IT IS NECESSARY TO UNDERSTAND THE VALUE OF K DENSITY WHEN TESTING THE QUALITY OF NATURAL AGGREGATE LAYER IN ROAD COAT STRUCTURE IN THE SOUTH

LE TAN
Department of Civil Engineering, Industrial University of Ho Chi Minh City
letan@iuh.edu.vn

Abstract. Density is an important parameter reflects the quality of the foundation and base construction. Therefore, the exact determination of density parameters is extremely necessary in the work of checking and accepting the work items. The paper presents the results of the research to determine the density of the natural mix layer in the road coat structure with flexible and rational adjustment of the oversized grain content - during standard compaction as well as sampling for field test of density to overcome difficulties and obstacles when implementing the inspection of road structure.
Keywords. Density, standard compaction, oversized grain content, natural aggregate.

1 INTRODUCTION

The quality of the road foundation always plays an important role in improving the load capacity as well as ensuring the stability of the pavement structure during the exploitation and use process. Therefore, the control of input materials and the process of constructing the foundation structure are always paid special attention by the managers.

With various material resources, natural aggregates are widely used in construction of transport works in the southern region and neighboring provinces. Basically, the quality of natural aggregate after construction must ensure that the technical requirements are within the allowable limits of the prescribed standards, specifically:

a. Ingredients grained granules
b. Geometric dimensions
c. Elevation
d. Horizontal slope
e. Elastic modulus E_{dh}
f. K density

During the organization of construction and acceptance, the above specifications (from a to f) are strictly controlled and ensured according to the technical process. Only the parameter of density K is always causing difficulties and hardness for the acceptance of the work, although in reality, the contractor has constructed in accordance with the provisions in the approved technical design dossier. In many projects, natural aggregate works could not be accepted because K density does not meet the requirements. Therefore, to find out the reason why the natural aggregate layer cannot reach the required density during the inspection and acceptance while the other specifications are met is an urgent requirement in current road construction work.

2 OVERVIEW OF STANDARD COMPACTION METHODS IN THE LABORATORY

2.1 Theoretical basis

The density K is determined by the formula [3]:

$$K = \frac{\gamma_k}{\gamma_k^{max}} \qquad (2.1)$$

Inside:

+ γ_k: dry density of field materials (g/cm ^{3}).

+ γ_k^{max} : Maximum dry density of materials is determined by standard laboratory compaction method (g/cm ^{3}).

The dry density is determined by the formula [3]:

$$\gamma_k = \frac{\gamma_w}{1+W} \qquad (2.2)$$

With:

+ γ_W: the natural density of the material determined by the sand hopper method 22TCN 346-06 (g/cm ^{3}) [3]

+ W: natural moisture of material (%) [3]

Maximum dry density of materials γ_k^{max} : determined based on the chart of relation between dry density and moisture content of materials when conducting standard compaction [2].

2.2 Overview of standard compaction methods in the laboratory

Applying standard 22TCN333-06 in soil compaction, macadam. The basic contents of the method are as follows [2]: Use the standard compaction method in the laboratory to determine the best compaction moisture value and the largest dry volume weight of the material used as the base and foundations of transport works. Compaction is done in two ways:

- Standard compaction: use 2.5kg compactor ram with the fall height of 305mm to compact the samples.
- Advanced compaction: using 4.54kg compactor ram with the fall height of 457mm to compact the sample.

Depending on the largest particle size while testing and the type of coil used in sample compaction, each of compaction methods is divides into two types of compaction with symbol A and D. There are four different compaction methods available with symbol I-A, II-A, I-D and II-D.

2.3 Steps of performance

2.3.1 Preparation of testing samples

2.3.1.1 Drying samples

If the sample is wet, it should be dried on the open air or placed in an oven, maintaining the oven temperature of no more than 60°C until it is possible to loosened the materials. Use a rubber hammer to beat lightly to loosen the material. Use a rubber ram to grind small particles to avoid altering the natural composition of the sample.

2.3.1.2 Screening samples

Compaction test samples shall be screened to remove oversized particles. Based on the specified compaction method to use the appropriate type of sieve:

+ With compacting method I-A and II-A: The materials are screened through 4.75mm sieve.

+ With compacting method I-D and II-D: Materials are screened through 19mm sieve.

2.3.1.3 Volume of necessary materials

Based on the specified compaction method, the minimum weight of materials needed for testing is required as follows:

+ With compaction method I-A and II-A: 15kg of materials.

+ With compacting method I-D and II-D: 35kg of materials.

2.3.1.4 Moisturing samples

Taking the prepared sample amount to divide into 5 equal parts, each part is mixed with a suitable amount of water to get a series of samples with a specified moisture distance, so that the best compacted moisture value found after being tested is in the middle of the 5 sample moisture values. Numbering materials from 1 to 5 in order of increasing sample moisture order. Place the moistly-mixed sample part in a closed container for incubation, with an approximate 12-hour incubation period. For macadam aggregates, sandy soil, the incubation time is about 4 hours.

Note: Refer to the following instructions for selecting the first sample moisture value and the humidity range between samples.

+ For sandy soil: starting at 5% moisture, the moisture distance between samples is from 1% to 2%.

+ For clay soil: beginning from 8% moisture, the moisture distance between samples is 2% (for clay soil) of from 4% to 5% (for clay).

+ With macadam gravel: starting from 1.5% moisture, the moisture content between samples is 1% to 1.5%.

+ For macadam aggregates: beginning from 1.5% moisture, the moisture distance between samples is from 1% to 1.5%.

2.3.2 Sample compaction

a. Preparing equipment and selecting compaction parameters.

b. Sample compaction sequences: a series of prepared samples will be compacted from the lowest moisture sample to the highest moisture sample one by one.

c. The thickness of each layer and the total thickness after compaction: based on the required number of compaction layers according to the compaction method to adjust the amount of materials of one layer to be suitable, so that the thickness of each layer after compaction is about the same and the total thickness of the sample after compacting is about 10mm.

d. First compaction mortar: to be carried out of the lowest moisture sample in the following order:

+ First compaction mortar: put the mortar in the firm position, not moving during compaction. Place an appropriate volume of a sample part into the mortar, spread the sample evenly and preliminarily compact with a ram or a tool with a diameter of about 50mm, gently compacting across the sample surface and letting the ram freely after each compaction to distribute the compacting beat evenly across the sample surface.

+ Compacting the next layers: repeat the as for the first layer.

+ After compacting, remove the mortar belt and flat the sample surface with steel rods, leveling it up to the level of the mortar upper surface. Determine the volume of the sample and mortar, symbolized as M_1 (g).

+ Take sample to determine moisture content: take a representative amount of materials among the soil mass, place in a moisturizing box, drying to determine the moisture, symbolized as W_1 (%).

e. Compacting the remaining samples: repeat the process as described in item d for the remaining samples in the ascending order of moisture until the series of 5 samples have been finished. The compaction process will be completed when the wet volume value of γ_W of the sample decreases or does not increase. Normally, the compaction test is conducted for 5 compaction mortars. In case the weight of wet volume γ_W of the 5^{th} sample still increases, the 6^{th} mortar and next motars should be tightly compacted.

2.3.3 Calculate experimental results

a. The moisture content of the sample is determined by the following formula:

$$W(\%) = \frac{A-B}{B-C} x100\% \qquad (2.3)$$

Inside:

+ W: moisture of sample (%).

+ A: weight of wet sample and moist box (g).

+ B: weight of dry sample and moist box (g).

+ C: weight of moisturizing box (g).

b. The wet mass of the sample is determined by the following formula:

$$\gamma_W = \frac{M_1 - M}{V} \qquad (2.4)$$

Inside:
+ γ_W: density of wet sample (g/cm^3).
+ M_1: weight of sample and mortar (g).
+ M: weight of mortar (g).
+ V: volume of mortar (cm^3)
c. The dry mass of the sample is determined by the following formula:

$$\gamma_k = \frac{\gamma_w}{1+W} \qquad (2.5)$$

Inside:
+ γ_k: dry weight of the sample (g/cm^3).
+ γ_W: density of wet sample (g/cm^3).
+ W: moisture of sample (%).
d. Drawing the moisture - dry volumetric relation graph: for 5 series of compacted samples, there will be 5 pairs of moisture value and corresponding mass. Express these pairs of points by the points on the relative humidity and mass density graph, with the vertical axis representing the dry volume mass value and the horizontal axis representing the moisture value. Draw smooth curves through the points on the graph.
e. Determining the best compaction moisture value: The value on the horizontal axis corresponding to the top of the curve is called the best compaction moisture content in a laboratory material, symbolized as W_{opt}
f. Determination of the largest dry bulk mass value: the value on the vertical axis corresponding to the top of the curve is called the largest dry mass of the laboratory material, symbolized as γ_k^{max}
g. Correct the compaction test results in the room when the field materials contain oversized particle sizes.
g.1 Determine the dry bulk mass of the standard particle and the oversized particle
- The dry mass of the standard particle is determined by the formula:

$$M_{ktc} = \frac{100M_{wtc}}{100 + w_{tc}} \qquad (2.6)$$

Inside:
+ M_{ktc}: dry mass of the standard particle (g).
+ M_{wtc}: wet weight of standard particle (g).
+ W_{tc}: moisture content of standard particle (%).
- The dry weight of the oversized grain is determined by the formula:

$$M_{kqc} = \frac{100M_{wqc}}{100 + w_{qc}} \qquad (2.7)$$

Inside:
+ M_{kqc}: dry weight of oversized grain (g).
+ M_{wqc}: wet weight of oversized grain (g).
+ W_{qc}: moisture content of oversized grain (%).
g.2 Determine the standard grain size and the oversize particle fraction.
- The ratio of standard grain is determined by the formula:

$$P_{tc} = \frac{100M_{ktc}}{M_{ktc} + M_{kqc}} \qquad (2.8)$$

- The ratio of oversized particles is determined by the formula:

$$P_{qc} = \frac{100M_{kqc}}{M_{ktc} + M_{kqc}} \qquad (2.9)$$

Inside:
+ M_{ktc}: dry mass of the standard particle (g).
+ M_{wtc}: wet weight of standard particle (g).
+ P_{tc}: standard seed rate (%).
+ P_{qc} : oversized grain percentage (%).
g.3 Determine the best compacting moisture and the corrected maximum dry bulk weight.
- The best adjusted compacted moisture content is determined by the formula:

$$W^{hc}_{opt} = \frac{W_{opt}.P_{tc} + W_{qc}.P_{qc}}{100} \qquad (2.10)$$

Inside:
+ W^{hc}_{opt} : modified best compacted moisture (%).
+ W_{opt} : best compacted moisture according to the results of laboratory compaction (%).
+ P_{tc} : standard seed rate (%).
+ P_{qc} : oversized grain percentage (%).
+ W_{qc} : oversized grain moisture content (%).
- The best corrected volumetric mass is determined by the formula:

$$\gamma^{hc}_{k\max} = \frac{100.\gamma^{\max}_{k}.G_m.\gamma_n}{G_m.\gamma_n.P_{tc} + \gamma^{\max}_{k}.P_{qc}} \qquad (2.11)$$

Inside:
+ $\gamma^{hc}_{k\max}$: the largest corrected dry bulk weight (g/cm^3).
+ $\gamma^{\max}_{k}$: the largest dry volume according to the results of compaction in the room (g/cm^3).
+ P_{tc}: standard seed rate (%).
+ G_m: density of oversized particles.
+ γ_n: volume separately of water (g/cm^3).
g.4 Calculate the compacting coefficient K.
- Actual dry mass of the field sample is determined by the formula:

$$\gamma_{ktt} = \frac{\gamma_{wtt}}{1 + W_{tt}} \qquad (2.12)$$

Inside:
+ γ_{ktt} : actual dry weight of the field sample (g/cm^3).
+ γ_W : actual wet weight of the field sample (g/cm^3).
+ W_{tt} : actual moisture content of samples in the field (%).
- The density coefficient K is determined by the formula:

$$K = \frac{\gamma_{ktt}}{\gamma^{hc}_{k\max}} \qquad (2.13)$$

Inside:
+ $\gamma^{hc}_{k\max}$: the largest corrected dry bulk weight (g/cm^3).
+ K: compacting coefficient (%).
+ γ_{ktt}: actual dry weight of the field sample (g/cm^3).

3 APPLICATION CALCULATION RESULTS FOR SPECIFIC CONSTRUCTION

The author uses compaction data in the laboratory and results of determining K density in the field of two specific works, performed by the Center for Geological Testing of Foundations [4] as a number. Data input for computational research.

3.1 Project: Road from Cultural Area to Ta Lai, Tan Phu Town, Dinh Quan Province, Dong Nai

3.1.1 Test results of particle aggregate particle size [1]

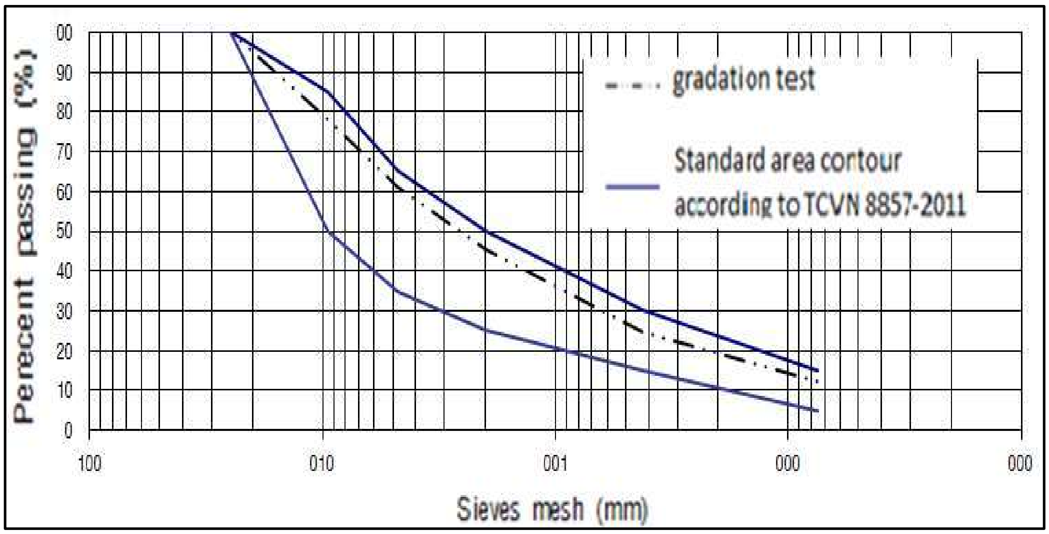

Figure 1: The results of analyzing the grain composition of the natural grading test sample according to the domain of type C (TCVN 8857-2011)

3.1.2 Determination of moisture and density relations [2]

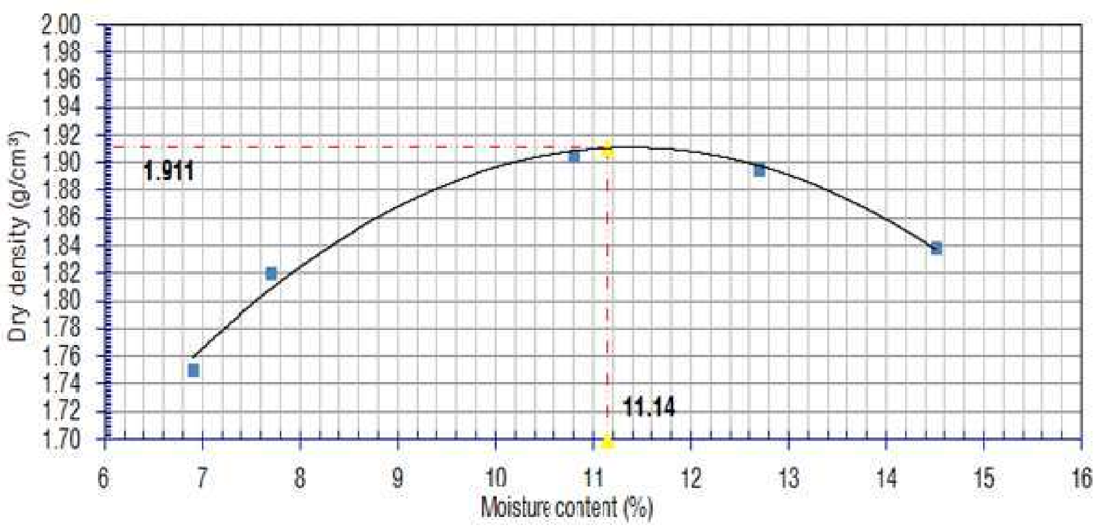

Figure 2: Results of a standard compaction test of a natural mating sample

3.1.3 Result of determining K density in the field [3]

Table 1: Determination of density K at site [3]

No.	Process	Location	Surface correction		Correction of excavation holes		Weight of material in hole (g)	Pit volume (cm^3)	Density of wet volume (g/cm^3)	Humidity (%)	Density of dry volume (g/cm^3)	Density (%)	Required density (%)	Comment
			M_1 (g)	M_2 (g)	M_3 (g)	M_4 (g)								
1	Km0+000	Right	9231	7604	9204	5120	3488	1723	2024	9.12	1.855	0.919	0.95	Unsatisfactory
2	Km0+500	Left	9146	7492	9183	5096	3567	1706	2.091	10.58	1.891	0.937	0.95	Unsatisfactory
3	Km1+000	Center	9027	7322	8986	4702	3713	1809	2.053	8.07	1.9	0.941	0.95	Unsatisfactory
4	Km1+500	Right	8953	7269	8917	4802	3559	1705	2.088	10.33	1.892	0.938	0.95	Unsatisfactory
5	Km2+000	Left	8862	7229	8834	4883	3324	1626	2.045	10.71	1.847	0.915	0.95	Unsatisfactory
6	Km2+500	Center	8693	6984	8649	4296	3715	1854	2.004	7.25	1.868	0.926	0.95	Unsatisfactory
7	Km3+000	Right	8574	6906	8529	4529	3296	1635	2.015	8.87	1.851	0.917	0.95	Unsatisfactory
8	**Km3+500**	**Left**	**8467**	**6815**	**8424**	**4082**	**3967**	**1886**	**2.103**	**9.28**	**1.924**	**0.954**	**0.95**	Satisfactory
9	Km4+000	Center	8382	6743	8351	4264	3574	1717	2.082	10.44	1.885	0.934	0.95	Unsatisfactory
10	Km4+500	Right	8146	6434	8103	3695	3811	1891	2.016	7.96	1.867	0.925	0.95	Unsatisfactory
11	Km4+950	Left	8054	6395	8019	3954	3509	1687	2.08	9.58	1.898	0.94	0.95	Unsatisfactory
12	Km5+000	Center	7961	6229	7887	3706	3501	1717	2.039	8.13	1.885	0.934	0.95	Unsatisfactory
13	Km5+450	Right	7758	5982	7716	3559	3398	1670	2.035	10.05	1.849	0.916	0.95	Unsatisfactory
Standard sand density γ_c = 1,426g/cm^3														

The authors found that the experimental step compaction standards and determine the density at the scene, the Center T U consulting K Score is the A. Ia substance N EN nail C he works are done carefully and methodically. However, the omission of the determination of oversized grain content (greater than 19mm) at the locations during the density test has led to an inaccurate estimation when calculating results of density K in the field (table 1).

To overcome this problem, the author has collaborated with the foundation geological testing and consulting center to perform the following steps:

a. At the locations where the density test was conducted, punching materials to get the same volume of excavated holes with the determined density of K.

b. Take all material samples to the lab, determine the exact amount of oversized particles in each excavation pit.

c. When determining the density K, each test site must be used $\gamma_k^{\max}$ or $\gamma_{k\max}^{hc}$ suitable for calculation. Specifically:

- At the test site, if there are no oversized particles: use $\gamma_k^{\max}$ for calculation.

- At the test site, if there are oversized particles: use $\gamma_{k\max}^{hc}$ it for calculation.

d. Results of density adjustment K in the field after adding oversized grain content are shown in **Table 2**

Table 2:Results of K density determination at site after calibration [3]

No.	Process	Location	Surface correction		Correction of excavation holes		Weight of material in hole (g)	Pit volume (cm^3)	Density of wet volume (g/cm^3)	Humidity (%)	Density of dry volume (g/cm^3)	Oversized grain content (%)	Maximum dry bulk weight (g/cm^3)	Density (%)	Required density (%)	Comment
			M_1(g)	M_2(g)	M_3(g)	M_4(g)										
1	Km0+000	Right	9231	7604	9204	5120	3488	1723	2.024	9.12	1.855	3.4	1.929	0.96	0.95	Satisfactory
2	Km0+500	Left	9146	7492	9183	5096	3567	1706	2.091	10.58	1.891	6.5	1.947	0.97	0.95	Satisfactory
3	Km1+000	Center	9027	7322	8986	4702	3713	1809	2.053	8.07	1.9	6.1	1.944	0.98	0.95	Satisfactory
4	Km1+500	Right	8953	7269	8917	4802	3559	1705	2.088	10.33	1.892	7.7	1.953	0.97	0.95	Satisfactory
5	Km2+000	Left	8862	7229	8834	4883	3324	1626	2.045	10.71	1.847	2.9	1.927	0.96	0.95	Satisfactory
6	Km2+500	Center	8693	6984	8649	4296	3715	1854	2.004	7.25	1.868	10.7	1.97	0.95	0.95	Satisfactory
7	Km3+000	Right	8574	6906	8529	4529	3296	1635	2.015	8.87	1.851	4.6	1.936	0.96	0.95	Satisfactory
8	**Km3+500**	**Left**	**8467**	**6815**	**8424**	**4082**	**3967**	**1886**	**2.103**	**9.28**	**1.924**	**13.8**	**1.988**	**0.98**	**0.95**	**Satisfactory**
9	Km4+000	Center	8382	6743	8351	4264	3574	1717	2.082	10.44	1.885	12.1	1.978	0.95	0.95	Satisfactory
10	Km4+500	Right	8146	6434	8103	3695	3811	1891	2.016	7.96	1.867	6.6	1.947	0.96	0.95	Satisfactory
11	Km4+950	Left	8054	6395	8019	3954	3509	1687	2.08	9.58	1.898	8.3	1.957	0.97	0.95	Satisfactory
12	Km5+000	Center	7961	6229	7887	3706	3501	1717	2.039	8.13	1.885	7.9	1.954	0.96	0.95	Satisfactory
13	Km5+450	Right	7758	5982	7716	3559	3398	1670	2.035	10.05	1.849	4.2	1.934	0.96	0.95	Satisfactory

To ensure reliability when calculating K density, the author used the standard compaction result of the testing unit to determine the largest dry volume $\gamma_k^{\max}$, only adjusting the largest dry volume. When there is an oversized particle content involved $\gamma_{k\max}^{hc}$ at specific experimental sites according to formula (3.9). Therefore, the flexible and reasonable application $\gamma_k^{\max}$ or $\gamma_{k\max}^{hc}$ for each experimental site has made a clear difference in the assessment of the quality of natural graded layer compaction, as shown by the K density test results. **(Table 2)**

3.2 Project: Renovating road from Dac Lua to Dang Ha, Dac Lua, Dinh Quan province, Dong Nai.

3.2.1 Results of particle composition analysis [1]

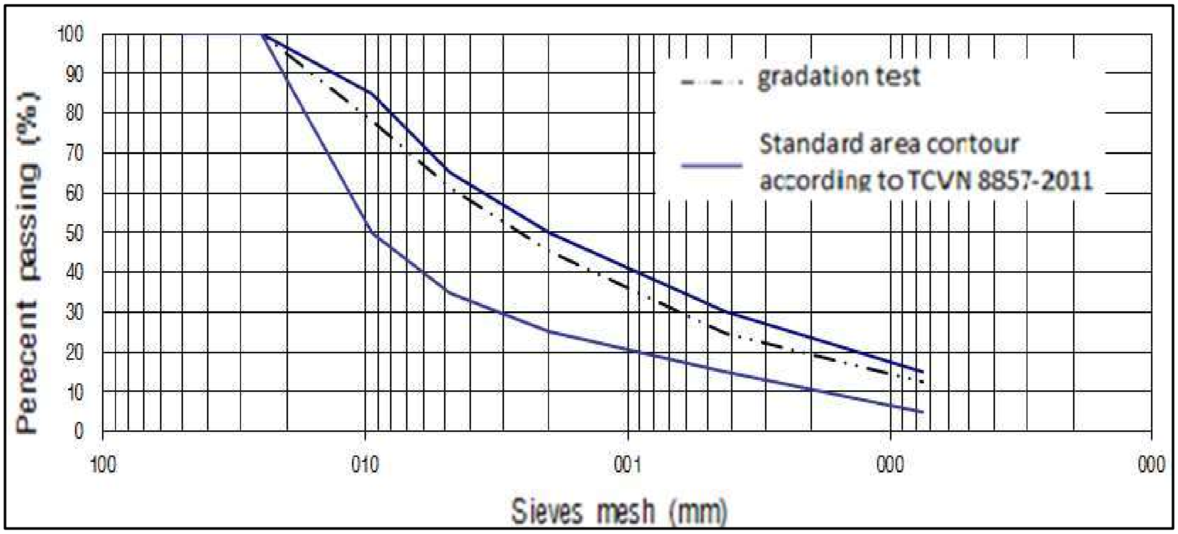

Figure 3: Results of grain composition analysis of natural graded laboratory samples by type C domain (TCVN 8857-2011)

3.2.2 Standard compaction results [2]

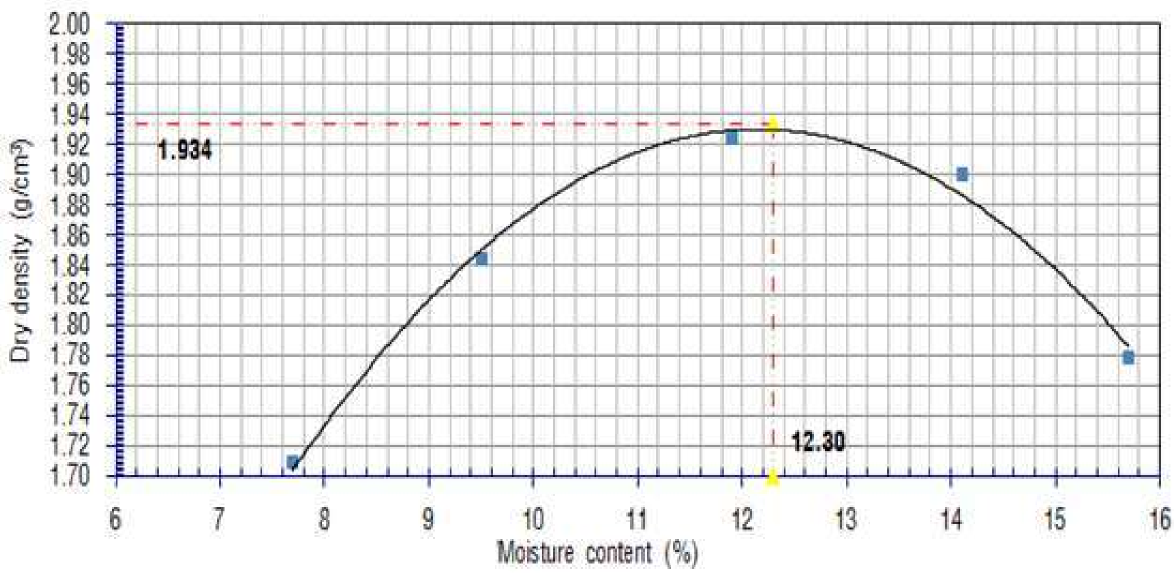

Figure 4: Results of the standard compaction experiment of natural mating sample

3.2.3 Results of density K at site

Table 3:Determination of density K at site [3]

No	Process	Location	Surface correction		Correction of excavation holes		Weight of material in hole (g)	Pit volume (cm^3)	Density of wet volume (g/cm^3)	Humidity (%)	Density of dry volume (g/cm^3)	Density (%)	Required density (%)	Comment
			M_1(g)	M_2(g)	M_3(g)	M_4(g)								
1	Km0 + 050	Heart	8873	7168	8818	4801	3376	1621	2.082	11.37	1,870	0.929	0.95	Unsatisfactory
2	Km0 + 500	Left	8749	6916	8705	4498	3357	1665	2.016	9.06	1.849	0.919	0.95	Unsatisfactory
3	Km1 + 000	Right	8631	6937	8577	4263	3812	1837	2,075	10.59	1,876	0.933	0.95	Unsatisfactory
4	Km1 + 500	Heart	8519	6897	8483	4311	3546	1788	1,983	7.63	1.842	0.916	0.95	Unsatisfactory
5	Km2 + 000	Left	8397	6549	8346	4174	3358	1630	2,060	8.87	1,893	0.941	0.95	Unsatisfactory
6	Km2 + 500	Right	8265	6503	8224	3975	3616	1744	2,073	10.05	1,884	0.937	0.95	Unsatisfactory
7	**Km3 + 000**	**Heart**	**8136**	**6257**	**8106**	**3778**	**3635**	**1717**	**2,117**	**9.91**	**1,926**	**0.957**	**0.95**	**Satisfactory**
8	Km3 + 500	Left	8006	6193	7951	3560	3786	1808	2,094	11.04	1,886	0.938	0.95	Unsatisfactory
9	Km4 + 000	Right	7873	6213	7840	3806	3397	1665	2,040	8.83	1,875	0.932	0.95	Unsatisfactory
10	Km4 + 500	Heart	7724	6085	7693	3542	3569	1762	2.026	10.19	1,839	0.914	0.95	Unsatisfactory
11	Km4 + 950	Left	7609	6012	7554	3574	3459	1671	2,070	9.65	1,888	0.93 8	0.95	Unsatisfactory
Standard sand density γ_c = 1,426g / cm^3														

Use the same procedure as **in 3.1.3** . Results of density adjustment K in the field after adding oversized grain content are shown in **Table 4.**

Table 4: Results of K density determination at site after calibration [3]

No.	Process	Location	Surface correction		Correction of excavation holes		Weight of material in hole (g)	Pit volume (cm^3)	Density of wet volume (g/cm^3)	Humidity (%)	Density of dry volume (g/cm3)	Oversized grain content (%)	Maximum dry bulk weight (g/cm^3)	Density (%)	Required density (%)	Comment
			M_1(g)	M_2(g)	M_3(g)	M_4(g)										
1	Km0 + 000	Right	8873	7168	8818	4801	3376	1621	2.082	11.37	1,870	4.8	1.96 1	0.95	0.95	Satisfactory
2	Km0 + 500	Left	8749	6916	8705	4498	3357	1665	2.016	9.06	1.849	2.2	1.9 46	0.9 5	0.95	Satisfactory
3	Km1 + 000	Heart	8631	6937	8577	4263	3812	1837	2,075	10.59	1,876	3.2	1.9 52	0.9 6	0.95	Satisfactory
4	Km1 + 500	Right	8519	6897	8483	4311	3546	1788	1,983	7.63	1.842	1 .3	1.9 41	0.9 5	0.95	Satisfactory
5	Km2 + 000	Left	8397	6549	8346	4174	3358	1630	2,060	8.87	1,893	3.6	1.9 54	0.9 7	0.95	Satisfactory
6	Km2 + 500	Heart	8265	6503	8224	3975	3616	1744	2,073	10.05	1,884	4.7	1,960	0.96	0.95	Satisfactory
7	**Km3 + 000**	**Right**	**8136**	**6257**	**8106**	**3778**	**3635**	**1717**	**2,117**	**9.91**	**1,926**	**12.6**	**2.0 05**	**0.96**	**0.95**	**Satisfactory**
8	Km3 + 500	Left	8006	6193	7951	3560	3786	1808	2,094	11.04	1,886	3.5	1.9 5 3	0.9 7	0.95	Satisfactory
9	Km4 + 000	Heart	7873	6213	7840	3806	3397	1665	2,040	8.83	1,875	6.5	1,970	0.9 5	0.95	Satisfactory

10	Km4 + 500	Right	7724	6085	7693	3542	3569	1762	2.026	10.19	1,839	1.4	1,942	0.95	0.95	Satisfactory
11	Km4 + 950	Left	7609	6012	7554	3574	3459	1671	2,070	9.65	1,888	8.7	1,983	0.95	0.95	Satisfactory

*** Comment:**

- Result of K density density implemented by the Advisory Center for geotechnical investigation on the project of **Road from Cultural Area to Ta Lai, Tan Phu Town, Dinh Quan Province, Dong Nai** and **Renovating road from Dac Lua to Dang Ha, Dac Lua, Dinh Quan province, Dong Nai** was mostly unsatisfactory (K<0.95) along the entire test (each project has only 01 inspection position meets the required density: K≥0.95).
- With reasonable and scientific adjustments at each experimental site (the author presented above), the density value of natural grading layer has changed markedly, all meeting design standards. (K≥0.95). Thus, the obstacles of the projects have been removed. Since the quality of compaction (through the density value K) of the route was not satisfactory (K<0.95), it was now guaranteed (K≥0.95). It is possible to conduct pre-acceptance test and transfer to the next stage of construction.

4 CONCLUSION

From the actual result, the author realized that in order to ensure the accuracy in determining the density K of the natural gradation in the pavement structure, the following requirements must be ensured:

a. At each position of the density test, it is imperative to determine the amount of oversized particles contained in the composition of the excavated volume

b. It is not recommended $\gamma_k^{\max}$ or used $\gamma_{k\max}^{hc}$ to calculate K density for all test sites.

c. Must be used $\gamma_k^{\max}$ or $\gamma_{k\max}^{hc}$ suitable for each testing site through the accurate determination of the oversized particle content.

REFERENCES

[1] The process of construction and acceptance of the pavement structure layers with natural gradients (TCVN8857: 2011)
[2] The process of compaction of soil and macadam in the laboratory (22BC 333-06)
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CẦN HIỂU ĐÚNG GIÁ TRỊ ĐỘ CHẶT K KHI KIỂM ĐỊNH CHẤT LƯỢNG LỚP CẤP PHỐI THIÊN NHIÊN TRONG KẾT CẤU ÁO ĐƯỜNG Ô TÔ Ở KHU VỰC PHÍA NAM

Tóm tắt. Độ chặt là thông số quan trọng phản ánh chất lượng thi công nền móng công trình. Vì vậy, việc xác định chính xác thông số độ chặt là vô cùng cần thiết trong công tác kiểm tra, nghiệm thu hạng mục công trình. Bài báo trình bày kết quả nghiên cứu xác định độ chặt lớp cấp phối thiên nhiên trong kết cấu áo đường mềm với sự điều chỉnh linh hoạt và hợp lý hàm lượng hạt quá cỡ trong quá trình đầm nén tiêu chuẩn cũng như quá trình lấy mẫu thí nghiệm độ chặt tại hiện trường nhằm tháo gỡ những khó khăn, vướng mắc khi triển khai công tác kiểm định kết cấu đường ô tô.
Từ khóa. Độ chặt, đầm nén tiêu chuẩn, hàm lượng hạt quá cỡ, cấp phối thiên nhiên.

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