



**TREATMENT OF EXPANSIVE FOUNDATION SOILS USING
EXTRUDED POLYSTYRENE (XPS) GEOFOAM AND
EXPANDED POLYSTYRENE (EPS) BEADS**

BY
Engineer \ Ibrahim Fawzy Ibrahim El-Demary

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of

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In
CIVIL ENGINEERING - PUBLIC WORKS

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Title of Thesis: Treatment of Expansive Foundation Soils Using Extruded Polystyrene (XPS) Geofoam and Expanded Polystyrene (EPS) Beads

Key Words: Expansive soil, swelling pressure, swelling strains, XPS geofoam, EPS beads

Summary: Swelling pressures and strains are induced when expansive soils swell vertically and laterally as their moisture content increases damaging structures and roadways. The main purpose of this research is to study the effect of polystyrene geofoam in reducing vertical swelling pressure and strain. Three synthetic expansive soils were used. Expanded polystyrene EPS beads and extruded polystyrene XPS geofoam were utilized in the study. Three treatment techniques were used in the study which were inserting cylindrical cores of XPS within the expansive soil mass, filling holes with EPS beads and mixing EPS beads with the expansive soil. The XPS core insertions and the holes filled with EPS beads are newly proposed approaches. The diameters of the XPS cores and the holes filled with beads were 5, 10 and 15 mm while the mixing contents of EPS beads were 0.1, 0.2 and 0.3 %. Small and large oedometer were used in testing. Results of XPS inserts showed a reduction in vertical swelling pressure and strain of up to 40.8 and 50.2 %, respectively, while the holes filled with beads reduced the vertical swelling pressure and strain by 66.2 % and 79.0 % respectively. The EPS beads – soil mixtures achieved a reduction of 100 % for both parameters.

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TABLE OF CONTENTS

ACKNOWLEDGMENT	i
TABLE OF CONTENTS	ii
LIST OF TABLES.....	vii
LIST OF FIGURES.....	ix
NOMENCLATURE	xv
ABSTRACT	xvi
CHAPTER 1 : INTRODUCTION	1
1.1 Statement of the Problem	1
1.2 Objectives:.....	1
1.3 Thesis Contents:	2
CHAPTER 2 : LITERATURE REVIEW	3
2.1 Background.....	3
2.2 Expansive soil.....	3
2.2.1 Problems of expansive soil	3
2.2.2 Mechanism of swelling.....	5
2.2.3 Stages of swelling.....	5
2.2.4 Factors influencing swelling potential.....	6
2.2.4.1 Initial moisture content	7
2.2.4.2 Initial dry density	8
2.2.4.3 Clay fabric	9
2.2.4.4 Method of compaction	11
2.2.4.5 Compaction energy	11
2.2.4.6 Clay mineralogy	12
2.2.4.7 Stress path	13
2.2.4.8 Surcharge pressure	14
2.2.4.9 Degree of saturation	14
2.2.4.10 Sample thickness	18
2.2.5 Clay anisotropic swelling behavior	18
2.2.6 Methods for identification of expansive soils and determination of swelling potential	20
2.2.6.1 Single index methods	20
2.2.6.1.1 Atterberg limit test.....	20
2.2.6.1.2 Linear shrinkage test	20
2.2.6.1.3 Free swell test	21
2.2.6.2 Indirect measurement methods	21
2.2.6.2.1 Potential volume change (PVC) method	21
2.2.6.2.2 Expansion index method	21

2.2.6.2.3 Swell index method	23
2.2.6.3 Direct measurement method	23
2.2.7 Methods of treatments used in expansive soil	24
2.2.7.1 Mixing treatment technique	24
2.2.7.1.1 Fly ash stabilization.....	24
2.2.7.1.2 Lime - Fly ash stabilization	26
2.2.7.1.3 Lime stabilization	27
2.2.7.1.4 Cement stabilization	28
2.2.7.1.5 Polypropylene fiber stabilization.....	28
2.2.7.2 Reinforcement inclusion technique.....	30
2.2.7.2.1 Geogrid embedment	30
2.2.7.2.2 Geogrid column reinforcement	31
2.2.7.2.3 Sand column reinforcement.....	32
2.3 The Geofoam	33
2.3.1 Introduction	33
2.3.2 Manufacturing process	33
2.3.2.1 Manufacturing of EPS geofoam blocks	34
2.3.2.2 Manufacturing of XPS geofoam sheets.....	34
2.3.3 Difference between EPS and XPS geofoam.....	34
2.3.4 The geofoam blocks.....	35
2.3.4.1 Mechanical properties	35
2.3.4.1.1 Compressive strength and stress – strain behavior.....	35
2.3.4.1.2 Initial tangent Young's modulus.....	38
2.3.4.1.3 Interface friction	39
2.3.4.1.4 Creep	40
2.3.4.1.5 Dynamic properties	45
2.3.5 EPS beads – soil mixture	46
2.3.5.1 Mechanical properties of EPS beads – soil mixture.....	46
2.3.5.2 Dynamic properties of EPS beads – soil mixture.....	49
2.3.6 Durability.....	50
2.3.6.1 Chemical hazard.....	50
2.3.6.2 Flammability	50
2.3.6.3 Ultraviolet degradation.....	51
2.3.6.4 Biological degradation	51
2.3.6.5 Water absorption	51
2.3.7 Practical applications of geofoam blocks	51
2.3.7.1 Compressible insert within expansive soil.....	52
2.3.7.2 Reduction of lateral earth pressure on retaining structures	53
2.3.7.3 Attenuating earthquake forces.....	55
2.3.7.4 Wave barriers	57

2.3.7.5 Slope stabilization	58
2.3.7.6 Reducing settlement	60
2.3.7.7 Embankment widening.....	62
2.3.7.8 Reducing stresses on buried structure and utilities	62
2.3.8 Cost reduction.....	63
2.3.9 Practical applications of EPS beads.....	63
2.3.9.1 Lightweight fill.....	64
2.3.9.2 Reducing swelling potential of expansive soil.....	64
2.3.10 Cost impact.....	64
CHAPTER 3 : EXPERIMENTAL DESIGN	65
3.1 Background.....	65
3.2 Factors considered in the study	65
3.2.1 Soil swelling potential	65
3.2.2 Treatment techniques.....	67
3.2.3 Treatment level	67
3.2.4 Sample size	67
3.3 Measuring the vertical swelling pressure and vertical swelling strain in the laboratory.....	67
3.3.1 The standard oedometer.....	67
3.3.2 The large oedometer	67
3.3.3 The compaction device	69
3.4 Selected materials and their properties.....	72
3.4.1 EPS geofoam	72
3.4.2 XPS geofoam.....	76
3.4.3 EPS beads	77
3.4.4 Bentonite.....	78
3.4.5 Sand	79
3.5 Expansive soil.....	80
3.5.1 Chemical analysis for expansive soil mixes	81
CHAPTER 4 : PRELIMINARY STUDY	87
4.1 Preliminary study.....	87
4.1.1 Accelerating the end of primary swell time.....	87
4.1.2 Selection of expansive soil	87
4.1.2.1 Specimen preparation and test procedure	88
4.1.3 Deciding the proper way for core insertion placement.....	99
4.1.3.1 Placement by drilling	99
4.1.3.2 Placement by soil compaction around the core.....	104

4.1.3.3 Comparison between the two placement methods	105
4.1.4 Hole filled with beads sample preparation and test procedure	108
4.1.5 EPS bead content determination	108
4.1.5.1 Specimen preparation and test procedure	109
4.1.6 Large specimen preparation and test procedure	112
4.2 Identifying clay minerals in selected expansive soils	112
4.2.1 Scanning electronic microscope	113
4.3 Determination of soil moisture characteristic curve	119
4.3.1 Sample preparation	119
4.4 Experimental program	121
CHAPTER 5 : INVESTIGATION OF SWELLING POTENTIAL.....	123
5.1 Background.....	123
5.2 Effect of clay content on swelling characteristics	123
5.2.1 Primary swell time	123
5.2.2 Vertical swelling pressure	124
5.2.3 Vertical swelling strain	125
5.2.4 Constrained modulus	128
5.2.5 Strain based compression index	129
5.3 Anisotropic swelling behavior.....	130
5.3.1 Anisotropic swelling pressure	130
5.3.2 Anisotropic swelling strain	130
5.4 XPS core insertion.....	131
5.4.1 Vertical swelling pressure	132
5.4.2 Vertical swelling strain	144
5.4.3 Strain based compression index	147
5.5 Hole filled with EPS beads.....	149
5.5.1 Vertical swelling pressure	149
5.5.2 Vertical swelling strain	157
5.5.3 Strain based compression index	161
5.6 EPS beads mixed with expansive soil	163
5.6.1 Primary swell time	163
5.6.2 Vertical swelling pressure	164
5.6.3 Vertical swelling strain	170
5.6.4 Coefficient of consolidation	175
5.6.5 Strain based compression index	177

5.7 Sample size	178
5.7.1 Comparison between large and standard oedometer	178
5.8 Comparison between the three treatment techniques	181
5.8.1 Vertical swelling pressure	182
5.8.2 Vertical swelling strain	182
5.8.3 Strain based compression index	183
5.9 Practical applications	184
5.9.1 XPS inserts	184
5.9.2 Holes filled with EPS beads	186
5.9.3 The EPS beads mixed with expansive soil	187
CHAPTER 6 : CONCLUSIONS AND RECOMENDATIONS	191
REFERENCES	195
APPENDIX A : REGRESSION ANALYSIS SUMMARY OUTPUT	211
ARABIC SUMMARY	

LIST OF TABLES

Table 2.1	Induced swelling pressures and potential corresponding to initial saturation (Ito [60])	15
Table 2.2	Relation between the plasticity index and the swelling potential (Seed et al. [70]).....	20
Table 2.3	Degree of expansion for various values of linear shrinkage and shrinkage limits (Altmeyer [72])	20
Table 2.4	PVC rating and the corresponding category (Lambe [73]).....	21
Table 2.5	Relation between expansion index and potential expansion (ASTM D 4829 [74]).....	22
Table 2.6	EPS testing stress loading and pressures (Leo et al. [119])	37
Table 2.7	Interface friction factors for EPS geofoam (Sheely and Negussey [131])	39
Table 2.8	Ratios of components to soil by mass in polystyrene lightweight fill (Liu et al. [144])	47
Table 3.1	Mechanical properties of EPS geofoam.....	73
Table 3.2	Values of average mechanical properties of EPS geofoam	73
Table 3.3	Mechanical properties of XPS geofoam	77
Table 3.4	Average mechanical properties values of XPS geofoam.....	77
Table 3.5	EPS beads constrained modulus	78
Table 3.6	Bentonite properties	78
Table 3.7	Physical properties of the expansive soil mixes	80
Table 3.8	Modified Proctor compaction test results	85
Table 4.1	Results of oedometer tests on the control samples	98
Table 4.2	Average oedometer test results on control samples.....	99
Table 4.3	Results of laterally sampled specimens of select control samples.....	99
Table 4.4	Results of drilling placement method	103
Table 4.5	Results of compaction around core placement method	107
Table 4.6	Results of EPS beads mixed with SB40 soil.....	111
Table 4.7	Bentonite mineralogical composition	117
Table 4.8	Bentonite pattern.....	118
Table 5.1	Constrained modulus values	128
Table 5.2	Strain based compression index values.....	129
Table 5.3	XPS core insertion test results	138
Table 5.4	Strain based compression index values.....	148

Table 5.5	Results of hole filled with EPS beads	155
Table 5.6	Area ratio participation percent in reducing vertical swelling pressure	156
Table 5.7	Area ratio participation percent in reducing vertical swelling strain.....	160
Table 5.8	Strain based compression index values.....	162
Table 5.9	Results of EPS beads - expansive soil mixtures	168
Table 5.10	Difference between the present study and Illuri, [6] study	169
Table 5.11	Coefficient of consolidation for EPS beads – expansive soil mixture...	176
Table 5.12	Strain based compression index of EPS beads – expansive soil mixture	177
Table 5.13	Coefficient of consolidation used in the comparison.....	178

LIST OF FIGURES

Figure 2.1	Building damage due to end lift (Jones [8]).....	4
Figure 2.2	Retaining wall collapse due to lateral swelling pressure (Dave [9])	4
Figure 2.3	Longitudinal cracks developed in the pavement.....	5
Figure 2.4	Dial reading versus time (ASTM D4546 [16])	6
Figure 2.5	Axial and radial swelling pressures versus dry density	9
Figure 2.6	Swelling pressure versus degree of saturation for Na bentonite sample with dry density of 1.76 t / m^3 (Borgesson [59]).....	16
Figure 2.7	Swelling pressure versus degree of saturation for Na bentonite sample with dry density of 1.57 t / m^3 (Borgesson [59]).....	16
Figure 2.8	Swelling pressure versus time for Na bentonite sample with dry density of 1.47 t / m^3 and a degree of saturation of 45 %.....	17
Figure 2.9	Void ratio – water content relationship (Ito [60]).....	17
Figure 2.10	Free swell curve, the swelling pressures and potentials corresponding to different saturation values (Ito [60]).....	18
Figure 2.11	Swell index – potential volume change relation (Lambe [73]).....	22
Figure 2.12	Swell index – liquid limit relationship.....	23
Figure 2.13	Incomplete coverage of the shoulder section by the geogrid layer induced a longitudinal crack (Zornberg and Gupta [11])	31
Figure 2.14	Stress –strain behavior of EPS geofoam with density of.....	36
Figure 2.15	EPS and XPS geofoam unconfined compression behaviour for various densities (Negussey [108]).....	37
Figure 2.16	Geofoam to geofoam interface friction (Sheeley [130]).....	40
Figure 2.17	Isochronous stress – strain curves for eps geofoam block having a density of 23.5 kg / m^3 (Horvath [111]).....	41
Figure 2.18	Comparing laboratory compression creep data for an EPS density of 20 kg / m^3 and applied stress of 20 kpa and calculated values (Arellano et al. [141])	43
Figure 2.19	Comparing laboratory compression creep data for an EPS density of 20 kg/m^3 and applied stress of 70 kPa and calculated values (Arellano et al. [141])	44
Figure 2.20	Cyclic load performance for EPS geofoam with density of	46
Figure 2.21	Ductile and brittle failure styles of polystyrene lightweight fills a) ductile failure style b) brittle failure style (Liu et al. [144])	48
Figure 2.22	Conceptual diagram of the physical behavior of the exceptional	54
Figure 2.23	EPS geofoam placement configuration to reduce the lateral stresses (Elragi [117])	54

Figure 2.24	Effect of EPS geofoam thickness and density on seismic isolation efficiency (Athanasopoulos et al. [167, 168]).....	56
Figure 2.25	Configuration of EPS geofoam (a) one row, (b) one row partial top and (c) one row partial bottom (Akay et al. [184]).....	60
Figure 3.1	Main phases of the research work.....	65
Figure 3.2	Schematic diagram of: (a) XPS core insertion.....	68
Figure 3.3	The large oedometer apparatus	69
Figure 3.4	Large oedometer apparatus dimensional details	70
Figure 3.5	The testing mold	71
Figure 3.6	The compaction device (a) picture (b) dimensional details	72
Figure 3.7	Stress – strain curves for: (a) ordinary EPS, (b) EPS16, and (c) EPS20.....	74
Figure 3.8	Stress – strain curves for: (a) EPS30, (b) EPS35, and (c) EPS40.....	75
Figure 3.9	Stress – strain curve for XPS geofoam: (a) vertically loaded, and (b) laterally loaded.....	76
Figure 3.10	Grain size distribution of EPS beads	77
Figure 3.11	Stress – strain curve of EPS beads.....	78
Figure 3.12	Grain size distribution of the bentonite.....	79
Figure 3.13	Grain size distribution of the fine sand.....	79
Figure 3.14	Grain size distribution of expansive soils	81
Figure 3.15	Modified Proctor compaction curves for: (a) SB13, and (b) SB20	82
Figure 3.16	Modified Proctor compaction curves for: (a) SB25, and (b) SB40	83
Figure 3.17	Modified Proctor compaction curves for: (a) SB41, and (b) SB44	84
Figure 4.1	Filter paper placement within the oedometer ring	88
Figure 4.2	Filter paper placement within the extruded sample	88
Figure 4.3	Time - strain charts for : (a) SB20, and (b) SB25	91
Figure 4.4	Time - strain charts for : (a) SB40, and (b) SB41	92
Figure 4.5	Time - strain charts for SB44.....	93
Figure 4.6	Stress - strain charts for: (a) SB20 and (b) SB25.....	94
Figure 4.7	Stress - strain charts for: (a) SB40, (b) SB41.....	95
Figure 4.8	Stress - strain charts for SB44.....	96
Figure 4.9	Time - strain chart for laterally sampled: (a) SB20, (b) SB25, (c) SB40.....	96
Figure 4.10	Stress - strain chart for laterally sampled: (a) SB20, (b) SB25, and (c) SB40	97
Figure 4.11	Core insertion by drilling for SB25 soil with core diameter of	101

Figure 4.12	Stress- strain chart for SB25 soil with 15 mm core insertion by drilling.....	102
Figure 4.13	Stress – strain chart for SB25 soil with 5 mm core insertion by compaction around core.....	105
Figure 4.14	Core insertion by soil compaction around core for SB25 soil with core diameter of (a) 10 mm, (b) 15 mm.....	106
Figure 4.15	Time - strain chart for SB40 soil mixed with different EPS bead contents	110
Figure 4.16	Stress - strain chart for SB40 soil mixed with different EPS bead contents	110
Figure 4.17	Structure identification of SB20	114
Figure 4.18	Structure identification of SB25 soil.....	115
Figure 4.19	Structure identification of SB40 soil.....	116
Figure 4.20	Stepped face – to - face clay structure	117
Figure 4.21	XRD chart relating the intensity and position (2 θ).....	118
Figure 4.22	Soil moisture characterization curve for SB20,	120
Figure 4.23	Soil moisture characterization curve for SB25,	120
Figure 4.24	Soil moisture characterization curve for SB40,	121
Figure 5.1	End of primary swell time versus the plasticity index of expansive soils used.....	124
Figure 5.2	Vertical swelling pressure versus plasticity index of expansive soils used	124
Figure 5.3	Correlation between the logarithm of measured vertical swelling pressure and the logarithm of predicted vertical swelling pressure of expansive soils used.....	125
Figure 5.4	Vertical swelling strain versus plasticity index of expansive soils used	126
Figure 5.5	Correlation between the logarithm of measured vertical swelling strain and the logarithm of predicted vertical swelling strain of expansive soils used.....	127
Figure 5.6	Vertical swelling pressure versus vertical swelling strain of expansive soils used.....	127
Figure 5.7	Constrained modulus versus plasticity index of expansive soils at stress increments of 100 to 200 kPa and 200 to 400 kPa.....	128
Figure 5.8	Strain based Compression index versus plasticity index of expansive soil samples.....	130
Figure 5.9	Average vertical swelling pressure versus lateral swelling pressure of expansive soil samples.....	131
Figure 5.10	Average vertical swelling strain versus lateral swelling strain of expansive soil samples.....	131