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BY OVERNIGHT MAIL

January 24, 2000

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: USNRC Docket No. 72-22
Private Fuel Storage, LLC

Reference: Holtec Project 70651

Dear Sir:

In response to your request on January 21, 2000, we are pleased to provide the attached clarifying information you requested regarding the estimated ISFSI pad temperatures and resultant air inlet temperatures for the HI-STORM 100 System EHT model.

If you have any questions or require additional information, please contact us.

Sincerely,

Brian Gutherman, P.E.
Licensing Manager

Approval:

K.P. Singh, Ph.D, P.E.
President and CEO

cc: Mr. Mark Delligatti, USNRC (w/attach.)
Dr. Max DeLong, PFS (w/attach.)
Mr. Paul Gaukler, Shaw-Pittman (w/attach.)

Document ID: 70651004
Attachment: PFS EHT Thermal Model Inlet Ducts Region Temperature Results Summary (7 pages)

Preparer:

Indresh Rampall

Reviewer:

Evan Rosenbaum

NMSS01 Public

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Document ID: 70651004
Attachment 1

PFS EHT THERMAL MODEL INLET DUCTS REGION TEMPERATURE RESULTS SUMMARY

1.0 INTRODUCTION

Holtec Report HI-992134 [1] presents the solution of the HI-STORM 100 thermal hydraulic problem using a mathematical model which was termed the EHT (Expanded HI-STORM Thermal) model. This model was devised to establish a conservative mathematical solution to the physical problem sought to be modeled in response to an NRC Request for Additional Information (RAI). Specifically, the model incorporated three features, namely:

i) Include the heat transmission to the sub-grade soil due to contact between the base of the HI-STORM and the ISFSI pad.

ii) Consider the effect of heating of a cask by neighboring casks.

iii) Incorporate the effect of solar heating of the exposed surface of the ISFSI pad.

The EHT thermal model was solved for two ambient temperature conditions, namely the Off-normal condition (100°F ambient) and Extreme Hot condition (125°F). These conditions were postulated to be steady-state conditions to obtain a conservatively bounding response to short term ambient temperature excursions. The first feature was modeled by including the 36 inch thick pad as an equivalent thermal resistance in the EHT model. To bound the effect of surrounding casks (second feature) the HI-STORM overpack was enclosed with a hypothetical reflecting cylinder having a no flux (insulated) boundary condition. To magnify the effects of concrete pad solar heating (third feature), an extremely conservative modeling construct was adopted. The pad surface was assumed to have an unobstructed view of the ambient, a situation which may occur for a short time in the day when the sun is shining directly overhead. For obliquely slanted orientations, a portion of the solar radiation will be blocked by the surrounding casks[1]. The net result of these modeling constructs is to engineer an elevation of temperatures in the inlet ducts region in the EHT model. The thermal solution results for the *Extreme Hot* condition in this region of the model are summarized herein.

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[1] In a sensitivity study performed at the request of the NRC, (Letter to Mark Delligatti from Indresh Rampall, July 2, 1999), the pad's view of the ambient in the EHT model was computed to be in less than 10%. In other words, in excess of 90% of solar energy is blocked off.

2.0 TEMPERATURE RESULTS SUMMARY

The basic features of the PFS EHT model are depicted in Figure 1. In this Figure, four representative locations labeled A through D in the inlet ducts region are shown. These locations correspond to the hypothetical reflecting cylinder temperature (A), pad temperature away from the inlet ducts and hypothetical cylinder (B), air and overpack temperatures at about the inlet duct height (C & D). A location E on the overpack surface near the air outlet is included to illustrate end effects. The thermal solution results for these locations are summarized in Table 1. Temperature profiles of air (from location A to C), the concrete pad and overpack surface (from location D to E) are shown in Figures 2, 3 and 4 respectively. Figure 2 illustrates that air temperature attenuates rapidly with height above the concrete pad. The temperature of pad (Figure 3) in the vicinity of the hypothetical cylinder is elevated relative to location B (i.e. lateral heat dissipation choked by the reflecting & insulated boundary). The concrete cools off, relative to location B by the sweeping air flow as the inlet ducts are approached. The HI-STORM overpack surface axial temperature plot (Figure 4) shows the characteristic "bump" from active fuel zone heating. Local temperature elevation near the top (end effect) is a characteristic of heating by the hot air in the outlet ducts.

3.0 REFERENCES

[1] "HI-STORM Thermal Analysis for PFS RAI", Holtec Report HI-992134.
[2] "Topical Safety Analysis report for the HI-STORM 100 Cask System", Holtec Report HI-951312.

TABLE 1: EHT MODEL TEMPERATURE RESULTS (125°F AMBIENT)

LOCATION	TEMPERATURE (°F)
Hypothetical Cylinder (@ A)	134
Concrete Pad (@ B)	206
Air (@ C)	136
Overpack Surface (@ D)	164
Overpack Surface (@ E)	182

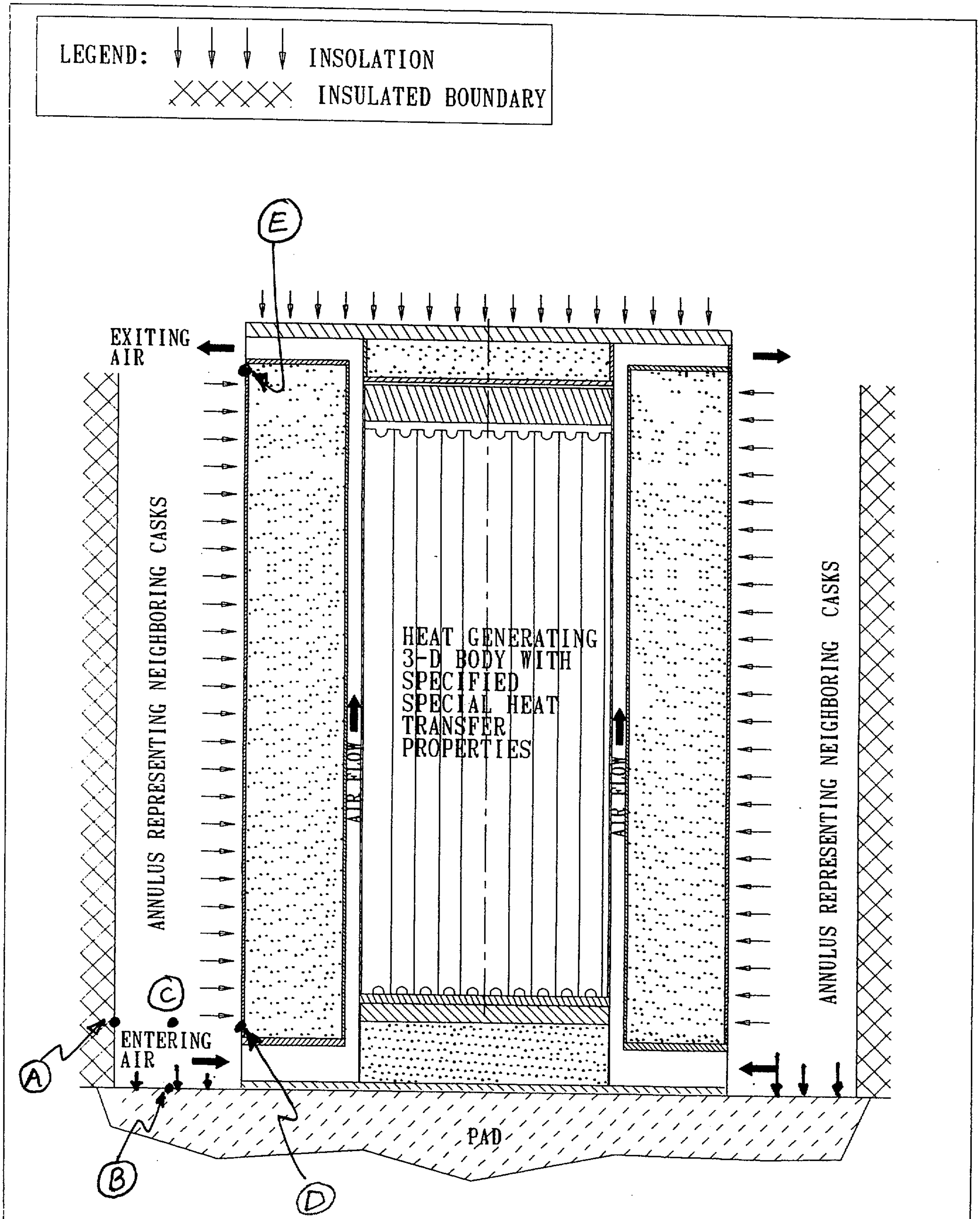
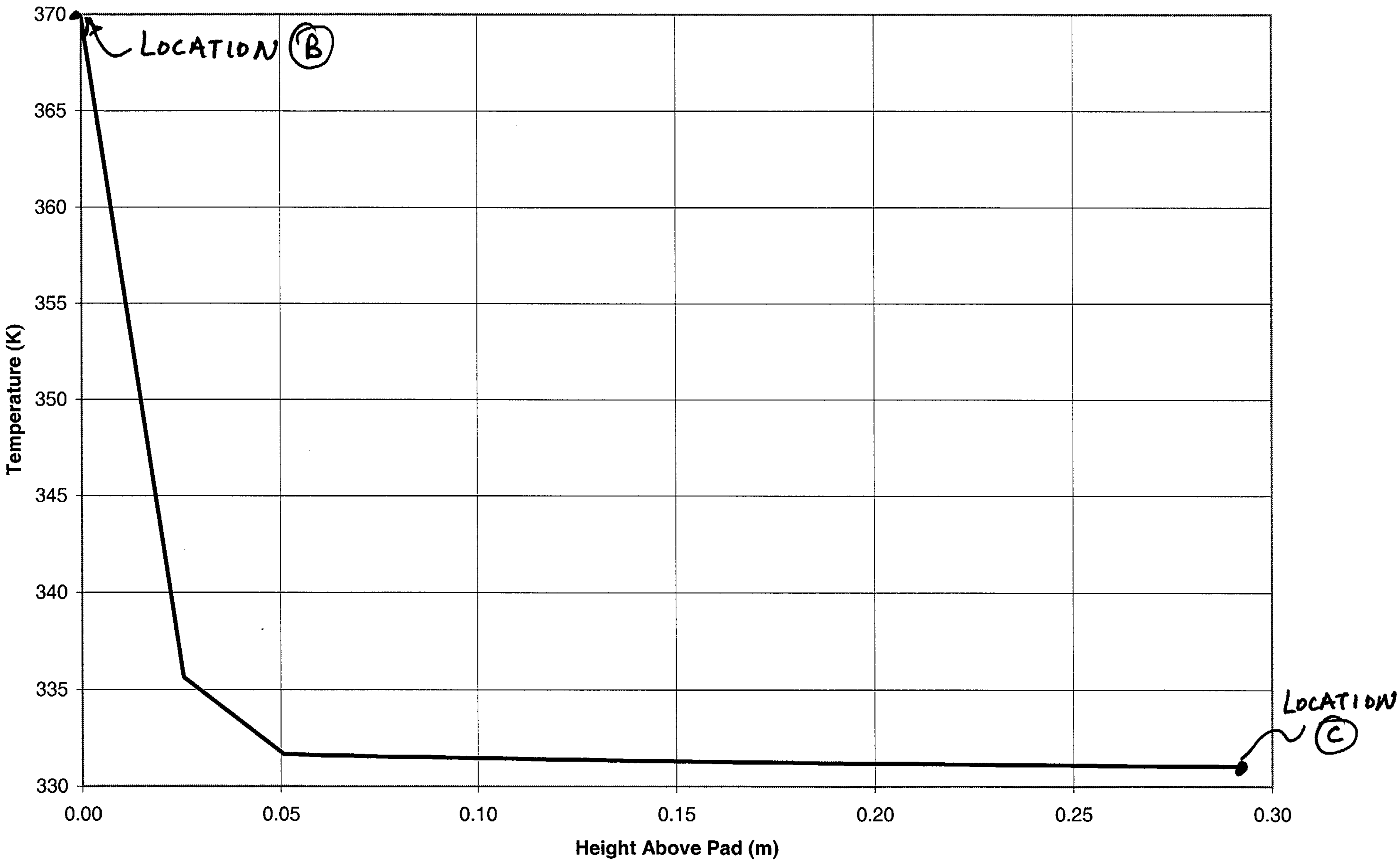
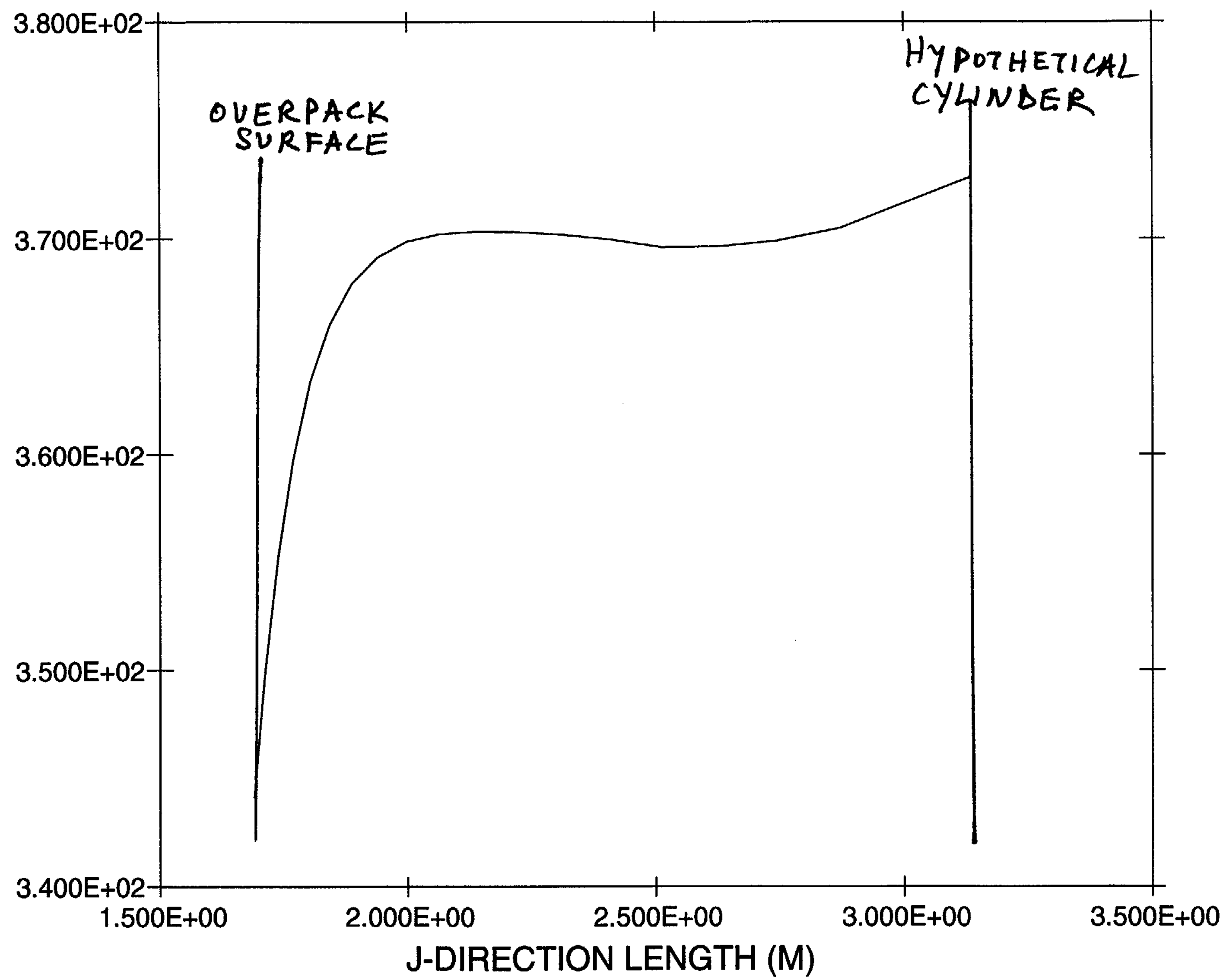


FIGURE 1: HI-STORM THERMAL MODEL

Figure 2: Air Temperature as a Function of Height Above Pad





Y Z X	FIGURE 3: Concrete Pad Temperature Outside Overpack Footprint Temperature (Kelvin) Vs. Radius (M)	Jan 21 2000 Fluent 4.32 Fluent Inc.

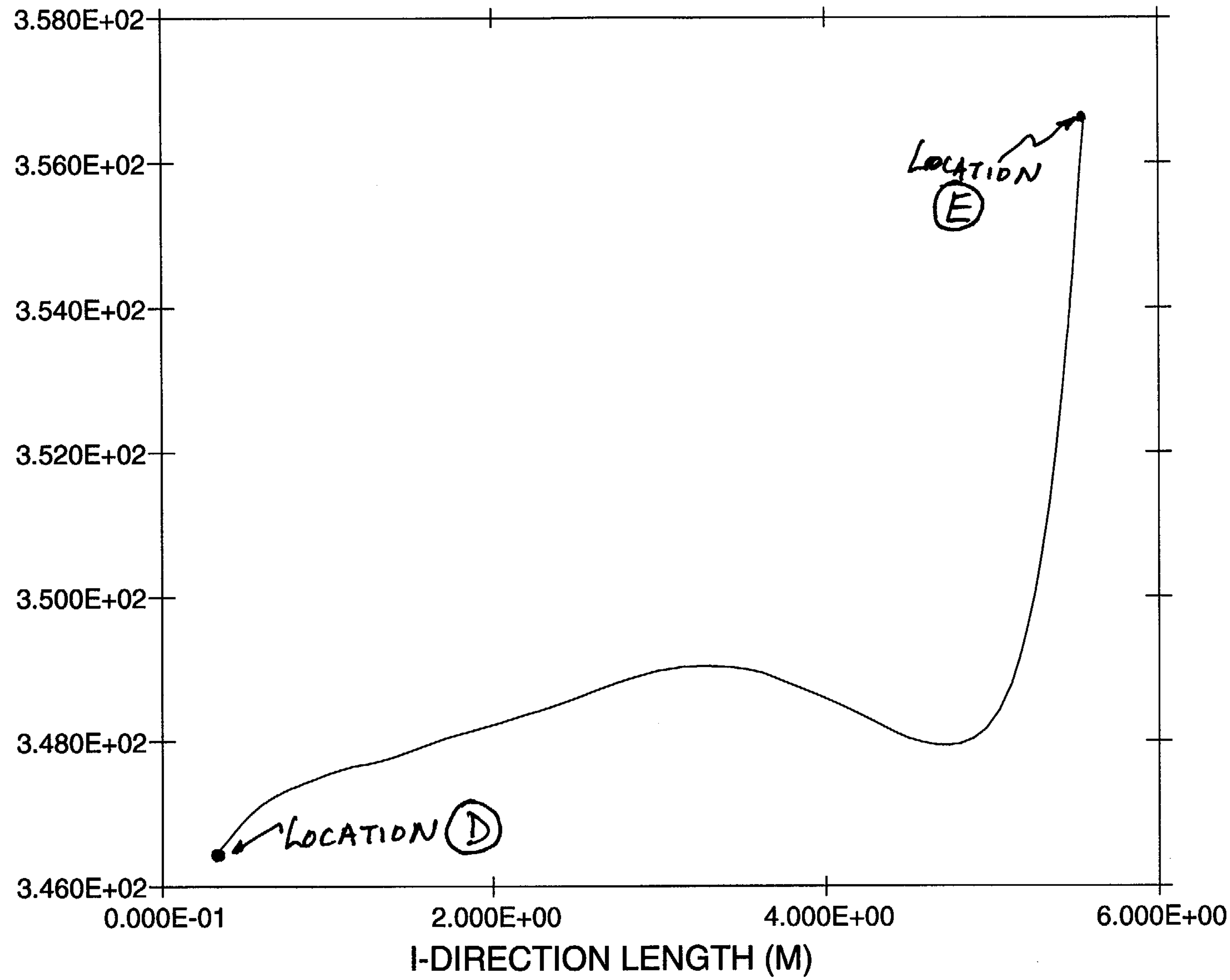


FIGURE 4: HI-STORM Overpack Surface Temperature Profile
Temperature (Kelvin) Vs. Height (M)

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