



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY DEVELOPMENTAL TEST COMMAND
314 LONGS CORNER ROAD
ABERDEEN PROVING GROUND, MD 21005-5055

MAR 19 2007

CSTE-DTC-TM-S

MEMORANDUM FOR US Army Rapid Equipping Force (REF) (VCFA-REF/Mr. John Spillman), 10236 Burbeck Road, Fort Belvoir, VA 22060-5820

SUBJECT: Safety Confirmation for the Gaco Western Polyfoam™ System 193 (GWPS-193) in Support of Rapid Equipping Force Issue

1. References.

a. Email, US Army Test and Evaluation Command (ATEC), Mr. Joseph Hall, 29 Jan 07, subject: RE: Request for ATEC Help on External Spray Foam Demo.

b. Document, Material Safety Data Sheet Polyfoam A & B, Gaco Western, Inc., Nov 05.

c. Document, Product Data Sheet Gaco Western Polyfoam™ System 193, Gaco Western, Inc., Dec 05.

d. Document, Product Data Sheet Gacoflex A-30 Fast Dry, Gaco Western, Inc., Jul 04.

e. Document, GW-3 Safety and Storage for Coatings, Gaco Western, Inc., undated.

f. Document, Spray Guide- Polyfoam, Gaco Western, Inc., undated.

g. Memorandum, US Army Center for Health Promotion and Preventive Medicine (CHPPM), MCHB-TS-OHH, 6 Mar 07, subject: Toxicity Clearance for the GACO Western PolyFoam™ System 193, 8 Mar 07.

h. Test Report, Exponent®, Inc., 12 Mar 07, Tent Foam Insulation Report (W9124Q-06-F-1204).

2. Purpose. To provide a US Army Developmental Test Command (DTC) Safety Confirmation in support of Rapid Equipping Force issue. US Army personnel deployed around the world are living and working in tents and shelters, to include extremely hot and cold environments. These structures are very hard to heat or cool due to their poor insulation characteristics. Adding polyfoam to these structures greatly enhances the insulation properties of tents and shelters, thus greatly reducing the cost and energy resources required to heat and cool these structures.

3. System Description. GWPS-193 is a Commercial Off-The-Shelf (COTS) item that has been developed to provide improved insulation of military tent systems over current capabilities. The system consists of a Hydrofluorocarbon (HFC) blown, zero-ozone depleting liquid spray that cures to a low-density rigid Polyurethane (PU) insulation material, and is applied to clean dry substrates in temperatures down to 35°F (1.66 °C). Once the spray foam is applied it is allowed to cure into a barrier approximately two

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inches thick. Finally, a topcoat of GacoFlex™ A-30 acrylic elastomeric coating is applied to provide enhanced protection against environmental conditions. At this point the tent or shelter becomes a semi-permanent structure that remains in place and cannot be relocated for other uses. GWPS-193 was developed by GACO Western, LLC and is intended to be applied to the exterior surface of military tents and shelters by contractor personnel. Soldier involvement will be limited to occupation of the spray foamed tents and shelters after the system is applied and cured. The PU foam used in the system contains material derived from naturally renewable resources and does not contain Chlorofluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs) or other gases harmful to the environment.

4. Evaluation Limiting Factors. No testing of the GWPS-193 has been conducted by the Developmental Test Command (DTC).

5. Evaluation Results. This Safety Confirmation is based on the information provided in references 1a through 1g. A Toxicological Clearance has been issued by CHPPM. Potential safety hazards identified are summarized below. Risk Assessment Codes (RAC) were assigned in accordance with the guidance given in AR 385-16, System Safety Engineering Management. The definitions from MIL-STD-882D, Standard Practice for System Safety, were used to assign the severity.

a. Application specifications and procedures. The GWPS-193 system should be applied by qualified, experienced spray applicator personnel only. Attempts to apply the material by unqualified personnel may result in injury or damage to equipment. This hazard is assigned a RAC of Critical-Frequent (II-A, HIGH Risk). If contractor support is provided by the manufacturer and no application, clean-up, or storage operations are performed by military personnel this hazard may be mitigated to a RAC of Critical-Improbable (II-E, LOW Risk).

b. Inhalation of spray foam mists or vapors during spray application. Inhalation of spray foam mist or vapors by unprotected personnel in the area during spray application operations can produce severe irritation of lungs and nasal passages. Excessive exposure to spray foam vapors may also produce serious and possibly irreversible pulmonary injury. This hazard is assigned a RAC of Critical-Probable (II-B, HIGH Risk). This hazard can be mitigated to a RAC of Critical-Improbable (II-E, LOW Risk) by ensuring that no unprotected personnel are in the designated work area during spraying operations and by constructing windbreaks to prevent vapors or mists from drifting outside of the designated spraying work area. Any personnel within the designated spraying area should wear an approved respirator to filter out hazardous vapors and mists.

c. Flammability. Based on results of the Exponent® safety testing, the fire risk associated with a foam insulated tent is increased for an interior fire scenario, but decreased for an exterior fire scenario when compared to a non-insulated tent. Consequently this hazard is assigned a RAC of Catastrophic-Remote (I-D, HIGH Risk). This hazard can be mitigated to a RAC of Catastrophic-Improbable (I-E, MEDIUM Risk) if the following procedures are implemented:

- (1) Fixed smoke alarms are installed in the tent.

(2) Portable fire extinguishers are permanently positioned inside the tent and regularly inspected to ensure they have not lost their charges.

(3) Electrical appliances are located away from the exterior walls and receive plenty of ventilation.

(4) Light fixtures are shielded to prevent contact with exterior walls.

(5) Power receptacles are located on the floor and not on the walls.

(6) Use of supplemental radiant heaters is monitored and heaters are located away from tent walls and receive plenty of ventilation.

d. Air exchange rates. Contractor testing, reference 1h, indicates the rate of air infiltration into foam insulated tents is significantly lower than that of noninsulated tents and is not sufficient for acceptable indoor air quality. This hazard is assigned a RAC of Critical-Probable (II-B, HIGH Risk). This hazard may be mitigated to a RAC of Critical-Improbable (II-E, LOW Risk) if a CO₂ sensor is installed in the tent and a Heating Ventilation Air Conditioning (HVAC) system is used with the tent and is modified to ensure fresh (makeup) air is introduced into the HVAC systems return air supply.

e. Storage of spray foam component containers. Both A and B components of the GWPS-193 foam contain volatile ingredients and their containers should be kept away from caustic solutions, tertiary ammonia compounds, and water, to prevent rapid polymerization and accompanying generation of heat and gasses. Dangerous pressures may also develop over time in closed containers. This hazard is assigned a RAC of Marginal-Occasional (III-C, MEDIUM Risk). This hazard may be mitigated to a RAC of Marginal-Improbable (III-E, LOW Risk) if the containers are tightly sealed and stored indoors at 64°F - 86°F (18°C to 30°C); not stored in direct sunlight; and the containers are opened carefully, allowing any built-up pressure to be relieved slowly and safely.

f. Spray foam thickness. The fast, exothermic reaction of spray foam curing can cause sufficient heat buildup to scorch or ignite the Spray foam when applied in thickness over two inches deep. This hazard is assigned a RAC of Marginal-Occasional (III-C, MEDIUM Risk). This hazard may be mitigated to a RAC of Marginal-Improbable (III-E, LOW Risk) if the spray foam is not applied in a thickness greater than two inches in a single application and allowed to fully cure before allowing military personnel into the work areas.

6. Conclusions and Recommendations. Hazards identified in paragraph 5 should be eliminated or controlled to an acceptable level. If the hazards are not eliminated or controlled to an acceptable level, the residual hazard must be accepted by the appropriate risk acceptance authority in accordance with Army Regulation (AR) 385-16, Decision Authority Matrix. The technical or operational limitations or precautions identified herein, needed to prevent injury and property damage during operation, are the responsibility of the Program Manager (PM). To permit revision of this Safety Confirmation, all design changes effected by the PM to reduce or eliminate hazards identified above will be verified and validated as acceptable through analysis or testing.

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7. The DTC point of contact is Mr. Chris Addison, CSTE-DTC-TM-S, chris.addison@dtc.army.mil, DSN 298-1405 or Commercial 410-278-1405. An alternative point of contact is Mr. Russell Kilbane, CSTE-DTC-TM-S, russell.a.kilbane@dtc.army.mil, DSN 298-1048 or Commercial 410-278-1048.



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