

## Chapter 6

# Experimental Study of Dry Zone Formation

### ABSTRACT

*In this chapter, the obtained experimental results are presented and analyzed from the thermal experiments that have been achieved on the different samples of natural soils. These soils can be used as backfill soil in buried cables. The obtained results are used to study the drying out phenomena and its effects on the cable insulation. These experiments study the temperature against heat flux density at infinity  $P_f$  value and the specification of the soil. An instrument simulates a real power buried cable is used. This apparatus was described in chapter five in detail.*

*To study the drying out phenomena, the following steps are followed:*

- 1. The temperature at different times is recorded.*
- 2. The temperature at different distances starting from the heater is recorded.*

*The recorded temperature in the above two steps are carried out at 9 positions measured starting from the electric heater for constant values of:*

- Heat flux density*
- Moisture content*
- Degree of compaction*

*According to the first step we can find the relationship between temperature and time for each studied sample at constant values of ( $Q_h$  and  $PF$ ).*

### 6.1 THE RECORDED TEMPERATURE AGAINST TIME FOR THE TESTED SAND TYPES

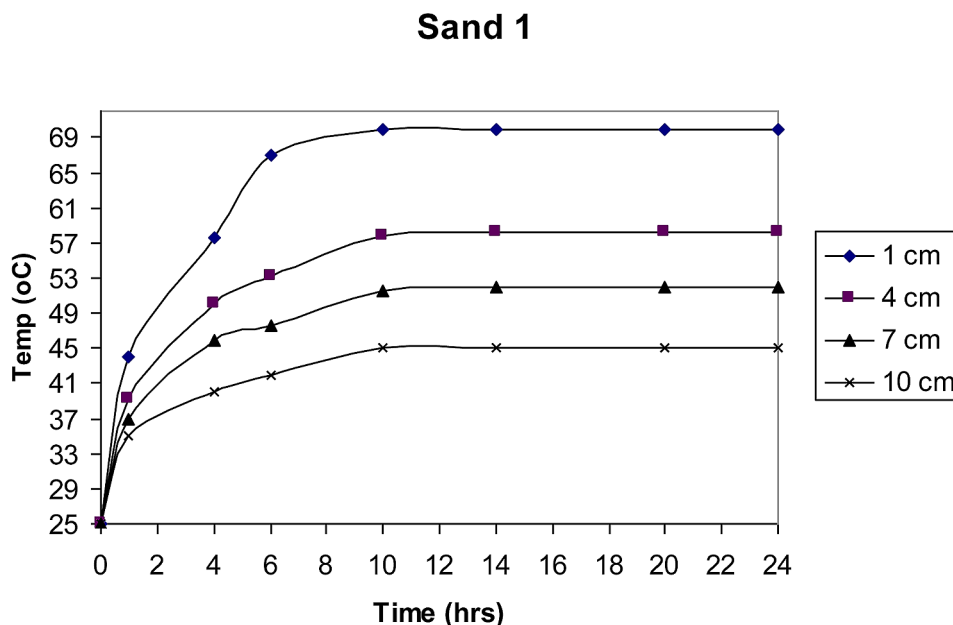
The relationship between temperature against time for sand1 at ( $Q_h=255$ ,  $PF= \infty$ ) is shown in (Figure 1a) .It is noticed that the temperature increases slightly with the increase of heating time while the heat flux density and moisture content are not changed. Also we can see that the temperature reached steady state after 10 hrs and then the temperature became constant with the increase of time. Before the steady state the rise of temperature was sharp.

The relationship between temperature against time for sand 2 at the stated conditions of ( $Q_h$  and  $PF$ ) is shown in (Figure 2a) .From this figure it is noticed that the temperature increases slightly with the increase of heating time, heat flux density and moisture content are constant during the test. Similar results are obtained for lime, clay,mixture 1(50% sand 1 + 50% lime), mixture 2 (25% sand 1+ 75% Lime), mixture 3 (75% sand 1 + 25% Lime) and mixture 4 (75% sand 1 + 25% Lime) in Figures 3a, 4a, 5a, 6a, 5a, 6a, 7a, 8a and 9a.

Figures 1a, 2a, 3a, 4a, .a, 6a, 5a, 6a, 7a, 8a and 9a show also that points with distances (4.5-5 cm and 7-8.5 cm) starting from the heater presents the cable have approximately small temperature difference after at least 25 hrs loading for  $Q_h=255$ ,  $PF= \infty$ . This behavior is a result of moisture condensation produced from moisture migration at the points near the heater. Also the reason is may be due to this type of sand has water retaining capacity relatively high because it has higher ratio of silt in its grain size distribution.

(Figure 3a) shows the relationship between temperature and time for sample 3 (Lime) for  $Q_h=255$  and  $PF=infinity$ . From this figure it is noticed that the increase in temperature with time is slower than that in Sand1 and Sand2 with the increase of heating time. This can be explained by Lime loses its

Figure 1a. Temperature against time for Sand1 in case of  $pf=\infty$   $Q_h=255$  ( $w/m^2$ )



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