BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure	NUMBER **IH101550**
	REVISION **FINAL Rev 2**
SUBJECT: **Heat Stress Monitoring at Remote Sites** **Using the Questemp 15 Area Heat Stress Monitor**	DATE **05-17-07**
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Contents

1.0 Purpose/Scope

This procedure provides a standardized method for the operation of the *Questemp 15* Area Heat Stress Monitor at a single site which is not represented by the SHSD Site-Wide Heat Stress Notification system such as:

- Work in artificially elevated heat situations such as near ovens and other large heat sources. Exposure monitoring for workers near heat sources should be done using a *Questemp15* placed in the local environment of these workers.
- Indoor work. Exposure monitoring for workers in indoor areas should be done by a *Questemp15* placed in the local environment of these workers.

The *Questemp 15* provides a method to survey the workplace heat stress exposure to outdoor workers in typical work clothing (long pants and short sleeve shirt of cotton or cotton blend). The area monitoring data is not representative of work while wearing moisture resistant protective clothing such as Tyvek or "PCs". Exposure monitoring for workers in PPE should be done via *IH10160 Personal Dosimetry for Heat Stress.*

2.0 Responsibilities

2.1 Use of the *Questemp 15* shall be limited to persons who act under the direction of a

competent hazard assessment person and have demonstrated the competency to satisfactorily use the meter, as evidenced by experience and training, to the satisfaction of their supervision or existing qualification criteria set by their organization.

2.2 Personnel that perform exposure monitoring with this instrument are responsible to follow all steps in this procedure.

3.0 Definitions

3.1 *Wet Bulb Globe Temperature (WBGT):* a measure of ambient heat that factors in the influence of wind speed and relative humidity to estimate the risk to workers from heat stress illnesses.

3.2 *Occupational Exposure Limit (OEL):* The maximum time weighted average (TWA) exposure permitted for employee exposure, based on the less of the OSHA Permissible Exposure Limits (PEL) [none published] or ACGIH Threshold Limit Value (TLV). The ACGIH WBGT serves as the BNL OEL.

4.0 Prerequisites

4.1 **Training prior to using this meter:** Demonstration of proper operation of this instrument to the satisfaction of the employee's supervision.

4.2 **Area Access for special monitoring projects at hazardous work sites**:

4.2.1 Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas if required.

4.2.2 Verify with the appropriate Facility Support Representative or Technician if a Work Permit or Radiological Work Permit is needed or is in effect. If so, review and sign the permit.

4.2.3 Use appropriate PPE for area.

5.0 Precautions

5.1 Hazard Determination:

5.1.1 The operation of this meter does not cause exposure to any chemical, physical, or radiological hazards. The meter design does not cause significant ergonomic concerns in routine use. The meter does not generate Hazardous Waste.

5.2 **Personal Protective Equipment:** No PPE is needed to operate this equipment. Appropriate PPE may be needed based on the area being entered. Check with the FS Representative.

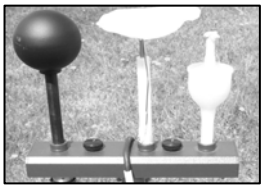
6.0 Procedure

6.1 Equipment:

- Meter Body
- Battery (9 volt alkaline)
- Temperature Sensing Head
- Data Cable
- Printer Cable
- Computer
- Printer
- Bottle with Distilled or De-ionized Water

Meter Body

Temperature Sensing Head



Globe / Dry Bulb / Wet Bulb Thermometers

6.2 **Placement of equipment:**

6.2.1 Electronic warm-up is not required for this meter.

6.2.2 The sensor head should be placed in the environment for 15 minutes before logging data so that the thermometers can equilibrate with that area.

6.2.3 Place the sensor head at shoulder height (on a tripod) in a location that will not be in the shade for the entire sampling period and is not sheltered from the prevailing winds.

6.2.4 Connect the meter sensor head to the meter body via the appropriate data cable or directly into the top of the meter.

6.2.5 **Water to thermometers:** Add distilled or de-ioninzed water to the wick of the wet bulb thermometer before use. Check it at least every two hours and add when no pooled liquid is visible.

6.3 **Operation of the Questemp 15**

6.3.1 Turning the meter on: Press the <On/Off> button on the meter.

6.3.2 Clear the memory by holding the <Reset> button for the 3-2-1-0 count down. The Meter then displays "- - -".

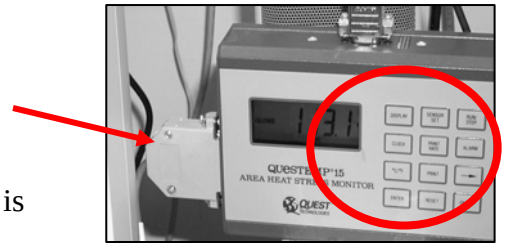
6.3.3 Press <Run/Stop>. Data now logs automatically.

6.4 **Recording readings:**

6.4.1 Use the BNL Heat Stress Record Instrument Form (or logger printout) to record readings.

6.4.2 If data logging was used, connect meter to a printer via the data port on the left side.

6.4.3 Activate printing by pressing <Print> and <Enter>. If nothing prints, double click <Print> and use the < → > until "PrII" is displayed, then press <enter>.



6.4.4 After data is printed out, clear the memory for next day by holding the <Reset> button for the 3-2-1-0 count down. The Meter then displays "- - -".

6.5 Return meter and original sampling form to the SHSD IH Laboratory daily (or at the end of each project as agreed to by the IH Equipment Custodian).

6.6 Send a copy of any hazard evaluation report written on the survey to the IH Laboratory and the Occupational Medicine Clinic.

7.0 Implementation & Training

Training prior to using this meter:

7.1 Demonstration of proper operation of this instrument to the satisfaction of the employee's supervision.

7.2 A record of qualification will be maintained on an equivalent of Attachment 9.3.

7.3 Personnel shall re-qualify on at least a three year basis.

8.0 References

8.1 BNL Subject Area Natural Hazards in the Environment

8.2 ACGIH American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

9.0 Attachments

9.1 BNL Heat Stress Notification Levels
9.2 Example of a Print-out from the meter
9.3 Heat Stress Survey Form
9.4 Job Qualification form

10.0 Documentation

Document Development and Revision Control Tracking		
PREPARED BY: *(Signature and date on file)* **R. Selvey** **Author** **Date 05/03/01**	**REVIEWED BY:** *(Signature and date on file)* **R. Wilson** **SHSD IH Group** **Date 05/08/01**	**APPROVED BY:** *(Signature and date on file)* **R. Selvey** **SHSD IH Group Leader** **Date 05/08/01**
ESH Coordinator/ Date: *none*	Work Coordinator/ Date: *none*	SHSD Manager / Date *none*
QA Representative / Date: *none*	Training Coordinator / Date: *none*	Filing Code: **IH52**
Facility Support Rep. / Date: *none*	Environ. Compliance Rep. / Date: *none*	Effective Date: **05/08/01**
ISM Review - Hazard Categorization ☐ High ☒ Moderate ☐ Low/Skill of the craft	Validation: ☐ Formal Walkthrough ☐ Desk Top Review ☐ SME Review Name / Date:	Implementation: Training Completed: Tracked in BTMS Procedure posted on Web: 05/17/07 Hard Copy files updated: 05/17/07 Document Control on forms: 05/17/07

Revision Log

Purpose: ☐ Temporary Change ☐ Change in Scope ☐ Periodic review ☒ Clarify/enhance procedural controls

Changed resulting from: ☐ Environmental impacts ☐ Federal, State and/or Local requirements ☐ Corrective/preventive actions to non-conformances ☒ none of the above

Section/page and Description of change: Updated format to Section 7 Implementation and Training. Added guidance on printing. Revised Attachment 9.3. Added Attachment 9.4

Robert Selvey 05/18/04 *(signature on file)* SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

Purpose: ☐ Temporary Change ☐ Change in Scope ☒ Periodic review ☐ Clarify/enhance procedural controls

Changed resulting from: ☐ Environmental impacts ☐ Federal, State and/or Local requirements ☐ Corrective/preventive actions to non-conformances ☒ none of the above

Section/page and Description of change: Revise format of Section 10. Added document control features to Attachment 9.3 and 9.4. Full review, not other changes except minor text improvements were needed.

R. Selvey 05/17/07 (signature on file) SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

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(signature on file) SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

Attachment 9.1

BNL Heat Stress Notification Levels

Based on 2001 Adopted ACGIH WBGT Screening Criteria (Wet Bulb Globe Temperature) (°C) °F								
Work-Rest Regimen (each hour)	**Work Load**							
	Light		**Moderate**		**Heavy**		**Very Heavy**	
	Unac-climated	Acclimated	Unac-climated	Acclimated	Unac-climated	Acclimated	Unac-climated	Acclimated
Continuous Work	(27.5) 81.5	(29.5) 85.1	(25) 77	(27.5) 81.5	(22.5) 72.5	(26) 78.8	----	----
75% Work - **25% Rest**	(29) 84.2	(30.5) 86.9	(26.5) 79.7	(28.5) 83.3	(24.5) 76.1	(27.5) 81.5	----	----
50% Work - **50% Rest**	(30) 86	(31.5) 88.7	(28) 82.4	(29.5) 85.1	(26.5) 79.7	(28.5) 83.3	(25) 77	(27.5) 81.5
25% Work - **75% Rest**	(31) 87.8	(32.5) 90.5	(29) 84.2	(31) 87.8	(28) 82.4	(30) 86	(26.5) 79.7	(29.5) 85.1

Attachment 9.2

Example of a Print-out from the Questemp 15 meter.

QUEST TECHNOLOGIES
QUESTEMP 15 WBGT AREA HEAT STRESS MONITOR

Software Version Number: 1.9 Serial Number: KL8060025

Name:

Location:

Date: 12-JUN-1
Start Time:09:25:49 End Time:09:27:42 Total Run Time:00:01:54

Alarm Level Setting - Sensor Set #1 WBGT OUT: 199.8 degree C
Print Rate: 10 minute

WBGT CUSTOM: 0.70 WB + 0.20 GLOBE + 0.10 DB

SENSOR SET # 1

	HIGH TEMP	TIME	LOW TEMP	TIME	AVG. TEMP
WET BULB	67.1	09:27	66.2	09:26	66.4
DRY BULB	73.4	09:27	72.5	09:26	72.7
GLOBE	95.4	09:25	92.8	09:27	93.9
WBGT IN	75.2	09:25	74.5	09:26	74.7
WBGT OUT	72.9	09:25	72.3	09:26	72.5
WBGT CUSTOM	72.9	09:25	72.3	09:26	72.5

TIME	WET	DRY	GLOBE	WBGT_I	WBGT_O	WBGT_C	ALARM
09:25	66.4	73.0	95.4	75.1	72.8	72.8	

BROOKHAVEN NATIONAL LABORATORY
SAFETY & HEALTH SERVICES ION DIVISION

HEAT STRESS ALERT
FIELD MONITORING & ALERT CHECKLIST

DATE:	SURVEYOR(S):

I. AREA INFORMATION

DEPT: **HP**	BLDG: **120**	ROOM: **OUTDOORS: EAST OF BUILDING**
SOURCE: **AMBIENT AIR TEMPERATURE**		
ENGINEERING CONTROLS: **HEAT STRESS ALERT NOTIFICATION MADE IF SET POINT EXCEEDED**		

II. SURVEY INSTRUMENT INFORMATION

INSTRUMENT: **QUEST ELECTRONICS**	MODEL: **QUESTEMP 15**	SERIAL#: **KL 2060001 or KL 8060025**
FACTORY CALIBRATION DATE:	PRE-CAL: n/a BY: n/a	POST CAL: n/a BY: n/a

III. SAMPLING INFORMATION & RESULTS

HAZARD: HEAT STRESS	UNITS: DEGREE F (C) WBGT	CORRECTION FACTOR: N/A

_____See attached printout or record below

TIME	WBGT-OUT (°F) (OUT)	WB	DB	GL	COMMENTS (Sun/ Clouds/ Wind)

Return completed form to: IH Lab, Building 120

FILE CODE: IH101500- Attachment 9.4 05/08/01

Heat Stress Remote Monitoring-

Using the Questemp 15 Area Heat Stress Monitor

Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:

Evaluation Practical Skill Evaluation: Demonstration of Methodology

Criteria	Qualifying Performance Standard		Unsat.	Recov.	Satisf.
1. Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.				
2. Pre-Testing Inspection	Verifies the system to be used for monitoring is operational and in calibration.				
3. Measurement of hazard	Knows how to properly measure employee exposure to hazardous heat stress levels.				
4. Operating Parameters	**Set up of meter,** Demonstrated how to: • Place the meter outdoors • Add water to thermometer				
	Downloading of Data Demonstrated how to: Printout hardcopy of monitoring data				
5. Documentation	Demonstrates correctly filling out IH monitoring forms.				

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:

I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date: