IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Study On Various Properties Of Peat Soil By The Addition Of Cow Dung Ash, Banana Ash And Lime

Submitted By

AKHILESH KUMAR CHAI (6319703)

RANJIT KUMAR YADAV (6319718)

Under the supervision of Er. Ashu Rana, Er. Jatin Thereja, Er. Jatin Sehri (Assistant professor in civil engg.)

GURU NANAK INSTITUTE OF TECHNOLOGY, MULLANA

AMBALA CANTT

ABSTRACT:

The properties of soil play a major effect on the design of road pavements. Thus, using waste materials to develop the characteristics of weak soil is being progressively necessary for industrial constructions. In past years, several pieces of research have been done to show the significance of these waste materials on the strength of the soil. This research aims to focus on the impact of granite powder on the behavior of the soil subjected to loading. Therefore, soils blended with several amounts of granite powder i.e. 4%, 8%, 12%, 16%, and 20% of the total weight were examined. The CBR, compaction and direct shear tests were executed to evaluate the performance of the untreated and treated soils. The findings proved that adding granite dust increased noticeably the shear strength, CBR and dry density of the soils. It was found that an addition of 8% granite dust to the natural soil yields the most appropriate results among other contents of granite dust. Hence, it is concluded that the granite dust has good potential to be used as an additive for improving the engineering properties of clayey soil.

INTRODUCTON:

Soil is the thin layer of material covering the earth’s surface and is formed from the weathering of rocks. It is made up mainly of mineral particles, organic materials, air, water and living organisms—all of which interact slowly yet constantly.

It also gives a clear demonstration of various effects of different environmental conditions on the microbial population during the process of decomposition. The decomposition product thus obtained was found to be rich in organic phosphorous and nitrogen, raising our hopes for a successful implementation of it in daily agricultural practices.

MATERIALS REQUIRED:

- Cow dung

- Banana leaf

- peat Soil

- Lime

Physical Properties of Clay Soil

1. Almost all the plant residues are still present; water in the peat is transparent.

2The plant residues are barely decomposed; water is transparent but with a light brown color.

3. Small amounts of plant residues are decomposed; water is turbid and brown**.**

4. The plant residues are highly decomposed and about 1/2 peat can flow between the Finger; the water is clear in color.

5. Fully decomposed; all parts are fluid and the organisms cannot be discerned.

Chemicals Properties of Clay Soil

1. It includes elemental composition, organic components, and ash elemental

2. The five basic elements of peat are C, H, O, N and S.

3. The properties of peat are generally between that of wood and coal.

4. The elemental proportion Zn of lowly decomposed peat approximates to that of wood, while highly decomposed peat resembles that of the lignite.

PROPERTIES OF BANANA LEAVES ASH:

The study has revealed that banana leaves ash satisfactorily act as cheap stabilizing agents for sub grade purposes. Optimum CBR results can be achieved by adding 4 % banana leaves ashes by weight of soil to the natural soil sample. Strength of lateritic soil stabilized with ashes of banana leaves increased.

Properties of cow dung ash

Cow dung ash is characterized by significant content of alkaline compound such as calcium (30.6%) and potassium (5.56%) mainly responsible for slugging and fouling phenomena. It h the high roughage content.cow dung provides high levels of organic materials and rich in nutrients. It contains about 3 percent Nitrogen, 2 percent Phosphorous, and 1 percent Potassium (3-2-1: NPK)

Properties of Lime

•It should possess good plasticity.

•It should be flexible and easily workable.

•When used in mortar, it should provide greater strength to the masonry.

•It should solidify in less time and become hard.

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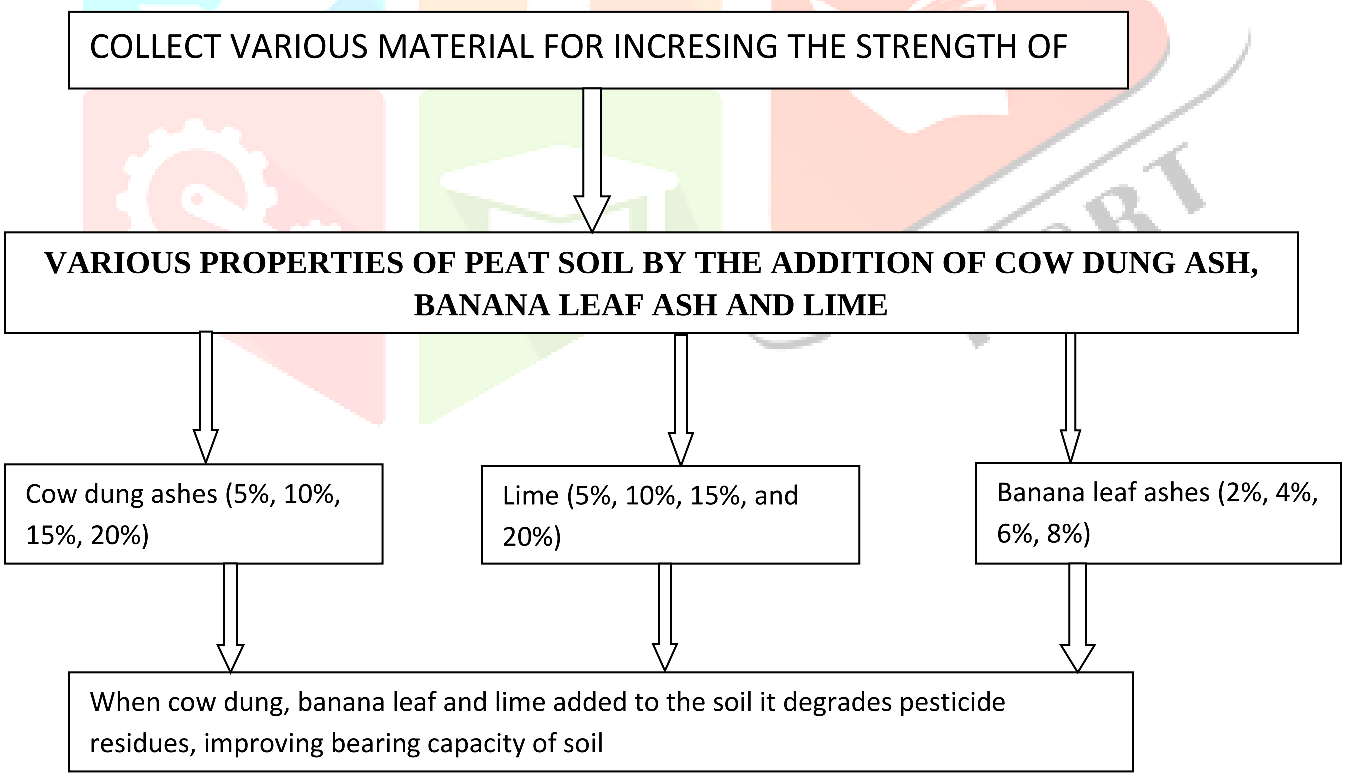
SOIL TESTING FOR CONSTRUCTION:

Soil testing is a very important part of building and road construction. In fact, no construction project can proceed without first making sure the soil can support the load. Thus, the purpose of **soil testing for construction** is to determine the suitability of the soil for the type of construction to be done. The test is also done to determine the presence of groundwater.

OBJECTIVE OF ADDITION OF COW DUNG ASH, BANANA LEAF AND LIME

- To enhance strength properties
- Stabilize embankments
- To control shrink swell properties of expansive soils
- Drying agent to reduce soil moisture contents to permit compaction

METHODOLOGY:



STEPS:

1. Collecting the cow dung and the banana leaf from the waste.

2. Burn it completely and make it completely in ashes form.

2. Add the cow dung ash and banana leaf ash to the soil.

3. Test a soil in the laboratory.

4. Then it will improves the soil quality

LITERATURE REVIEWS:

S.N	Author	Title	Conclusion
1.	Akshaya Kumar sabat	A review of literature on stabilization of expansive soil.	Stabilization of expansive soil using solid wastes improves the geotechnical properties of expansive soil.
2.	S.Andavan, Vamsi Krishna Pagadala	A study on soil stabilization of fly ash and lime	It was absorbed from the analysis that the Strengths of lime and fly ash stabilized soil after 7 and 28 days are greatly increased by increased density and compaction, but the optimum lime to fly ash ratio is influenced in significant.
3.	K. Raja, S. Venkatachalam, K. Vishnuvarham, R. Siva Rama Krishna, V.Tamil selvan	A review on soil stabilization using rice husk ash and lime sludge	It decreases liquid limit test and reduces swelling properties of expansive soil.
4.	Amanpreet Tangri	Effect of lime and Rha on clayey soil	With the increase in percentage of lime maximum dry density decreases and optimum moisture content increases.
5.	Armin Roohbakshan, Behzad Kalantari	Stabilization of clayey soil with lime and waste powder	There is a decreases in liquid limit test and increases in plastic limit test with increases waste stone powder and lime content.

Results and discussion:

Liquid limit test results:-

The liquid limit is the amount of water at which soil begins to behave like a liquid. A clay sample is put in a regular cup, and a groove is made with a spatula to determine the liquid limit. Up till the separation disappears, the cup is dropped. From this sample, the soil's water content is determined. Liquid limit test standard values. A portion of soil that has been sliced by a groove with conventional dimensions will flow together for a distance of 1.25 cm when subjected to 25 blows in a standard liquid limit device. This is known as the liquid limit. The soil's strength at its water content is approximately 0.17 N/cm.sq. (17 gms/sq.cm).

Apparatus required

1. Casagrande Apparatus
2. Grooving tool
3. Blow counter
4. ASTM type tool

Procedure for liquid limit test

• Place 30 to 40 g of the specified soil that has been through a 425 micron IS sieve in an evaporating disc. To make a paste, add water. Give the soil enough time so that water can permeate the entire quantity of soil.

• Using the spatula, remove a little amount of the paste and place it in the cup of a liquid limit device that is calibrated for 10 mm blows.

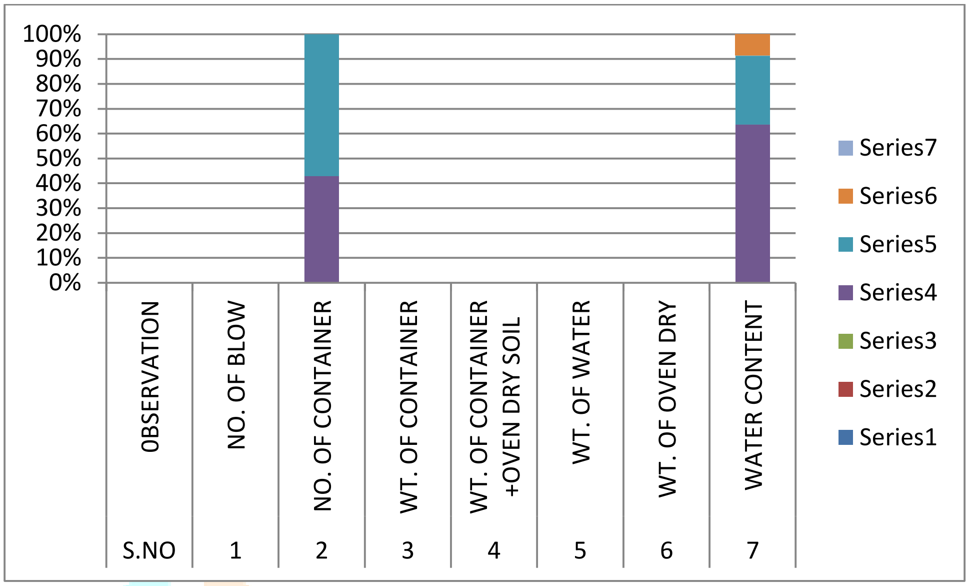
• Using the typical grooving tool, cut the vertical groove. (The ASTM tool for sandy soils and Casagrande's tool for clays).

• Apply blows by turning the standard device's crank at a rate of two rotations per second, and record the quantity of blows for a groove at the bottom that is 12 mm closer.

• Take a sample of soil with a representative thickness.

Observation table:

S.NO	OBSERVATION	SAMPLE NUMBER		
1.	No. of blows	19	20	21
2.	No. of container	3	4	-
3.	Wt. of container	20 g	20 g	20 g
4.	Wt. of container + oven dry soil	49.5g	50g	52.5g
5.	Wt. of water	7g	5.5g	3.5
6.	Wt. of oven dry soil	22.5g	24.5g	29g
7.	Water content	2.8%	1.22%	0.38%



Standard proctor test results:

The soil's compaction characteristics, as determined by the standard Proctor test, were represented by a maximum dry unit weight (dmax) of 19.3 KN/m3 and an ideal water content (w opt) of 9.5%.

Formula

W1 = weight of the empty standard proctor mold + base plate.

W2 = weight of the standard proctor mold + base plate filled with compacted soil sample.

W3 = weight of the compacted moist soil only = W2 – W1.

Dm = diameter of the mold. H = height of the mold. V = volume of the mold = $(\pi D^2/4)$ x H. Υ_b= bulk density of soil sample = W3 / V

Apparatus

1. Standard proctor Mould
2. Hammer
3. Weighing machine
4. Knife
5. Oil
6. Water content container

Procedure for standard proctor test;

Take sufficient quantity of representative soil, air dry & pulverize it with a rubber mallet Sieve the soil through No: 4 sieve & reject the coarser material.

2. Take about, 3 kg of soil, add water to bring its water content to about 5% below the estimated optimum moisture content.(For coarse-grained soil 4% initial water content & for fine-grained soil 10% initial water content is preferable).Then Mix it thoroughly.

3. Clean the mold, measure its diameter & height & weigh it without the collar.

4. Fit the collar & compact the moist soil in three equal layers by the rammer with evenly distributed blows to each layer. Use 25 blows for 4 inches diameter & 56 blows for 6 inches diameter mold to the total height of mold with collar.

5. Remove the collar and use a straight steel edge to cut the compacted soil level with the top of the mould. Clean the base plate and molds outside before weighing it.

6. Remove the dirt from the mould, split it, and take a sample of around 100 gram to determine the water content.

7. Smash the dirt lamps then combine them with the remaining soil in the tray. Repeat the compaction process for each increment of added water until the bulk of the compacted soil reduces. Add additional water to increase the water content by 2 to 3%.

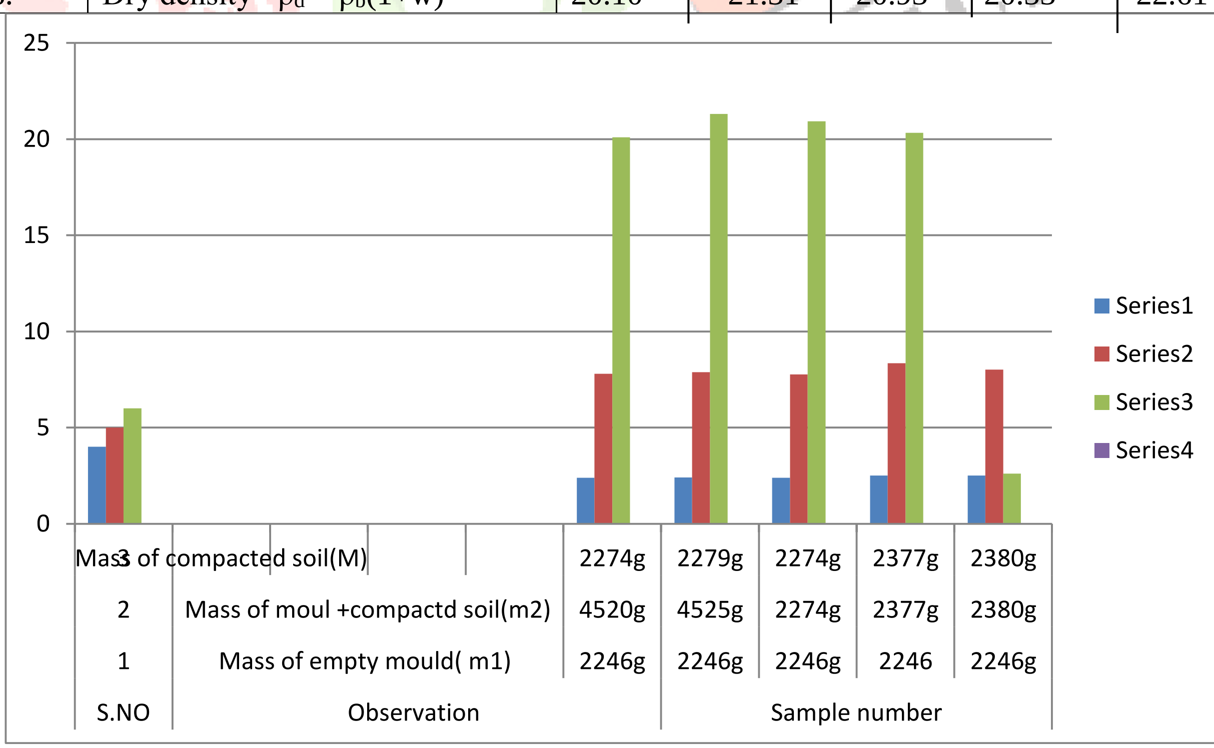
8. Determine the dry density and water content for each path.

9. Plot the compaction curve with dry density as the ordinate and water content as the abscissa.

10. The water content is best measured against the curve's peak.

Observation table:

S.NO	OBSERVATION	SAMPLE NUMBER				
1.	Mass of empty mould(M1)	2246g	2246g	2246g	2246g	2246g
2.	Mass of mould + compacted soil(M2)	4520g	4525g	4520 g	4623g	4626 g
3.	Mass of compacted soil(M)	2274 g	2279g	2274g	2377g	2380g
4.	Bulk density(ρ)=M/V	2.39	2.40	2.39	2.50	2.51
5.	Water content of soil =w%	7.80	7.88	7.76	8.34	8.01
6.	Dry density= ρ_d = $\rho_b(1+w)$	20.10	21.31	20.93	20.33	22.61



Direct shear test:

Shear strength is defined as the maximum resistance that a material can withstand when subjected to shearing, and the direct shear test is an experimental procedure that is **used to determine the shear strength of soil materials**. It is one of the simplest, most common, quickest, and inexpensive tests implemented to derive the strength of a soil.

Formula

Coulomb has represented the shear strength of soil by the equation:

$S = C + \sigma * \tan \theta$

Where,

S = Shear strength of soil = Shear stress at failure,

C = Cohesion intercept,

σ = Total normal stress on the failure plane,

θ = Angle of internal friction or shearing resistance.

APPARATUS:

1. Direct shear apparatus
2. Split mould
3. Weighing machine
4. Proving ring
5. Sample trimmer
6. Spatula
7. Porous stone
8. Micrometer dial gauge

Test Procedure of Direct Shear Test

1. Collect the soil specimen which is either undisturbed or remolded. The sample should be taken using sampler and Rammer. If cohesion less soil is taking then sampler and rammer are not required.
2. The inner dimensions of sampler should be 60 mm x 60 mm in plan which is also the inner dimensions of shear box. The Thickness of box is about 50 mm while the thickness of sample should be 25mm.
3. Now attach the two halves of the shear box with locking pins and place the base plate at the bottom.
4. Above the bottom plate, Place the porous stone and above it place the grid plate. Plain grid plates are used for undrained conditions while perforated grid plates are used for drained conditions.
5. Now we have base plate, porous stone and grid plate in the shear box. Weigh the box at this stage and note down.
6. After that place the soil specimen above the grid plate. Undisturbed sample is directly transferred to shear box. If sandy soil is using, place it layers wise and tamper the each layer to get the required density.
7. Note down the weight of shear box with soil specimen.
8. Above the soil specimen, place the upper grid plate, porous stone and loading pad one above the other. Now the whole box is placed in a container and mounted on the loading frame.
9. Proving ring is arranged in such a way that it should contact the upper half of the shear box.

10. Loading yoke is placed on the steel ball of loading pad of shear box.
11. Two dial gauges are fitted one to the container for measuring shear displacement and other one is to the loading yoke for measuring vertical displacement.
12. Now locking pins are removed from the shear box and spacing screws are placed in their respective positions of the box.
13. The upper half of the box is raised slightly with the help of spacing screws. The spacing is decided depending upon the maximum size of particle.
14. Now apply the normal stress which is generally 25 KN/m^2. Also apply the shear load at a constant rate of strain.
15. Now the box starts reacting to loads applied and for every 30 seconds note down the readings of proving ring and dial gauges.
16. If the proving ring reaches maximum and suddenly drops it, means the specimen is failed. Note down the maximum value which is nothing but failure stress.
17. For some soils, failure point is taken at 20% of shear strain.
18. Finally remove the box and measure the water content of the specimen.
19. Repeat the same procedure for different normal stresses of 50, 100, 150,200,250,300,400 kN/m^2

Observation table:

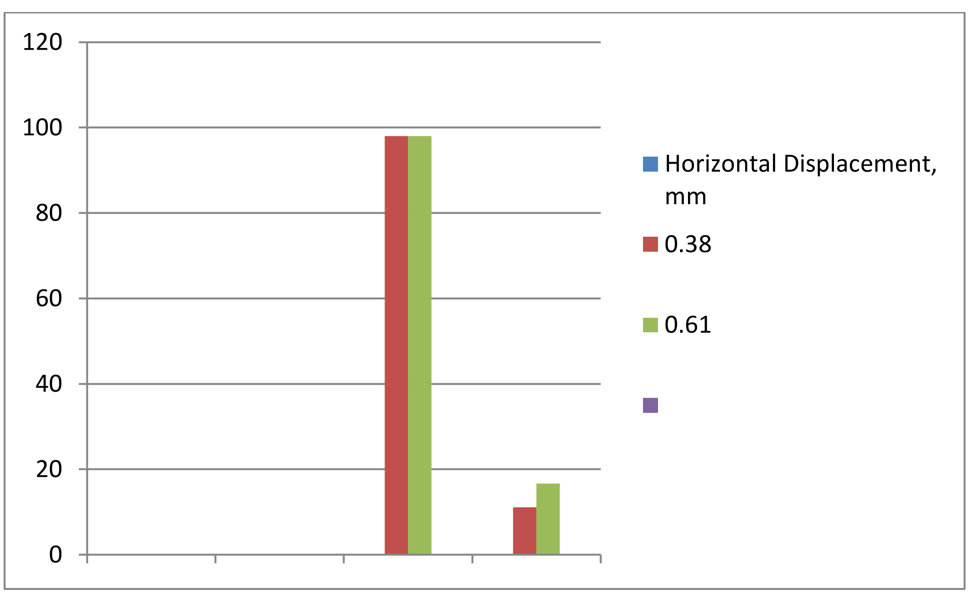
Normal stress=1kg/m^2

Area of sample=366m^2

Rate of loading=0.25mm/min

For normal load: 1 kg/m^2

Horizontal Displacement, mm	Horizontal Load, KN	Effective Area, m^2	Normal Stress, KN/m^2	Shear Stress, KN/M^2
0.380	0.040	3.6×10^{-3}	98	11.11
0.610	0.060	3.6×10^{-3}	98	16.67



For Normal Load: 4 kg/m^2

Horizontal displacement, mm	Horizontal Load, KN	Effective Area, m^2	Normal Stress, KN/M^2	Shear Stress KN/M^2
0.103	0.0410	3.6×10^{-3}	390.28	11.38
0.240	0.0980	3.6×10^{-3}	390.28	27.72
0.370	0.150	3.6×10^{-3}	390.28	41.67
0.420	0.160	3.6×10^{-3}	390.28	44.44
0.500	0.200	3.6×10^{-3}	390.28	55.55
0.560	0.220	3.6×10^{-3}	390.28	61.11
0.570	0.230	3.6×10^{-3}	390.28	63.88

AUTHORS

AUTHOR 1:

Akhilesh Kumar chai is the student of Civil Department of GNIT, Mullana (Ambala). Pursuing his B.tech in Civil Engineering. His research area lies in Study on various properties of Peat soil by the addition of cow dung ash, banana ash and lime.

Email: akleshsahani90@gmail.com

AUTHOR2:

Ranjit Kumar yadav is the student of Civil Department of GNIT, Mullana (Ambala). Pursuing his B.tech in Civil Engineering. His research area lies in Study on various properties of Peat soil by the addition of cow dung ash, banana ash and lime.

Email: : ranjitk77yadav@gmail.com

AUTHOR 3:

Er. Jatin Sekhri is working as assistant professor in Department of civil engineering, Guru Nanak Institute of Technology, Mullana (Ambala). He has done Master of Technology in Geotechnical engineering and pursing his Ph.D. He has 7 years of teaching experience. He has publishing 36 papers in various international journals including journals indexed in Scopes. He has presented major paper in various international conferences and attended many seminars. He is acting as reviewer in many international journals.

Email: jsekhri09@gmail.com

AUTHOR 4:

Er. Jatin Thereja is working as assistant professor in Department of civil engineering, Guru Nanak Institute of Technology, Mullana (Ambala). He has done B. tech. He has 7 years of teaching experience. He has published 9 papers in various international journals including journals indexed in scopes.

Email: jatinthereja4@gmail.com

AUTHOR 5:

Er. Ashu Rana is working as assistant professor in Department of civil engineering, Guru Nanak Institute of Technology, Mullana (Ambala). He has 2 years of teaching experience. He has published 5 papers in various international journals including journals indexed in Scope.

Email: ashuranamullana@gmail.com

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