers. The first symptoms include a stinging, pricking pain. Contrary to frostbite, the underlying tissue is not frozen.

Prevention requires vigilance, working in pairs in which each looks after the well-being of the other, and protective clothing. Frostnip is likely to recur in the susceptible individual.

First aid treatment: If in a safe, warm shelter, the affected area can be rapidly rewarmed. **If further exposure to cold conditions is expected, the affected part should be protected against further cold exposure but rewarming should not be attempted until in a situation where re-exposure to cold conditions after rewarming is not likely.**

Frostbite

This is the freezing of deeper, as well as superficial, tissues. It usually affects the fingers, toes, nose, cheeks and ears. It can provoke various levels of tissue damage all the way to tissue death requiring amputation. Frostbite may occur without hypothermia.

There are three degrees of frostbite:

- first degree: freezing without peeling and blistering of the skin;
- second degree: freezing with blistering and peeling of the skin; and
- third degree: freezing with death of skin tissues and in some cases deeper tissues.

In frostbite, the skin first changes colour, going from white or greyish-yellow to reddish-violet and then black as the tissues die. Pain which is felt at first may disappear. Blisters appear and the affected area becomes numb and anaesthetised.

Prevention requires vigilance, a buddy system, protective clothing.

First aid treatment: The aim of treatment is to prevent or reduce tissue loss. In frostbite, do not try to rewarm the extremity by rubbing with snow or by soaking in cold water. Protect frozen area from additional injury and transport to a medical facility, if possible, for thawing. It is better to delay thawing and send the victim to a suitable location. Rewarming is very painful and analgesia (pain killers) may be required. Rewarming should not be attempted if there is a chance of refreezing afterwards. The affected area should be observed as referral for medical attention may be necessary. No attempts at amateur surgery should be made.

Cold Burn

Cold burn is the instant, superficial freezing of tissue when touching a very cold object or tool (e.g. metal).

Prevention requires that gloves be worn and skin contact with cold surfaces avoided.

Treatment: The injured part should be immersed in warm water at 40°–42°C for about 10 minutes. Where practicable it should then be elevated and kept clean and dry. Pain relief may be achieved through use of simple analgesics.

Snow Blindness

It is the excessive exposure to ultraviolet light reflecting off the snow or ice which basically causes a sunburn of the eye. It can cause severe pain and prevent work for long periods. The eye swells, weeps profusely and becomes reddish, accompanied by a deep rooted eyeball pain. Exposure to light is extremely painful.

Prevention is based on protective sun glasses or goggles which are most effective if they have side covers. The sunglasses or goggles must reduce the amount of ultraviolet (UVB) to less than 10 per cent.

First aid treatment requires rest and protection from light. The use of simple analgesics can relieve the pain. Eye patches may be required for 12 hours and, where necessary and available, one application of a topical local anaesthetic to the eye can help with pain relief. Snow blindness usually does not lead to permanent blindness.

Hypothermia

Hypothermia is defined as the chilling of the body's core temperature below 35°C (95°F) as measured by a clinical low reading (e.g. rectal) thermometer. The body loses heat faster than it can produce it.

The onset of hypothermia is preceded by fatigue and mental confusion. The victim begins to have uncontrollable shivering, poor coordination and slurred speech, and shows poor judgement. As body temperature falls further, shivering gradually disappears. The victim may become irrational. Severe exhaustion sets in which may lead to death. The victim is always the last to realise that he/she is in danger. He/she must be warmed up immediately by an external source.

Prevention is based on a buddy system, correct protective clothing and seeking shelter.

First aid treatment: Remove the victim from the snow, rain or wind. Get him out of his wet clothes and into something dry. Warm him up and reduce his heat loss by putting him in a sleeping bag with another person or provide insulating wrapping. Try keeping him awake. Do not administer alcohol. Seek professional medical advice.

Other Cold-related Health Problems

Carbon Monoxide (CO) Poisoning

Carbon monoxide is a colourless, odourless gas produced by the incomplete or inefficient combustion of natural gas, propane, coal, wood, kerosene, charcoal, gasoline motors or any fuel-fired engine. The risk of CO poisoning is high in cold climates where heaters and motors must be kept working constantly and where correct ventilation is not always maintained. CO is dangerous and can be fatal. Symptoms may include persistent headaches, nausea and dizziness.

Prevention is based on correct ventilation when using a heater or stove in a shelter (ensuring that the efficiency of the ventilator is not compromised by the presence of snow and ice), keeping engine and generator exhausts well away from air intakes to cab of vehicles. A CO detector may be useful.

First aid treatment: Remove the victim from the intoxicated air and start cardio-pulmonary resuscitation. Obtain medical treatment as soon as possible.

Animal Bites/Insects

In certain cold areas, rabies is endemic.

Prevention may require vaccination and in all situations contact with animals should be avoided. This should include even apparently friendly domestic pets.

First aid treatment: If an animal bite occurs the wound should be cleaned and medical attention sought urgently.

In some areas mosquitoes and other flying insects can be a problem during the summer months. Malaria and tick borne encephalitis are not rare. Prevention includes insect bite prevention (repellents, protective clothing, bed nets) and chemoprophylaxis for malaria. Vaccinations may be useful in some cases (tick borne encephalitis).

Sunburn

Sunburn is an ultraviolet (UVB) burn of the skin.

Prevention is based on the use of barrier creams which should be applied to exposed parts of the body (nose, chin, upper eyelids, ears). The UVB protection of a barrier cream can be determined by its Sun Protection Factor (SPF) number. It is also advisable to use a barrier cream which protects against other ultraviolet energy (UVA) which can have a long-term ageing effect on the skin.

First aid treatment consists of the use of cool compresses, calamine lotion, the use of simple analgesics (pain killers), liberal administration of fluids by mouth and avoidance of further exposure.

Windburn

Windburn provokes dry skin.

Prevention is based on covering up exposed parts of the body (face) in windy conditions.

First aid treatment requires the use of moisturisers on affected parts and pain relief with simple analgesics (pain killers) if necessary.

Trauma

Snow and ice can be responsible for traumatic accidents, slips and falls.

Prevention and first aid treatment will be related to the circumstances in question and the injury.

GENERAL RECOMMENDATIONS FOR REDUCING EXPOSURE TO THE COLD

The following are recommendations which will reduce the risks of cold exposure.

- General or spot heating on the work site in order to increase temperature.
- If a worker must use his bare hands for more than 15 minutes, special material should be used such as warm air jets, radiant heaters or contact warm plates. (Time of exposure should be temperature dependant. At some temperatures, bare skin should not be allowed at all.)
- Shielding of work area from the wind.
- Covering of metal tools with thermal insulating materials.
- Avoiding unprotected metal chairs.
- Reducing the individuals work load by using power tools (hoist, cranes, etc.).
- Providing heated shelters on the work site.
- Providing frequent intake of warm, non-alcoholic energetic drinks.
- Taking extra work breaks when necessary, and providing relief workers.
- Getting sufficient sleep and good food.
- Using a buddy system and working in pairs.
- Emphasising work/rest schedules in order to reduce cold stress.

In general:

- Managers will need to allow extra time due to the cold in order to complete a given task.

Shift patterns and work/rest schedules sustainable in a warmer climate may not be possible and managers need to make this allowance in their project planning.

- Furthermore, if the work-site is exposed and the ambient temperature low, thermal clothing alone may not be sufficient to maintain the body temperature at a comfortable and efficient level. Time will be needed to allow for warming during rest periods.

A proposed work/warm-up schedule based on air temperature and wind speed is provided on the following page.

Work/warm-up schedule for a four-hour shift

- Schedule applies to moderate-to-heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For light-to-moderate work (limited physical movement) apply the schedule one step lower. For example, at -35°C (-31°F) with no noticeable wind a worker at a job with little physical movement should have a maximum work period of 40 minutes with four breaks in a four-hour period.
- The following is suggested as a guide for estimating wind velocity if accurate information is not available:
 - 5 mph or 8 kph = light flag moves
 - 10 mph or 16 kph = light flag fully extended
 - 15 mph or 24 kph = raises newspaper sheet
 - 20 mph or 32 kph = blowing and drifting snow

Work/warm-up schedule for a four-hour shift (°C/kph wind)

Air temperature °C	No noticeable wind		8 kph wind		16 kph wind		24 kph wind		32 kph wind	
	Max. work period	No. of breaks	Max. work period	No. of breaks	Max. work period	No. of breaks	Max. work period	No. of breaks	Max. work period	No. of breaks
-26 to -28	115 mins.	1	115 mins.	1	75 mins.	2	55 mins.	3	40 mins.	4
-29 to -31	115 mins.	1	75 mins.	2	55 mins.	3	40 mins.	4	30 mins.	5
-32 to -34	75 mins.	2	55 mins.	3	40 mins.	4	30 mins.	5	Non-emergency work should cease	
-35 to -37	55 mins.	3	40 mins.	4	30 mins.	5	Non-emergency work should cease			
-38 to -39	40 mins.	4	30 mins.	5	Non-emergency work should cease					
-40 to -42	30 mins.	5	Non-emergency work should cease							
-43 and below	Non-emergency work should cease									

Work/warm-up schedule for a four-hour shift (°F/kph wind)

Air temperature °F	No noticeable wind		5 kph wind		10 kph wind		15 kph wind		20 kph wind	
	Max. work period	No. of breaks	Max. work period	No. of breaks	Max. work period	No. of breaks	Max. work period	No. of breaks	Max. work period	No. of breaks
-15 to -18	115 mins.	1	115 mins.	1	75 mins.	2	55 mins.	3	40 mins.	4
-20 to -24	115 mins.	1	75 mins.	2	55 mins.	3	40 mins.	4	30 mins.	5
-25 to -29	75 mins.	2	55 mins.	3	40 mins.	4	30 mins.	5	Non-emergency work should cease	
-30 to -34	55 mins.	3	40 mins.	4	30 mins.	5	Non-emergency work should cease			
-35 to -39	40 mins.	4	30 mins.	5	Non-emergency work should cease					
-40 to -44	30 mins.	5	Non-emergency work should cease							
-45 and below	Non-emergency work should cease									

THE MEDICAL ORGANISATION IN THE COLD

A Module 3 or 4 medical kit (see Annex 4) should be provided for the base camp when a competent medical professional is on site.

Daily Medical Care

In extreme locations the provision of company approved medical services relies on having:

- company approved medical professionals at each strategic location;
- effective communications with outside physicians (corporate, company approved specialists, telemedicine, etc.) to advise on difficult medical cases, treatment and actions to be taken;
- effective transport systems and management for evacuation of casualties; and
- effective communications with relevant authorities/managers to expedite the latter.

Emergency Medical Care

For cold climates normal emergency care procedures are usually applicable but careful consideration should be given for the potential of fluids to get cold (IV drip) or to freeze (breakage of ampoules) and for pressurised gases to exhibit differing physical properties at low temperatures.

Further guidelines can be obtained through E&P Forum Report No. 6.30/190, *Health Management Guidelines for Remote Land-based Geophysical Operations*.

ANNEX 1: CONTENTS OF A HEALTH ASSESSMENT

Taken from E&P Forum Report No. 6.46/228, *Health Assessment of Fitness to Work in the E&P Industry*.

A three-level modular system is recommended:

Level 1: A nurse based health assessment

Level 2: A physician based health assessment

Level 3: Additional investigations

For All Occupations

A health questionnaire should be completed by each individual and a basic clinical examination performed. This can be undertaken by a designated nurse working under the physician's supervision.

Level 1 Module:
Nurse-based Health Assessment

The Health Questionnaire

The health questionnaire should include:

- *Administrative information*
 - last name, first name, address, date of birth, sex; and
 - proposed occupation.
- *Medical information*
 - past medical and dental history;
 - occupational history;
 - family medical history;
 - current medical complaints;
 - known allergies;
 - current medication taken;
 - immunisations received (type, date of last booster); and
 - lifestyle (smoking, alcohol intake, exercise).

The Basic Clinical Examination

After review of the completed questionnaire the following should be noted:

- height;
- weight;
- blood pressure;
- pulse;
- visual acuity (eye chart); and
- urine analysis (dip stick urine test).

If any significant abnormalities are detected during the Level 1 module, the person should be referred to a Level 2 physician based health assessment. If any major lifestyle risks are identified appropriate advice could be given.

A Level 2 module should include a review of the Level 1 nurse-based health assessment, an interview and a physical examination as appropriate.

Level 2 Module:
Physician-based Health Assessment

Level 3 Module: Additional Investigations

A Level 2 module health assessment may be required:

- as a result of Level 1 findings;
- by the occupation involved;
- by the living and working environment;
- by legislation; and
- to meet industry standards.

Results of the physical examination and its consequences should be discussed with the individual. Significant abnormalities detected during the Level 2 physician's assessment may require Level 3 additional investigations.

A Level 3 health assessment may be required:

- as a result of Level 2 findings;
- by the occupation involved;
- by the living and working environment;
- by legislation; and
- to meet industry standards.

The above criteria will determine which of the following additional tests may be performed. This list is non-exhaustive.

Eye Testing

- colour vision;
- testing of visual fields, peripheral vision and visual depth;
- peripheral vision; and
- night vision (where applicable).

Hearing

- Audiometry

Laboratory Tests

- *Blood tests*
Type of blood tests to be performed depend on the above criteria. Testing for blood borne diseases should not be performed as part of a routine health assessment for fitness.
- *Urine analysis*
Further tests may be required if the initial dip-stick test results were abnormal.
- *Stool Analysis*
Analysis for blood, parasites, ova, cysts and pathogenic organisms in stools.

Radiological Investigations

- *Chest X-ray may be required if:*
 - Level 2 assessment is abnormal;
 - required by law;
 - required by industry standards;
 - required by exposure.

No other X-ray investigations should be considered as mandatory for basic health assessments unless required by law or industry standards.

Pulmonary-function Spirometry and/or Peak Flow may be required if:

- Level 2 assessment is abnormal;
- required by law;
- required by industry standards;
- required by exposure.

Electrocardiogram (ECG)

An ECG should not be mandatory for a basic health assessment. A resting ECG is not a predictive test but can be considered useful by the examining physician if clinically indicated. In case of cardiological problems, a specialist's advice is recommended.

Drug Testing

With reference to the E&P Forum document *Substance Abuse and Management Strategies* (Report No. 6.23/173, July 1991), drug testing should respect a chain of custody and include all or some of the following:

- amphetamines;
- barbiturates;
- benzodiazepines;
- cannabinoids;
- cocaine;
- methadone;
- methaqualone;
- opiates;
- phencyclidine;
- propoxyphene.

Alcohol Testing

Testing for chronic or acute alcohol intake can be performed through a breathalyser (breath alcohol concentration) or a blood test (blood alcohol concentration). Further guidance is available in the E&P Forum report *Substance Abuse and Management Strategies* (Report no. 6.23/173, July 1991).

Psychological Assessment

The examining physician may recommend, if indicated, a referral for psychological assessment.

Testing of Physical Fitness

The examining physician may recommend that an appropriate test of physical fitness be carried out.

The examining physician will determine if other tests are necessary.

ANNEX 2: FITNESS GUIDELINES

Taken from E&P Forum Report No. 6.30/190, *Health Management Guidelines for Remote Land-based Geophysical Operations*.

These guidelines should be considered as advisory only and should be applied by a physician knowledgeable of the local area.

Infectious Diseases

Active infectious disease must be treated before assignment. Catering staff require special examination to identify acute or chronic disease involving gastrointestinal tract, chest, ear, nose, throat and skin.

Malignant Neoplasms

Each case should be considered individually and the natural history and prognosis of the neoplasm taken into account. The progress and likelihood of complications of the disease and the availability of treatment on site must be carefully evaluated.

Diseases of the Digestive System

- Dental caries, abscess or severe gum disease should be treated before assignment. Dentures or other orthodontic appliances should be well fitting and functional.
- History of digestive disorders causing severe or recurrent symptoms requiring special diet or medication, e.g. oesophagitis, gastritis, cholelithiasis, inflammatory or parasitic bowel disease, is unacceptable¹ until satisfactorily treated and reassessed.
- Acute gastric erosion may be considered following healing, demonstrated by endoscopy, with absence of symptoms.
- Proven active peptic ulceration is unacceptable.¹ Where there is a part history of peptic ulceration a person may be acceptable provided that the examining physician is satisfied that the risk of complications is reduced to an absolute minimum by successful surgery or the use of appropriate medication. Healing is normally assessed by endoscopy.
- Diaphragmatic hernia is only unacceptable.¹ if disabling symptoms are present.
- Hernia is unacceptable.¹ until satisfactorily surgically repaired.
- Haemorrhoids, fistulae and fissures causing intractable pain, or frequent recurrent bleeding, are unacceptable¹, unless treated. Abscesses and fistulae are unacceptable.¹
- A person with a stoma is unacceptable.¹

Diseases of Liver and Pancreas

- Chronic or recurring pancreatitis is unacceptable.¹
- Diseases of the liver are unacceptable¹ where the condition is serious or progressive and/or where complications such as oesophageal varices, or ascites, are present. This includes chronic active Hepatitis B. Asymptomatic Hepatitis B carriers may be acceptable.

¹ When used in this Annex the term *unacceptable* means the presence of the condition under circumstances whereby the condition would cause the person to be a safety or health hazard to him or herself or to others, where the conditions cannot be controlled by the measures as described in this document.

Cardiovascular System

The cardiovascular system should be free from acute or chronic disease.

- *Congenital heart disease*
If this is unassociated with symptoms or haemodynamically significant change it is acceptable.
- *Valvular heart disease*
 - If there is significant haemodynamic change it is unacceptable.¹
 - An individual who has undergone successful cardiac surgery for valvular or congenital heart disease may be fit for assignment in remote areas if free of all symptoms and off all therapy. If otherwise, then cardiac review is needed. Individuals in this group may require more frequent assessment.
- *Ischaemic heart disease*
Myocardial insufficiency (e.g. uncontrolled angina), is unacceptable.¹
- *Myocardial infarction*
Normally a past history of myocardial infarction is unacceptable.¹ After an infarct, it is likely that medical assessment for work in remote areas will be inappropriate for a least one year. Specialised cardiac opinion should be obtained in all cases.
- *Coronary bypass surgery (CABS) and angioplasty*
Individuals who have undergone these procedures must have their cardiac fitness proven before return to work. A cardiological opinion is essential, and will be appropriate not earlier than six months after the event. This assessment must include submaximal exercise testing. Individuals with cardiac transplants are not acceptable.
- *Cardiac arrhythmias*
If these produce symptoms, or are associated with haemodynamic abnormality, then expert cardiac opinion is recommended.
- *Cardiomyopathy*
These individuals are unacceptable.¹
- *Cardiac enlargement*
Fitness will depend on the underlying cause.
- *Pacemakers*
The subject of pacemakers is highly specialised and acceptability to work in remote areas must include assessment of:
 - the underlying condition and indication for insertion;
 - the type of pacemaker;
 - the effect of the seismic environment on the unit (i.e. radioactivity, explosives, cold, heat, etc.); and
 - the risk of physical damage to the unit.

¹ When used in this Annex the term *unacceptable* means the presence of the condition under circumstances whereby the condition would cause the person to be a safety or health hazard to him or herself or to others, where the conditions cannot be controlled by the measures as described in this document.

Hypertension

As a general rule, hypertension is acceptable provided it is uncomplicated and well controlled by treatment.

Peripheral Circulation

The following conditions are unacceptable¹:

- current or recent history of thrombophlebitis or phlebothrombosis with or without embolisation;
- varicose veins associated with varicose eczema, ulcers or other complications; and
- arteriosclerotic or other vascular disease with evidence of circulatory embarrassment, e.g. intermittent claudication, or aneurysm.

Pulmonary Circulation

- A history of more than one pulmonary embolism is unacceptable.¹ A single episode requires careful assessment.

Cerebro-vascular Disorders

- Any cerebro-vascular accident including history of transient ischaemic attack or evidence of general cerebral arteriosclerosis, including dementia, is unacceptable.¹

Diseases of the Blood or Blood Forming Organs

There should not be any significant disease of the haemopoietic system and the following are unacceptable¹ for working in remote areas:

- anaemias until investigated and successfully resolved;
- leukaemia, polycythemia and disorders of the reticulo endothelial system unless in long term remission;
- haemorrhagic disorders;
- any other disease of blood forming organs which may adversely affect performance or safety;
- individuals with immuno suppression are unacceptable¹; and
- splenectomy (generally unacceptable).¹

Mental Disorders

Care is necessary when assessing an individual during remission from one or more episodes of mental illness. An established medical history or clinical indication of any of the following is unacceptable¹ for working in remote areas:

- personality disorders characterised by anti-social behaviour;
- psychoses;
- phobias;
- chronic anxiety states and recurrent depression;
- alcohol abuse; and
- drug abuse.

Diseases of The Nervous System and Sense Organs

- Organic nervous disease causing, or likely to cause, any significant defect of intellect, muscular power, balance, mobility, vision, sensation or coordination is unacceptable.¹

¹ When used in this Annex the term *unacceptable* means the presence of the condition under circumstances whereby the condition would cause the person to be a safety or health hazard to him or herself or to others, where the conditions cannot be controlled by the measures as described in this document.

- Established medical history with current diagnosis of epilepsy of any type, or disturbance of consciousness is unacceptable.¹ Any other convulsive disorder, disturbance of consciousness or neurological condition likely to render the individual unable to perform duties safely is also unacceptable.¹ This category includes epileptiform seizure following episodic drinking or tranquiliser withdrawal, or those which are stroboscopically induced (e.g. by the flicker of helicopter blades).
- Established history of migraine which does not interfere with the individual's ability to work efficiently and safely is acceptable.

Musculo-skeletal System

- There must be no deformity, or amputation of body or limb, which significantly reduces mobility, interferes with performance of duties, or prevents compliance with all evacuation procedures. An upper limb prosthesis may be acceptable providing the above criteria can be met.
- Acute chronic or recurrent disease of peripheral nerves, muscles, bones or joints significantly affecting mobility, balance, coordination or ability to perform normal duties, or installation evacuation procedures, or survival training is unacceptable.¹

Skin

The skin should be healthy, without evidence of clinical disease.

- Any skin condition likely to be aggravated or triggered by items in the environment is unacceptable.¹

Endocrine and Metabolic Disorders

- Adequately controlled thyroid disease may be acceptable but, in all cases, thyroid disorders require careful assessment.
- Uncomplicated stable diabetes mellitus treated by diet alone (or diet and an oral hypoglycaemic agent), and satisfactorily controlled, may be acceptable but will require more frequent assessment. Insulin dependence is unacceptable.¹
- Individuals suffering from other endocrine disorders such as Addison's disease, Cushing's syndrome, acromegaly, diabetes insipidus and hypoglycaemia, either functional or due to pancreatic or adrenal pathology, are unlikely to be acceptable for remote areas but should be individually considered and carefully assessed.
- All cases of gross obesity require individual assessment. Those in whom exercise tolerance, mobility, general health, or personal hygiene are adversely affected are unacceptable.¹ As a general rule, those in whom the Body Mass Index exceeds 35 will probably be unacceptable.¹
- Well-controlled gout may be acceptable.

Genito-urinary System

- The presence of renal, ureteric or vesical calculi is generally unacceptable.¹ Recurrent renal colic without demonstrable calculi requires careful assessment. Successful treatment by surgery or lithotripsy may be acceptable;
- Recurring urinary infections are unacceptable¹ until investigated and treated.

¹ When used in this Annex the term *unacceptable* means the presence of the condition under circumstances whereby the condition would cause the person to be a safety or health hazard to him or herself or to others, where the conditions cannot be controlled by the measures as described in this document.

- Any renal disease which could lead to acute renal failure, i.e. nephritis, nephrosis, is unacceptable.¹ Polycystic disease, hydronephrosis or unilateral nephrectomy with disease in the remaining kidney, is unacceptable¹ unless otherwise indicated by a nephrologist.
- Renal transplant is unacceptable.¹
- Enuresis or incontinence, recent or active, is unacceptable.¹
- Prostatitis is unacceptable.¹ Prostatic hypertrophy, or urethral stricture interfering with adequate bladder evacuation is unacceptable.¹
- Gynaecological disorders, such as menorrhagia, disabling dysmenorrhoea, pelvic inflammatory disease or prolapse, are unacceptable.¹
- Hydrocoeles, or painful conditions of the testicles, require careful assessment.
- Sexually transmitted disease should be treated. A diagnosis of HIV positive need not debar from assignment. Such employees should receive regular surveillance.
- Pregnancy should be carefully evaluated with regard to the personal history and risk assessment. In general, the risks would be unacceptable.¹

Respiratory System

- A history of spontaneous pneumothorax is generally unacceptable¹, except for a single episode without recurrence for one year, or after a successful surgical procedure.
- Obstructive airways disease, such as chronic bronchitis, emphysema, and any other pulmonary disease causing significant disability or recurring illness, such as bronchiectasis, is unacceptable.¹
- Restrictive or fibrotic pulmonary disease resulting in significant symptoms or disability is unacceptable.¹
- Open pulmonary tuberculosis is unacceptable¹ until treatment is concluded and the attending physician has certified that the patient is no longer infectious.
- A history of asthma requiring frequent or recurrent medication including oral steroids requires careful assessment.

Ear, Nose and Throat

- *Ear*
 - Active otitis externa (acute or chronic) requires treatment.
 - Disorders of the tympanic membrane (e.g. dry perforations and grommets) and the middle ear require further assessment. Chronic middle ear disease is unacceptable¹ until treated.
 - Intractable inner ear disorders with severe motion sickness, vertigo, etc. (e.g. Meniere's disease) are probably unacceptable.¹
 - A functional hearing loss sufficient to interfere with communications or to impede safety (e.g. inability to hear audible warning devices) is unacceptable.¹ Intrinsically safe hearing aids may be worn, but the examinees should not be dependent on such an aid to hear a safety warning. Measurement of auditory acuity is best performed by screening audiometry.

¹ When used in this Annex the term *unacceptable* means the presence of the condition under circumstances whereby the condition would cause the person to be a safety or health hazard to him or herself or to others, where the conditions cannot be controlled by the measures as described in this document.

- **Nose**
Chronically infected sinuses, or frequently recurring sinusitis are generally unacceptable.¹
- **Throat**
Chronically infected tonsils or frequently recurring tonsillitis require careful assessment.

Eyes

- Any eye disease or visual defect rendering, or likely to render, the applicant incapable of carrying out job duties efficiently and safely, is unacceptable.¹ A history of conditions such as glaucoma, uveitis, require specialised assessment.
- A monocular individual is acceptable provided the job functions can be performed efficiently and safely.
- Colour perception should be adequate for the particular type of assignment to be undertaken.

Medicines

Individuals being treated with certain medicines require careful consideration:

- Individuals on anticoagulants, cytotoxic agents, insulin, anticonvulsants, immunosuppressants, and oral steroids.
- Individuals on psychotropic medications, e.g. tranquillisers, antidepressants, narcotics, hypnotics. A previous history of such treatment will also require further consideration.
- Any employee in possession of medications must report these to the Module 4 or 5 employee. The individual must ensure an adequate supply to last longer than the normal tour of duty. A change in dosage should also be reported.
- Any previous adverse drug reaction must be brought to the attention of the Module 4 or 5 employee.

Catering Crew

Food handling and hygiene are of paramount importance.

Before assignment, and regularly thereafter, the following procedures may be followed in the case of anyone handling, or likely to handle food:

- Thorough clinical examination of potential communicable disease sites, e.g., skin, ears, upper respiratory tract and gastro-intestinal tract.
- Chest X-ray in the preassignment medical examination will be required only on clinical indication. The individual's medical history, clinical examination findings or current medical practice will determine the need for further chest X-rays.

Additional investigation may be required if the employee has been absent due to infectious disease.

¹ When used in this Annex the term *unacceptable* means the presence of the condition under circumstances whereby the condition would cause the person to be a safety or health hazard to him or herself or to others, where the conditions cannot be controlled by the measures as described in this document.

Work Factor Considerations

Work factors to be considered in the assessment of medical fitness to work in remote areas are:

- physical exertion (climbing walkways, stairs, work tasks, etc.);
- shift work;
- climate;
- altitude;
- change in routine;
- absence from home;
- total control by employer;
- lack of privacy;
- helicopter and boat travel;
- exposure to height;
- in-water exercises;
- claustrophobia;
- smoke exposure;
- heat and cold exposure;
- peer group pressure;
- explosives; and
- lack of communication.

ANNEX 3: JOURNEY MANAGEMENT PLANNING

Taken from E&P Forum Report No. 6.50/238, *Land Transport Safety Guidelines*

Journey Management Objectives

- to assure the health and safety of all travellers and reduce risk exposure;
- to challenge the need for unnecessary journeys and to undertake only the minimum number of journeys necessary;
- to maximise the efficiency of each journey;
- to avoid or minimise the effect of all identified hazards likely to be encountered;
- to be able to recover in a timely manner from any incident;
- to monitor journey performance; and
- to ensure that drivers are fully aware of journey plans and any hazards.

Journey Planning

Once the need for a journey has been established then aspects of journey management should be introduced which will assist in reducing the risk of an incident. Systems need to be in place for:

- selecting appropriate vehicle for the task—maximise payload carried to minimise number of journeys;
- establishing and controlling maximum speeds;
- controlling duty hours and rest periods;
- establishing standard journey times;
- implementing optimum time for travel and driver shift patterns;
- route identification and planning, avoiding high risk areas where possible (poor road surface, delay situations, urban congestion);
- setting designated routes for certain categories of vehicles (height, width, length, weight, cargo);
- provision of auxiliary equipment, e.g. tow chains, shovels, ice chains, survival kits, extra wheels, extra fuel, vehicle parts (lamps, fuses, filters, fan belts, radios, emergency flares, emergency locator beacons);
- checking survival kit contents, e.g. to verify that they are the correct type for the season and sufficient for the number of travellers;
- checking that sufficient fuel is provided for the journey, allowing for detours or long stretches of slow speeds and that fuel is available *en route*;
- checking that correct maps and, where appropriate, compasses or Global Satellite Positioning System (GPS) units are carried;
- the provision of communication systems in the vehicle (e.g. mobile phones or radios etc.);
- establishing agreed stopover points *en route* and reporting status back to base at regular intervals;
- authorising and recording deviations from the planned route;
- designating contact points for advising base, both *en route* and at end of journey;
- recording the journey details, times, locations to be visited and number of people travelling;
- the driver to maintain a log of the journey details;
- emergency response and provision of resources for search and rescue;
- recording of travellers with special skills e.g. first aid, survival training, recovery training;
- awareness of special health hazards associated with the region where vehicles will transit;
- avoiding roadworks; and
- implementing changes due to weather conditions.

ANNEX 4: MEDICAL AND FIRST AID EQUIPMENT

Taken from E&P Forum Report No. 6.30/190, *Health Management Guidelines for Remote Land-based Geophysical Operations*

The contents of each kit should be professionally reviewed to an appropriate level.

Module 0

None required

Module 1

Basic first aid kit plus C.P.R. mask and gloves, i.e.:

- guidance card;
- individually wrapped sterile adhesive dressings;
- sterile eye pads with attachment;
- sterile triangular bandages;
- safety pins;
- medium sterile unmedicated dressings;
- large sterile unmedicated dressings;
- extra large sterile unmedicated dressings; and
- alcohol free cleansing wipes.

Module 2

The Module 2 first aid kit should include:

- guidance leaflet;
- adhesive dressings (assorted);
- sterile eye pads;
- various sterile dressings;
- sterile triangular bandages;
- butterfly closures;
- crepe bandages (6");
- elastic adhesive bandages (4");
- various Band-Aids™;
- surgical scissors;
- splints (inflatable or vacuum plus cervical collar);
- thermometer (digital);
- a clinical low reading thermometer²;
- forceps;
- burns packet;
- antiseptic solution;
- burn blanket;
- hypothermia bag;
- paracetamol;
- rehydration sachets;
- eye antiseptic;
- antihistamine;
- antacid;
- antiseptic skin cream;
- sterile gloves;
- mouth ointment;
- C.P.R. mask and gloves;
- tweezers²;
- total sun block/lip balm²;
- water purification tablets²;

Module 3

Content to be as Module 2 plus the addition of as much of the following items in which the user is competently trained or certified to administer:

- suture set;
- sphygmomanometer;
- stethoscope;
- oro-pharyngeal airway;
- intramuscular injection needles and syringes;
- laxative;
- cough pastilles;
- antidiarrheal medication;
- metronidazole;
- eye antiseptic;
- suppositories for haemorrhoids;
- antispasmodics³;
- doxycycline³;
- curative anti-malarial tablets³;
- 1% Hydrocortisone (topical)³;
- throat lozenges;
- anti fungal preparation (topical);
- ear drops;
- xylocaine 1% (no adrenalin)³;
- potent analgesic³;
- antiemetic³;
- broad spectrum antibiotics²;
- manufacturers' prescribing information must be available in the pack.

Module 4

Content to include complete Module 3 set plus:

- intravenous giving sets and fluids;
- cut down set;
- endotracheal set;
- laryngoscope;
- ambubag or doctors resuscitation kit; and
- supply of pharmaceuticals as agreed with contractor's medical officer or Module 5 person.

The quantities would depend on whether in the field or the base camp. At base camp, one may consider a cardiovascular emergency kit, anti-shock kit, and a resuscitator.

If anti-snake venom is provided, the Module 4 person must be fully trained and experienced in its use and its dangers. Only the appropriate anti-venom(s) for that area should be provided.

² These items are in addition to the first aid kit referenced in E&P Forum Report No. 6.30/190

³ The Module 3 person should contact a Module 4 or 5 person prior to use.



E&P Forum

The Oil Industry International Exploration and Production Forum

25-28 Old Burlington Street
London W1X 1LB
United Kingdom
Telephone: +44 (0)171 292 0600
Fax: +44 (0)171 434 3721

25th Floor, Tour Madou
Madou Plaza, 1 Place Madou
1210 Brussels, Belgium
Telephone: +32 2 226 1950
Fax: +32 2 217 5908

Internet site : <http://www.eandpforum.co.uk>



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