

Dedicated to my

Parents, Wife (Jutika) & Daughter (Aarvi K.)

## **DECLARATION**

I hereby declare that the thesis entitled “**An Experimental Study on Behaviour of Geocell-Reinforced Sand Beds under Static and Repeated Loads**” was carried out by me at the Department of Civil Engineering, Tezpur University, Tezpur under the guidance of Prof. Utpal Kumar Das, Professor of Civil Engineering Department, Tezpur University, Tezpur. This thesis is being submitted towards the partial fulfilment of the award of the degree of the Doctor of Philosophy in Civil Engineering by Tezpur University, Napam, Tezpur, Assam, India.

All help received by me have been duly acknowledged.

I further declare that this thesis has not been submitted elsewhere for the award of any other degree.

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## **CERTIFICATE OF THE SUPERVISOR**

This is to certify that the thesis entitled “**An Experimental Study on Behaviour of Geocell-Reinforced Sand Beds under Static and Repeated Loads**” submitted to the School of Engineering, Tezpur University in partial fulfillment for the award of the degree of Doctor of Philosophy in the Department of Civil Engineering, Tezpur University, Assam is a record of research work carried out by Mr. Chirajyoti Doley under my supervision and guidance.

All help received by him from various sources have been duly acknowledged.

No part of this thesis has been submitted elsewhere for the award of any other degree.

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Tezpur

**Chirajyoti Doley**

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## ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS AND SYMBOLS	SIGNIFICANCE
$\alpha$	Level of significance
$\gamma$	Bulk unit weight of the sand
$\gamma_d$	Dry unit weight of the sand
$\gamma_{d, max}$	Maximum dry unit weight of the sand
$\gamma_{d, min}$	Minimum dry unit weight of the sand
$\delta$	Surface deformation
$\delta_s$	Interfacial friction angle of sand-geogrid
$\sigma_3$	Minor principal stress
$\sigma_n$	Normal stress
$\tau$	Shear stress
$\epsilon_u$	Strain at failure
$\varphi$	Frictional angle of sand
$\varphi_{ps}$	Frictional angle of sand for plane strain state
$\varphi_{tr}$	Frictional angle of sand for triaxial state
$\xi_i$	Partial regression coefficient
$b$	Width of the geocell mattress
$B$	Width of footing
$BC$	Bearing capacity
$c$	Cohesion
$C_u$	Coefficient of uniformity
$C_c$	Coefficient of curvature
$d$	Pocket size of the geocell mattress
$df$	Degrees of freedom
$d_c, d_q, d_\gamma$	Depth factor
$df$	Degrees of freedom
$D_{10}$	Effective size of particle
$D_f$	Depth of foundation
$D_r$	Relative density of subgrade sand
$D_r, infill$	Relative density of geocell infill sand

## List of Abbreviations and Symbols

$E_s$	Standard error
$G$	Specific gravity of sand
$GR$	Geocell reinforcement
$GRF$	Geocell-reinforced foundation
$h$	Height of the geocell mattress
$IF$	Improvement factor
$J_s$	Secant modulus
$k$	Stiffness of reinforcement layer
$l$	Length of geocell reinforcement
$L$	Length of footing
$n$	Number of observations
$N$	Number of cycles
$N_c, N_q, N_\gamma$	Bearing capacity factor
$p$	Number of independent variables
$PRS$	Percentage reduction of settlement
$q$	Bearing pressure
$q_d$	Applied repeated pressure
$q_{ult.}$	Ultimate bearing pressure for unreinforced or reinforced soil
$q_d/q_{ult.}$	Repeated load ratio
$q_R$	Ultimate bearing capacity of geocell-reinforced sand
$q_U$	Ultimate bearing capacity of unreinforced sand
$R^2$	Coefficient of determination
$R_{adj}^2$	Adjusted coefficient of determination
$s$	Footing settlement
$s_c, s_q, s_\gamma$	Shape factor
$s_{rep}$	Settlement due to repeated load only
$s_t$	Total settlement
$t$	Thickness of footing/woven geotextile
$T_u$	Ultimate tensile strength
$x$	Distance from centre of footing to dial gauge
$u$	Placement depth of the geocell mattress below the footing
$\hat{y}_i$	Predicted values
$y_i$	Dependent variables