The Afghanistan Engineering Support Program assembled this deliverable. It is an approved, official USAID document. Budget information contained herein is for illustrative purposes. All policy, personal, financial, and procurement sensitive information has been removed. Additional information on the report can be obtained from Firouz Rooyani, Tetra Tech Sr. VP International Operations, (703) 387-2151.

[redacted]

From: [redacted]
Sent: Saturday, February 26, 2011 2:53 PM
To: [redacted]
Cc: [redacted]
Subject: Roof Insulation Comparison Analysis EPS vs. PUR

[redacted]

Per your request, I have reviewed the materials submitted by IOM regarding the proposed substitute insulation of the specified and detailed Polyurethane (**PUR**), with Expanded Polystyrene (**EPS**). I have referred to the attached chart prepared by IOM, the EPS manufacturers brochure, and the Roof Detail drawing 01/A502. There are two main issues here to consider, (1) insulation value, and (2) flammability.

Insulation Value:
EPS depending on the manufacturer, has an average R value of 4 per 1 inch thickness. The manufactures' data from Styropax indicates an R value of 5. **PUR,** again depending on the manufacturer, has an average R value of 7 to 8 per inch. No manufacturer's data was submitted to verify the **PUR** R values from the National Scientific Corporation of Pakistan, the manufacturer listed on the comparison chart. Higher R values from **PUR** could be achieved through the use of a foil faced surfacing, which not only eliminates the thermal drift mentioned in the chart, but also acts as a radiant barrier. This adhered reflective foil can add R=2 to the total insulating value. The Specification section for the Roof Insulation was not provided for review, so it is unknown if a foil faced **PUR** was specified. It appears from the chart that a thicker **EPS** is being contemplated for use, rather than the specified thickness shown on drawing 01/A502. The additional cost of longer mechanical fasteners is an issue to consider with this approach of an increased thickness of insulation.
Recommendation based on R value per inch thickness: PUR.

Flammability:
EPS ignites at around 200 degrees F., and reverts back to a liquid state when on fire. **PUR** being a thermoset material ignites at a much higher temperature, and self-extinguishes when the heat source is removed.
For this reason PUR is recommended.

Code related issues:
It should be noted that the drawing does not indicate a thermal barrier such as a deck board, or gypsum bd. as required by IBC code(2009) Section 1508 ROOF INSULATION, and Section 2603.4 THERMAL BARRIER. This requirement would apply whether **EPS** or **PUR** is used. An exception exists for the deletion of the thermal barrier, "provided the roof assembly with the foam plastic insulation satisfactorily passes FM4450 or UL1256". In the event of an fire inside the building, this thermal barrier would help to protect the foam from the fire.

If you have any questions on this analysis please do not hesitate to call or e-mail.

Sincerely,
[redacted]