Annex
A proposal for a Directive on Workplace Heat Stress

Directive on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (Heat stress)

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 153(2), point (b), in conjunction with Article 153(1), point (a), thereof,

(…)

Whereas:

(1) Pursuant to Article 3 of the Treaty on European Union (TEU), the aims of the Union are, amongst others, to promote the well-being of its peoples and to work for the sustainable development of Europe based, inter alia, on balanced economic growth, and a highly competitive social market economy, aiming at full employment and social progress.

(2) Article 31 of the Charter of Fundamental Rights of the European Union (the 'Charter') provides for the right of every worker to fair and just working conditions which respect his or her health, safety and dignity.

(3) A definition of heat-related risks at work, risk factors related to heat exposure at work, and the prevention of heat-related accidents and illnesses due to work should be adopted at a European level to provide certainty to employers and workers.

(4) Heat-related risks at work should be recognised as occupational risks within the meaning of Union occupational safety and health law.

(5) Workplace heat stress is affecting workers across Europe in different manners. The prevention of heat-related risks at work should be based on collective, technical, and organisational measures, in accordance with the hierarchy of prevention, including the adjustment of working time, adequate working environment and proper prevention measures. Stresses that individual resilience training and workplace guidance cannot replace employers' legal obligations to prevent heat-related risks at work.

(6) Employers should ensure that workers' health, dignity and fundamental rights are respected in a changing world of work directly linked to climate factors.

HAVE ADOPTED THIS DIRECTIVE:

CHAPTER I
GENERAL PROVISIONS

Article 1
Subject matter and purpose

1. This Directive lays down the minimum requirements concerning the protection of workers from risks to their safety and health arising or likely to arise from exposure to heat.

2. It establishes binding organisational, technical, structural and participatory obligations for employers in order to protect workers that are or may be exposed to heat stress hazards as a result of their work. Particular attention shall be paid to heat stress in the summer period, especially during heatwaves.

3. This Directive shall be without prejudice to existing or future national provisions which are more favourable to protection of the safety and health of workers at work.

Article 2
Scope

This Directive applies to workers in all sectors of economic activity, both public and private.

Article 3
Definitions

For the purpose of this Directive, the following definitions shall apply:

1. "Workplace heat stress" means a physical hazard that is caused by the following factors, acting alone or in combination:

   (a) Environmental heat, manifested through the combined interaction of increased air temperature/humidity, limited air flow and radiant heat sources.
   (b) Thermal insulation from clothing and Personal Protective Equipment.
   (c) Metabolic heat generated when performing physically tasks.

2. "Physiological strain" means the series of physiological manifestations that occur as a result of internal heat accumulation and an increase in the temperature of the human body.

3. "Wet-Bulb Globe Temperature" or "WBGT" means the index used to estimate the heat stress experienced by a person, which is a function of

environmental parameters. The WBGT index (unit of measurement: °C) is calculated for indoor and outdoor areas using the equations presented in Annex 1. Annex 1 also includes a widely accepted simplified equation for indoor and outdoor use, in cases where only air temperature and relative humidity measurements are available, as well as the calculation of this index for a wide range of temperature and humidity values.

4. "Intensity of work" means the level of physical effort required to perform a work activity, determined according to the worker's average metabolic rate. The different levels of intensity are classified and defined as follow:

   (a) "Light intensity work" means the work involving mild manual activity (using hands or a combination of hands and feet) in a sitting position, driving, light work in a standing position and occasional walking.
   (b) "Moderate-intensity work" means the work involving normal walking with prolonged moderate-intensity activity with the arms and forearms, moderate activity with the arms and legs, moderate activity with the arms and torso or mild pushing and pulling of light loads.
   (c) "High-intensity work" means the work involving intense manual and trunk activity, carrying, shovelling, sawing, pushing and pulling heavy loads and walking at a fast pace.
   (d) "Very high intensity work" means the work involving very intense activity at a fast or maximum rate.

5. "The core of the body" means the part of the human body in which the temperature is relatively constant and relatively homogeneously distributed. It includes the brain and the organs of the trunk (such as the heart, lungs, viscera). Under normal conditions, the temperature of the body's core is 37°C.

6. "Acclimatisation" means the physiological adaptations developed by the human body through gradual exposure to heat exposure, typically combined with physical activity, which reduce physiological strain and the risk of heat-related harm while improving the body's capacity to tolerate heat and perform physical work in hot environments. These adaptations involve adjustments in the body's thermoregulatory systems and functional homeostasis.

7. "Exposure limit value" means internal body core temperature value to protect the health of workers established on the basis of biophysical and biological considerations, in particular on the basis of scientifically well-established short-term and acute direct effects.

8. "Action levels" means operational WBGT levels established for the purpose of simplifying the process of demonstrating the compliance with relevant exposure limit values or, where appropriate, to take relevant protection or prevention measures specified in this Directive. The action levels terminology used in this Directive is as follows: (a) low action levels, which trigger the preventive measure specified in this Directive including,

inter alia, provision of training and personal protection measures, (b) high action levels, which trigger the preventive measure specified in this Directive including, inter alia, complete cessation of work. In between the low and high action levels, different organizational and technical measures are applied.

Article 4
Exposure limit value and action levels

1. For the purposes of this Directive, the exposure limit value and the action levels for workplace heat stress exposure levels are set as follow:

   (a) The exposure limit value shall be a core body temperature of 38°C.
   (b) In order to ensure compliance with the exposure limit value, measurable action levels for acclimatised workers are fixed at:

      i) The high and low action levels in low-intensity work: 32.5°C and 31.0°C WBGT, respectively.
      ii) The high and low action levels in moderate-intensity work: 31.5°C and 28.0°C WBGT, respectively.
      iii) The high and low action levels in high-intensity work: 30.5°C and 27.5°C WBGT, respectively.
      iv) The high and low action levels in very high-intensity work: 30.0°C and 28.0°C WBGT, respectively.

2. When applying the action levels, the worker's actual thermal exposure should take into account the reduction provided by the personal protective equipment that the worker may be using. The impact of such protective equipment on the high and low action levels is presented in Annex 2.

3. When applying the action levels, the determination of the actual exposure of the worker shall take into account the reduction achieved by a possible lack of acclimatisation of the individual to work in the hot environment. This effect of acclimatisation on the high and low action levels shall be taken into account as shown in Annex 3.

4. In accordance with previous points, the high and low action levels are calculated by taking the WBGT for action according to work intensity and correcting it based on the personal protective equipment worn (Annex 2) and the acclimatisation level (Annex 3) of the workers.

5. Based on the final high and low action levels, the working time and the breaks that workers must take to ensure compliance with the exposure limit value are set as follow:

Table 1 **Working time according to the high and low WBGT (°C) action levels***

Time per 60 minutes of working shift			WBGT (°C) based on the intensity of work		
Work (minutes)	Break (minutes)	Low intensity	Medium intensity	High intensity	Very high intensity
Up to 60	Up to 0	31.0	28.0	**	**
" 45	at least 15	31.0	29.0	27.5	**
" 30	" 30	32.0	30.0	29.0	28.0
" 15	" 45	32.5	31.5	30.5	30.0
Complete cessation of work		>32.5	>31.5	>30.5	>30.0

* This table aims to adapt heat production from the human body and therefore to maintain the exposure limit values by dividing working time into work-rest intervals in descending proportions of 100%-0% (continuous work), 75%-25%, 50%-50%, 25%-75%, 0%-100% (cessation or postponement of work), depending on the WBGT value.

** =no high and low action levels of WBGT are provided for continuous or almost continuous high and very high intensity work. In these cases, an accurate assessment of the thermal stress by means of body core temperature measurements of workers during their work is required.

CHAPTER II
OBLIGATIONS OF EMPLOYERS

Article 5
Identification and mandatory assessment of heat-related risks

1. The employer, in response to the obligations contained in Articles 6(3) and 9(1) of Directive 89/391/EEC, shall carry out a mandatory heat risk assessment, including the measurement of the levels of heat stress exposure to which workers are exposed. This assessment shall take into account Article 4 of this Directive and be updated regularly, in particular if there have been significant changes which may render it obsolete, or when the results of health surveillance so require.

2. The methods and devices used shall be suitable for the prevailing conditions. Such methods and instruments must permit the determination of the parameters contained in Article 3 and the checking of exceedances of the values laid down in Article 4.

3. The methods used may include representative sampling of the individual exposure of the worker.

4. In applying this Article, the assessment of the measurement results shall take into account the measurement errors determined by the metrological practice.

5. The assessment of the risks from exposure to heat is an integral part of the written assessment of occupational safety and health risks referred to Article 9(1)(a) of Directive 89/391/EEC, which must be provided by the employer. This assessment shall be updated regularly, in particular if there

have been significant changes which may render it obsolete, or when the results of health surveillance so require.

6. The assessment, measurement and/or calculations referred to in this article shall be planned and carried out by competent services or persons at suitable intervals, taking particular account of the provisions of Articles 7 and 11 of Directive 89/391/EEC concerning the necessary competent services or persons and the consultation and participation of workers. The data obtained from the assessment, measurement and/or calculation of the level of exposure shall be preserved in a suitable form so as to permit consultation at a later stage.

7. The employer shall pay particular attention, when assessing the risks, to the following:

(a) The categories of workplaces in terms of their heat exposure characteristics.
(b) The level, type and duration of exposure, including any exposure to heat.
(c) The exposure limit value and the action levels referred to in Article 4.
(d) Any effects on the health and safety of workers belonging to particularly sensitive risk groups as described in Annex 4.I.
(e) Any effects on the health and safety of workers resulting from heat stress caused by the interactions between environmental parameters (including protective equipment) and the heat generated within the body from metabolic activity due to the intensity of work.
(f) The information on the reduction of body heat dissipation capacity provided by manufacturers of clothing and work equipment on the basis of relevant standards.
(g) The availability of alternative clothing or personal protective and other equipment that has fewer negative effects on the ability to remove heat from the body.
(h) The extension of heat exposure beyond working hours under the responsibility of the employer.
(i) Appropriate information gathered during health surveillance.

Article 6
Measures to prevent or reduce exposure

1. Taking into account technical progress, available risk control measures at the source, as well as local forecasts of meteorological conditions, particularly during heatwaves, the risks arising from heat exposure should be eliminated at the source or, where this is not possible, reduced to a minimum.

The reduction of risks arising from exposure to heat shall be based on the general principles of prevention set out in Directive 89/391/EEC, taking into account in particular the following technical and organisational

measures to be implemented progressively as the applicable action levels are reached, in accordance with the level of heat exposure:

(a) Other working methods and/or equipment that ensure the reduction of either the physical stress of workers or the heat released into the surrounding area and thus reduce the exposure of workers to heat.
(b) Selection of appropriate clothing, taking into account the task(s) performed, which has the least negative impact on the ability to dissipate heat from the body.
(c) The design and layout of premises and workplaces, including appropriate ventilation and/or air conditioning.
(d) Adequate and accessible information and training of workers on the application of preventive measures and early recognition of symptoms for heat-related disease.
(e) Appropriate maintenance of ventilation/air conditioning systems in the workplace.
(f) Adequate hydration strategies, including regular supply of cool water and electrolytes to workers.
(g) Limitation of continuous exposure to direct sunlight by implementing shading systems and providing appropriate personal protective equipment in accordance with applicable legislation, especially in hot weather conditions and where such exposure cannot be avoided.
(h) Mitigation of heat stress by organising work:

i) Limiting the duration and intensity of heat exposure.
ii) Providing an appropriate work schedule which includes adequate rest periods taking into account Article 4(5) of this Directive.
iii) Scheduling the heaviest work at cooler parts of the day during hot periods, if the microclimate of the workplace is directly or significantly affected by the weather conditions.

2. On the basis of the assessment of the risks from heat exposure provided for in Article 5, if exposure exceeds the high action levels, the employer shall draw up and implement a programme consisting of technical and organisational measures to reduce heat exposure, taking into account in particular the measures provided for in paragraph 1. When such measures are insufficient to ensure the safety and health of workers, work shall be suspended.

3. In accordance with Article 8(4) of the Directive 89/391/EEC, in the event of serious, imminent and unavoidable danger caused by extreme heat exposure, workers are entitled to leave their workstation and/or a dangerous area without being placed at any disadvantage because of their action and must be protected against any harmful and unjustified consequences, in accordance with national laws and/or practices.

4. On the basis of the assessment of the risks from heat exposure provided for in Article 5, workplaces where workers are likely to be exposed to heat levels exceeding the high action levels shall be marked with appropriate

and accessible signs where practicable. Such sign will follow the model included in Annex 5. The boundaries of such places shall be defined and access to them shall be restricted where technically feasible and justified by the risk of exposure.

5. Where, due to the nature of the activity, workers have rest areas under the responsibility of the employer, cool, shaded and well-ventilated rest areas shall be provided, including the access to sanitation facilities. The level of ambient heat in these areas shall be reduced to a level compatible with their purpose and conditions of use.

6. Under Article 15 of Directive 89/391/EEC, the employer shall adapt the measures referred to in this article to the requirements of workers belonging to particularly sensitive risk groups, as described in Annex 4.I of this Directive.

Article 7
Personal protective equipment

1. If the risks arising from exposure to heat cannot be prevented by other technical and organisational measures, appropriate personal protective equipment shall be made available to workers and used by them in accordance with the provisions of the legislation in force, subject to the following conditions:

   (a) Where heat exposure reaches the low action levels, the employer shall make personal protective equipment against heat stress available to workers.
   (b) Where heat exposure exceeds the low action levels, the use of personal protective equipment against heat stress is mandatory.
   (c) Personal protective equipment against heat stress is selected in such a way as to prevent or minimise the risk to workers.

2. The employer shall make every effort to ensure the correct use of the means of protection against heat stress and shall be responsible for verifying the effectiveness of the measures taken in accordance with this Article.

Article 8
Limitation of heat exposure

The worker's exposure to heat, as determined in accordance with Article 4 paragraph 1, shall not exceed the exposure limit values. This requirement shall be ensured by compliance with the high action levels.

If, despite the measures taken to implement this Directive, exposures above the high action levels occur, and unless the assessment carried out in accordance with Article 4 shows that the exposure limit values has not been exceeded and that safety risks can be excluded, the employer shall:

1. Take immediate action to reduce workers' exposure to heat,
2. Identify the reasons why the action levels were exceeded, and
3. Modify and/or adapt the protection and prevention measures in order to prevent any recurrence.

Article 9
Worker information and training

Without prejudice to Articles 10 and 12 of Directive 89/391/EEC, the employer shall ensure that workers who are exposed to heat reaching or exceeding the high action levels, and/or their representatives, are provided with accessible information and training on these risks, in particular on:

1. The nature of these risks.
2. The measures taken in application of this Directive to eliminate or minimise the risks arising from heat stress, including the circumstances in which such measures are to be applied.
3. The exposure limit values and action levels provided for in Article 4.
4. The results of the heat assessments and measurements carried out pursuant to Article 5 of this Directive, together with an explanation of their significance and potential risks.
5. The correct use of thermal protection equipment.
6. How to recognise symptoms of heat stress and responding appropriately.
7. The conditions under which workers are entitled to health surveillance and the purpose of such surveillance, in accordance with Article 11 of the present Directive.
8. Safe working practices to minimise heat exposure.

The employer shall ensure that workers from outside undertakings, including those employed by subcontractors, temporary work agencies or other third parties, who are engaged in work in his undertaking and/or establishment and exposed to heat risks, have received appropriate information and instructions concerning those risks, and that the preventive measures provided for in this Directive are applied.

Article 10
Consultation and participation of workers

1. Without prejudice to Articles 11 of Directive 89/391/EEC, workers and workers' representatives shall be consulted and allowed to take part in the assessment and prevention of heat risks at work.

2. Such consultation and participation shall concern, in particular:

   (a) The assessment of the risks from heat exposure and the definition of the measures to be taken, as referred to in Article 5.
   (b) The design, planning and implementation of measures aimed at preventing or reducing the risks arising from exposure to heat, as referred to in Article 6 including training, work schedules and emergency procedures.

(c) The choice of personal protective equipment against heat stress as referred to in Article 7 paragraph 1 point c.
(d) The monitoring and evaluation of the effectiveness of those measures;
(e) The continuous improvement of policies and practices relating to occupational heat risks.

3. Workers and/or their representatives shall be provided with the necessary information, training and means to participate effectively in the process referred to in paragraph 2.

4. Participation shall take place in good time and in a meaningful manner, allowing workers and/or their representatives to contribute to decision-making and the development of appropriate measures.

5. The provisions of this Article shall apply without prejudice to national laws and practices concerning information, consultation and participation of workers.

CHAPTER III
MISCELLANEOUS PROVISIONS

Article 11
Health Surveillance

1. With a view to the prevention and early detection of adverse health effects related to heat stress, appropriate health surveillance shall be ensured for workers expected to be exposed to heat stress risks based on risk assessment and in accordance with Article 14 of Directive 89/391/EEC. Such surveillance shall be proportionate to the risk and carried out at suitable intervals, as determined by national law and practice.

2. The results of health surveillance shall be recorded and stored in accordance with applicable data protection rules. Workers shall have access to their personal medical records and to the results of any laboratory tests.

3. Where heat exposure exceeds the high action levels, the employer shall ensure that the worker(s) concerned are offered appropriate medical examinations in accordance with national law and practice and Article 14 of Directive 89/391/EEC. Such surveillance shall be proportionate to the level and duration of exposure and aimed at the prevention and early detection of adverse health effects.

4. These examinations or surveillance shall take place at times chosen by the employee and any costs incurred shall not be borne by the employee.

Article 12
Derogations

1. In exceptional circumstances and because of the nature of the work, the competent authorities may grant derogations from the provisions of Article 7.

2. In duly justified circumstances, and only for as long as they remain duly justified, the temporary exceeding of the exposure limit values is permitted in specific sectors or for specific activities. For the purposes of this point, 'duly justified circumstances' means circumstances in which the following conditions are met:

   (a) The risk assessment carried out in accordance with Article 4 indicates that the exposure limit value is exceeded.
   (b) Taking into account technical progress, all possible technical and/or organisational measures have been implemented.
   (c) The specific characteristics of the workplace, work equipment or working practices have been taken into account.
   (d) The employer demonstrates that workers continue to be protected from adverse health effects and safety risks, including through the use of comparable, more specific and internationally recognised standards and guidelines.

3. The derogations referred to in paragraphs 1 and 2 shall be granted by Member States after consultation of the two sides of industry in accordance with national laws and practice. Such derogations must be accompanied by conditions which guarantee, taking into account the special circumstances, that the resulting risks are reduced to a minimum and that the workers concerned are subject to increased health surveillance.

CHAPTER IV
ENFORCEMENT, DATA AND SANCTIONS

Article 13
Labour inspections

Members states shall ensure that labour inspection authorities are prepared and duly provided with expertise, training, tools and resources to adequately identify, assess, and investigate heat-related risks.

Article 14
Monitoring and data collection

The European Commission, together with relevant EU agencies and bodies, shall monitor work-related heat risks to workers' health and safety across Members States to assess the effectiveness of this Directive.

Member States shall ensure that records are maintained of occupational accidents and diseases attributable to heat exposure taking into account the list of diseases in Annex 4.II, for statistical purposes and in accordance with Union and national rules on the protection of personal data.

Article 15
Sanctions

Member States are required to establish appropriate sanctions under national law for infringements of legislation adopted pursuant to this Directive. These sanctions must be effective, proportionate and dissuasive.

CHAPTER V
FINAL PROVISIONS

Article 16
Non-regression

Implementation of this Directive shall not be used to lower the level of protection already afforded to workers.

This Directive does not affect Member States' prerogative to maintain or to introduce laws, regulations or administrative provisions that provide greater protection for workers or to allow collective agreements that offer more favourable conditions to workers. This Directive is without prejudice to the full respect for the autonomy of the social partners, as well as their right to negotiate and conclude collective agreements.

Article 17
Transposition

Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive within two years of its entry into force. They shall communicate to the Commission the text of the main measures of national law which they adopt in the field covered by this Directive.

Annex 1
WBGT index – calculation and tables

The Wet-Bulb Globe Temperature (WBGT) estimates the heat stress experienced by a person, which is a function of environmental parameters and the heat generated within the body by metabolic activity. The WBGT (unit of measurement: °C) is calculated by means of equations (1) and (2) which combine three parameters:

a) The natural wet-bulb temperature, which is assessed with a wet-bulb thermometer exposed to thermal radiation and wind.
b) The black globe temperature (known as "globe temperature"), which is evaluated inside a black sphere.
c) The air temperature, which is assessed with a standard thermometer in the shade.

(1) Equation for calculating the WBGT index outdoors (under conditions of direct exposure to solar radiation):
OUTWBGT = 0.7 × (Natural wet bulb temperature) + 0.2 × (Black bulb temperature) + 0.1 × (Air temperature)
(2) Equation for calculating the WBGT index indoors or outdoors in the shade (without direct exposure to sunlight):
INWBGT = 0.7 × (Natural liquid bulb temperature) + 0.3 × (Black bulb temperature)

In cases where only air temperature and relative humidity measurements are available, the simplified equation (3) can be used.

(3) Equation for simplified calculation of the WBGT index (SIMPLIFIEDWBGT). This equation calculates the WBGT for indoor or shaded outdoor (i.e., without direct exposure to solar radiation) settings as well as non-shaded outdoor (i.e., with exposure to direct solar radiation conditions) settings as follows:

SIMPLIFIEDWBGT (indoors or outdoors in the shade) = 0.7 × (air temperature × ATAN(0.151977 × SQRT(relative humidity + 8.313659)) + ATAN(air temperature + relative humidity) - ATAN(relative humidity - 1.676331) + 0.00391838 × relative humidity$^{3/2}$ × ATAN(0.023101 × relative humidity) - 4.686035) + 0.2 × (air temperature + 1.6)) + 0.1 × air temperature

SIMPLIFIEDWBGT (outdoors under direct solar radiation exposure) = 0.7 × (air temperature × ATAN(0.151977 × SQRT(relative humidity + 8.313659)) + ATAN(air temperature + relative humidity) - ATAN(relative humidity - 1.676331) + 0.00391838 × relative humidity$^{3/2}$ × ATAN(0.023101 × relative humidity) - 4.686035) + 0.2 × (air temperature + 7.5)) + 0.1 × air temperature

Note: in the above equations of SIMPLIFIEDWBGT, air temperature is measured in °C, the term ATAN refers to the arctangent and the term SQRT refers to the square root.

The SIMPLIFIEDWBGT is shown in Table 2 for a wide range of temperature and relative humidity.

Table 2 **Calculation of the SIMPLIFIEDWBGT index for a wide range of temperature and relative humidity**

Temperature (°C) \ Relative humidity (%)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
45	27.9	30.0	31.8	33.3	34.6	35.8	36.9	37.9	38.8	39.6	40.5	41.2	42.0	42.7	43.4	44.1	44.7	45.4	46.0	46.6
44	27.2	29.3	31.0	32.5	33.8	35.0	36.0	37.0	37.9	38.7	39.5	40.3	41.0	41.7	42.4	43.1	43.7	44.4	45.0	45.6
43	26.6	28.6	30.3	31.7	33.0	34.1	35.2	36.1	37.0	37.8	38.6	39.4	40.1	40.8	41.5	42.1	42.8	43.4	44.0	44.6
42	25.9	27.9	29.5	30.9	32.2	33.3	34.3	35.2	36.1	36.9	37.7	38.4	39.2	39.8	40.5	41.2	41.8	42.4	43.0	43.6
41	25.2	27.2	28.8	30.2	31.4	32.5	33.5	34.4	35.2	36.0	36.8	37.5	38.2	38.9	39.5	40.2	40.8	41.4	42.0	42.6
40	24.6	26.5	28.0	29.4	30.6	31.6	32.6	33.5	34.3	35.1	35.9	36.6	37.3	37.9	38.6	39.2	39.8	40.4	41.0	41.6
39	23.9	25.8	27.3	28.6	29.8	30.8	31.8	32.6	33.5	34.2	35.0	35.7	36.3	37.0	37.6	38.2	38.8	39.4	40.0	40.6
38	23.3	25.0	26.6	27.8	29.0	30.0	30.9	31.8	32.6	33.3	34.0	34.7	35.4	36.0	36.7	37.3	37.9	38.4	39.0	39.6
37	22.6	24.3	25.8	27.1	28.2	29.2	30.1	30.9	31.7	32.4	33.1	33.8	34.5	35.1	35.7	36.3	36.9	37.5	38.0	38.6
36	22.0	23.6	25.1	26.3	27.4	28.3	29.2	30.0	30.8	31.5	32.2	32.9	33.5	34.1	34.7	35.3	35.9	36.5	37.0	37.6
35	21.3	22.9	24.3	25.5	26.6	27.5	28.4	29.2	29.9	30.6	31.3	31.9	32.6	33.2	33.8	34.4	34.9	35.5	36.0	36.6
34	20.7	22.2	23.6	24.7	25.8	26.7	27.5	28.3	29.0	29.7	30.4	31.0	31.6	32.2	32.8	33.4	33.9	34.5	35.0	35.6
33	20.0	21.5	22.8	24.0	25.0	25.8	26.7	27.4	28.1	28.8	29.5	30.1	30.7	31.3	31.8	32.4	33.0	33.5	34.0	34.6
32	19.4	20.8	22.1	23.2	24.1	25.0	25.8	26.6	27.2	27.9	28.5	29.2	29.7	30.3	30.9	31.4	32.0	32.5	33.0	33.6
31	18.7	20.1	21.3	22.4	23.3	24.2	25.0	25.7	26.4	27.0	27.6	28.2	28.8	29.4	29.9	30.5	31.0	31.5	32.0	32.6
30	18.0	19.4	20.6	21.6	22.5	23.4	24.1	24.8	25.5	26.1	26.7	27.3	27.9	28.4	29.0	29.5	30.0	30.5	31.0	31.6
29	17.4	18.7	19.9	20.9	21.7	22.5	23.3	23.9	24.6	25.2	25.8	26.4	26.9	27.5	28.0	28.5	29.0	29.5	30.0	30.6
28	16.7	18.0	19.1	20.1	20.9	21.7	22.4	23.1	23.7	24.3	24.9	25.4	26.0	26.5	27.0	27.5	28.1	28.6	29.1	29.5
27	16.1	17.3	18.4	19.3	20.1	20.9	21.6	22.2	22.8	23.4	24.0	24.5	25.0	25.6	26.1	26.6	27.1	27.6	28.1	28.5
26	15.4	16.6	17.6	18.5	19.3	20.0	20.7	21.3	21.9	22.5	23.0	23.6	24.1	24.6	25.1	25.6	26.1	26.6	27.1	27.5
25	14.8	15.9	16.9	17.7	18.5	19.2	19.9	20.5	21.0	21.6	22.1	22.7	23.2	23.7	24.1	24.6	25.1	25.6	26.1	26.5
24	14.1	15.2	16.1	17.0	17.7	18.4	19.0	19.6	20.2	20.7	21.2	21.7	22.2	22.7	23.2	23.7	24.1	24.6	25.1	25.5
23	13.5	14.5	15.4	16.2	16.9	17.6	18.2	18.7	19.3	19.8	20.3	20.8	21.3	21.8	22.2	22.7	23.1	23.6	24.1	24.5
22	12.8	13.8	14.7	15.4	16.1	16.7	17.3	17.9	18.4	18.9	19.4	19.9	20.3	20.8	21.3	21.7	22.2	22.6	23.1	23.5
21	12.1	13.1	13.9	14.6	15.3	15.9	16.5	17.0	17.5	18.0	18.5	18.9	19.4	19.8	20.3	20.7	21.2	21.6	22.1	22.5
20	11.5	12.4	13.2	13.9	14.5	15.1	15.6	16.1	16.6	17.1	17.6	18.0	18.5	18.9	19.3	19.8	20.2	20.6	21.1	21.5
19	10.8	11.7	12.4	13.1	13.7	14.2	14.8	15.3	15.7	16.2	16.6	17.1	17.5	17.9	18.4	18.8	19.2	19.6	20.1	20.5
18	10.2	11.0	11.7	12.3	12.9	13.4	13.9	14.4	14.8	15.3	15.7	16.1	16.6	17.0	17.4	17.8	18.2	18.7	19.1	19.5
17	9.5	10.3	10.9	11.5	12.1	12.6	13.1	13.5	14.0	14.4	14.8	15.2	15.6	16.0	16.4	16.9	17.3	17.7	18.1	18.5
16	8.9	9.6	10.2	10.8	11.3	11.8	12.2	12.6	13.1	13.5	13.9	14.3	14.7	15.1	15.5	15.9	16.3	16.7	17.1	17.5
15	8.2	8.8	9.4	10.0	10.5	10.9	11.4	11.8	12.2	12.6	13.0	13.4	13.7	14.1	14.5	14.9	15.3	15.7	16.1	16.5

Annex 2
Inclusion of personal protective equipment in the determination of the WBGT index

For the determination of the actual WBGT index the employer must take into account the effect of the personal protective equipment that the worker may be wearing. The impact of personal protective equipment on the high and low action levels shall be accounted for as presented below:

1. Typical single-level workwear made of woven fabrics or full-face coveralls made of treated cotton woven fabrics or single-level coveralls made of polypropylene non-woven fabrics: reduction of the high and low action levels by 0°C WBGT.
2. Single-ply polyethylene full body coveralls without weave: reduction of the high and low action levels by 2°C WBGT.
3. Two-layer workwear made of woven fabrics: reduce the high and low action levels by 3°C WBGT.
4. Full-face coveralls and additional long vapour and chemical protection apron with long sleeves: reduction of the high and low action levels by 4°C WBGT.
5. Single-level hoodless full-face coveralls with protection against vapours and chemicals: reduction of the high and low action levels by 10°C WBGT.
6. One-level full body hooded overalls with vapour and chemical protection: reduction of the high and low action levels by 11°C WBGT.
7. Two-layer workwear with hoodless coveralls with vapour and chemical protection over workwear: reduction of the high and low action levels by 12°C WBGT.
8. Workwear that includes a headgear of any fabric: reduction of the high and low action levels by 1°C WBGT in addition to the reduction indicated above for each item of workwear.

Note: Given the evolving nature of PPE technologies, these values should be subject to periodic review and updating as further robust evidence becomes available.

Annex 3
Inclusion of heat acclimatisation for the determination of the WBGT index

The determination of the worker's actual exposure shall take into account the reduction of the action levels caused by a possible lack of acclimatisation of the worker to the hot environment. This effect of acclimatisation on the high and low action levels shall be taken into account as shown below:

1. Workers who in the previous 15 days have performed 12 or more 8-hour shifts working in the environmental conditions under investigation: no reduction to the high and low action levels.
2. Workers who in the previous 15 days have not performed 12 or more 8-hour shifts of work in the environmental conditions under investigation: reduction of the high and low action levels by 2.5°C WBGT.

Annex 4

I. Risk factors for occupational heat illnesses/injuries

Risk factors for heat-related illnesses/injuries due to workplace exposure include: 1) lack of acclimatisation to heat, 2) low physical fitness, 3) dehydration, 4) advanced age, 5) high body mass index, as well as 6) certain underlying conditions/diseases and 7) certain medications.

Table 3 presents individual, environmental and pharmaceutical factors as well as pathological conditions that predispose to heat-related illnesses/injuries due to workplace exposure. These injuries can occur even in low-risk individuals who implement appropriate heat exposure mitigation procedures. The table shows that there may be factors that make some workers inherently more vulnerable on a particular day.

Table 3 **Factors that predispose to heat-related illnesses/injuries due to workplace heat exposure**

Individual factors	Environmental factors	Drugs / Medications	Health conditions
• Pregnancy • Disability • Lack of heat acclimatization • Low physical fitness • Hypohydration • Advanced age • High body mass index • Limited work experience	• Heavy/impermeable clothing • Physical work/ exercise • Heatwave • High temperature • High relative humidity • Little air movement • Sources of radiant heat (sun and/or machinery)	• Antiepileptic, antipsychotic and neuroleptic drugs, tricyclic antidepressants, amphetamines, cocaine, "ecstasy" • Anticholinergic substances • Heart and antihypertensive drugs: (diuretics, nitrites, vasodilators and calcium ion channel blockers) • Hormones (including insulin) • Alcohol • Ergogenic stimulants	• Acute illness (e.g., inflammation with fever, gastroenteritis) • Diseases of the central nervous system and mental illnesses • Cardiovascular diseases • Malignant hyperthermia • Diabetes mellitus • Kidney diseases • Skin rash, sunburn and/or previous burns on large skin areas • Hemoglobin diseases (sickle cell anemia) • Chronic liver diseases • Chronic respiratory diseases

II. Diseases and health problems associated with occupational heat stress

The list of diseases to be considered within the scope of this Directive is the latest version of the International Classification of Diseases (ICD-11) published by the World Health Organization.

Annex 5
Indication of workplaces where workers may be exposed to heat levels exceeding the high action levels