

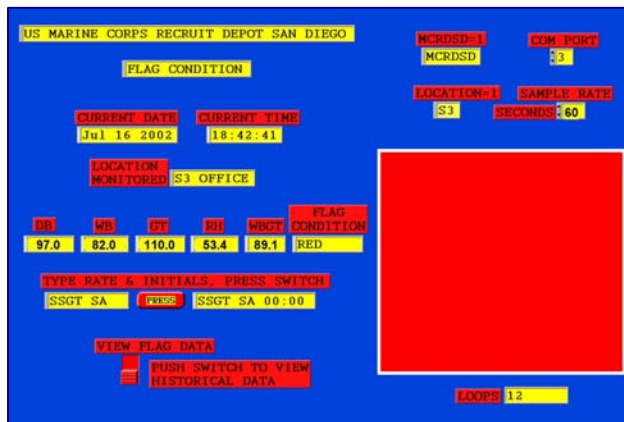
AUTOMATION OF SHORE INSTALLATION HEAT STRESS MONITORING AT NAVAL STATION ROTA SPAIN

Whether ashore or afloat, conditions of high heat and humidity can be found at U.S. military bases in many regions worldwide. High heat and humidity can make [heat stress](#) a serious health concern. When the body is no longer able to regulate its internal temperature through evaporating sweat, heat-related illness, which could become life-threatening, may result.

Chapter B-2 of the Navy Safety & Occupational Health Program for Forces Afloat, OPNAV Instruction 5100.19E, identifies the shipboard requirement for the Navy's heat stress prevention program. In order to determine the length of time it is safe for an individual to work under high heat stress conditions (i.e., to prevent or reduce the severity of developing a heat illness), the Navy measures heat and humidity using a [Wet Bulb Dry Globe Temperature](#) (WBGT) meter. The WBGT meter mathematically integrates measurements of air temperature, humidity, and radiant heat into a single value known as the WBGT Index.

A combined Naval Health Research Center (NHRC) and Naval Sea Systems Command Smart Ship initiative simplified the process of monitoring heat stress conditions on board Navy ships (see related success story at <http://www.safetycenter.navy.mil/success/stories/0-50/0033.pdf>). A new meter, the Automated Heat Stress System (AHSS) WBGT Unit, has been installed on DDG Class and other ships for several years now. The new meter continuously records ambient dry/wet bulb temperatures, radiant heat globe temperature, and relative humidity to calculate the WBGT.

This real-time data is then passed to a personal computer, which graphically documents the WBGT environmental conditions and automatically identifies the appropriate exposure time guidance.



AHSS real-time data is passed to a personal computer which graphically documents WBGT hazard warning "Flag conditions"

In 2002 NHRC developed a shore version of the AHSS mounted in a wood cabinet. Using the same technology as the shipboard AHSS, the shore unit monitors "Flag Condition" on Navy/Marine Corps shore commands

that meet the heat stress prevention requirements of the Manual of Naval Preventive Medicine (NAVMED-P5010) and the Marine Corps Heat Injury Prevention Program (MCO 6200.1E). Hazard warning “Flag Conditions” range from none to black flag for imminently dangerous ambient heat stress.

Specific Navy/Marine Corps Heat Flag Warnings are:

WHITE/No Flag

When the WBGT index is less than 80, extremely intense physical exertion may precipitate heat exhaustion or heat stroke, therefore, caution will be taken.

Green Flag

When the WBGT index is between 80 and 84.9, discretion is required in planning heavy exercise for non-acclimatized personnel (i.e., new to the heat stress area; environmental physiological heat acclimatization can typically take one to two weeks). This is a marginal heat stress limit for all personnel.

Yellow Flag

When the WBGT index is between 85 and 87.9, strenuous exercise and activity will be curtailed for new and non-acclimatized personnel during the first three weeks of heat exposure. Outdoor classes in the sun will be avoided when the WBGT index exceeds 85.

Red Flag

When the WBGT index is between 88 and 89.9, strenuous exercise will be curtailed for all personnel with less than 12 weeks of living and working in hot weather.

Black Flag

When the WBGT index is 90 or above, strenuous, nonessential outdoor physical activity will be suspended for all personnel. All reasonable efforts should be made to reschedule these activities during cooler periods of the day.

At U.S. Naval Station, Rota Spain hot summer temperatures can present community health risks to workers and family members alike. In past years, the Industrial Hygiene Department at Naval Hospital (NH) Rota manually collected WBGT data. The procedure was performed hourly during the summer season using the departments’ traditional WBGT heat stress meter mounted on a tripod to monitor Flag Condition guidance. The extremely labor-intensive effort required setting up and



Traditional “wet wick” WBGT meters used by Rota’s IH Department were manually labor-intensive.

taking down the unit each work day, keeping its wet bulb sensor continually saturated for accurate readings, and someone to physically read the data and record it. The recorded data was then posted to the hospital's internal local area network intranet webpage to advise staff and community members about current heat stress threat conditions.

Upon learning of the AHSS cabinet arrangement, Mr. David Hiipakka of the NH Rota Industrial Hygiene Department turned to the Navy Mishap Prevention and Hazard Abatement (MPHA) Program. The MPHA Program established by Chief of Naval Operations (CNO) and managed by the Naval Facilities Engineering Command (NAVFAC) was created to assist activities to fund safety abatements beyond their local funding capability. This program is a very progressive effort by NAVFAC to dedicate extraordinary funding each fiscal year for the specific purpose of abating safety and health hazards with price tags above what local installation budgets can afford.



Mr. Jay Heaney (left), Environmental Physiologist from NHRC San Diego explains the function and theory of an AHSS heat stress monitoring station installed aboard the NH Rota campus to Mr. David Hiipakka from Rota's Industrial Hygiene Office.

Working together with NAVFAC MPHA Project Manager Ms. Glenna Humphrey and the Naval Health Research Center AHSS Environmental Physiologist Mr. Jay Heaney, Mr. Hiipakka successfully solicited funding to purchase and install two AHSS units for the Rota Naval base. One unit was located on the hospital campus, and the other outside the base's Fitness Center.



NAVSTA, Rota AHSS unit #2 deployed to the base Fitness Center for staff and patron awareness of ambient heat stress warning conditions in real-time.

Acceptance of the AHSS units at the Rota Naval base was immediate. The Fitness Center staff posts the respective heat stress warning flag (white, green, yellow, red, or black) on the main entrance to the gym for all members to see before they begin their summer work out regimens.

At the hospital, Mr. Frank Polhaus of the Information Technology Department went a step further and via a complicated, dedicated ADSL modem line was able to post the real time Heat Stress Flag warning on NH Rota's external non-restricted public webpage. The posted warning flag allows any community member to instantly consult outdoor ambient heat stress risk conditions and make informed decisions when planning club, family, or personal outdoor summer activities.

The screenshot shows the homepage of the U.S. Naval Hospital Rota, Spain. The main heading reads "WELCOME to U. S. Naval Hospital Rota, Spain". To the left is the hospital's logo, which includes the American and Spanish flags and a central emblem. Below the logo are the US and Spanish mailing addresses and telephone numbers. On the right, there is a "Travelers Tips" section with the text "En route to Naval Hospital Rota, Spain" and a "Request a Sponsor" link. A photograph of the hospital building is in the center. Below the photo, a "Heat Stress" warning is displayed, consisting of a green flag icon and the text "Heat Stress" and "Last Update: 2009-08-24 15:58:00". This warning is circled in red. To the right of the photo is an "H1N1 Flu Info" section with links to "U.S. Info", "Things You Can Do", "Plan & Prepare", and "International Info", along with "HHS.gov" and "CDC.gov" links. The bottom of the screenshot shows a Windows taskbar with several open applications, including "U.S. Nav...", and a search bar.

Heat Stress Flag warning is posted in real time on Naval Hospital Rota Spain's external non-restricted public webpage.

Naval Hospital Rota is proud of its opportunity to assist our military and civilian families to stay healthy during the summer months in Rota. For further information, please contact: David Hiipakka, MPH, CIH, NH Rota Industrial Hygiene Department; Telephone: 011 34 956 82-2783; Email: david.hiipakka@med.navy.mil