STEPS Students Report

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I visited the geotechnical engineering lab of the prestigious Lomonosov Moscow State University of Russia for a duration of one month in October. I was accepted to the lab of Prof. Eugene Voznesensky, who is one of the leading researcher in the field of geotechnical engineering. During my stay in Russia, I helped the researchers of the lab in performing geotechnical experiments in various soil specimens. While assisting the researchers, I have been able to deepen my understanding about the experimental methodologies adopted in Russia.

The two series of experiments that are going on during my stay in the lab are 1. Static Triaxial Test 2. Dynamic Triaxial Test. The tested soil specimens were collected primarily from two locations: 1. Organic clays collected from sea shelf of Northern Russia 2. Silty sands obtained from an atomic station in Hungary. Moreover, soil specimens were acquired from numerous construction companies of Russia. The experimental procedure is briefly discussed below:

A 50 × 100 mm dimension split mold (as shown in figure 1) is used to prepare the sandy soil specimen. The sand specimens were compacted to the desired relative density by means of side tapping onto the mold using a rubber mallet. A top cap is gently placed on top of the sand (as shown in figure 2) and the membrane is rolled upwards and an o-ring is used to fix the membrane on to the top cap. Figure 3 shows the prepared sand specimen for the triaxial testing. The dimensions are then accurately measured by means of a Vernier caliper. The confining pressure cell is placed outside the soil specimen and the entire assembly is positioned into a loading frame (figure 4).

		
Fig. 1 Mold for sample preparation	**Fig. 2** Placing of top cap	**Fig. 3** Prepared sand specimen

Fig. 4 Assembly for triaxial testing

The samples are saturated by means of back pressure saturation procedure. To ascertain that the samples are fully saturated, B-value is calculated. A B-value close to 0.99 signifies that the samples are fully saturated. After that, samples are consolidated to a desired effective confining pressure. The consolidation stage for sand specimens usually takes about one hour. Up to this step, the triaxial testing is similar for both the static and dynamic tests. In case of static test series, samples are then monotonically sheared at a fixed strain rate in undrained condition. The increase in pore pressure due to shearing is also recorded.

On the other hand, in case of dynamic tests, small cyclic stress of predetermined number of cycles is applied to the soil specimen first. The amplitude of cyclic load is gradually increased keeping the number of cycles same throughout the test. By connecting the points obtained at the end of each cyclic loading amplitude, it is possible to obtain a stress-residual strain relationship.

The setup used for the preparation of the clayey soils is different from that used for sandy soils. Figure 5 depicts the setup used for the preparation of clayey specimens. The undisturbed soil which is obtained from various construction sites, is placed inside the top and bottom pedestal of this apparatus and the excess soil is gently trimmed off using a knife. Moreover, I have been described the working principles of other state of the art test apparatus that are available in the laboratory. Figure 6 and figure 7 show the resonant column test apparatus and true triaxial test apparatus available in the laboratory.

Fig. 5 Setup for clayey soil specimens

Fig. 6 Resonant column test apparatus

Fig. 7 True Triaxial test apparatus

Other than research, I utilized my time judiciously and visited some splendid and spectacular places in Moscow. I visited Kremlin and the Red square, with some of my friends from Moscow on a clear Sunday morning.

Fig. 8 Picture with St. Basil's cathedral

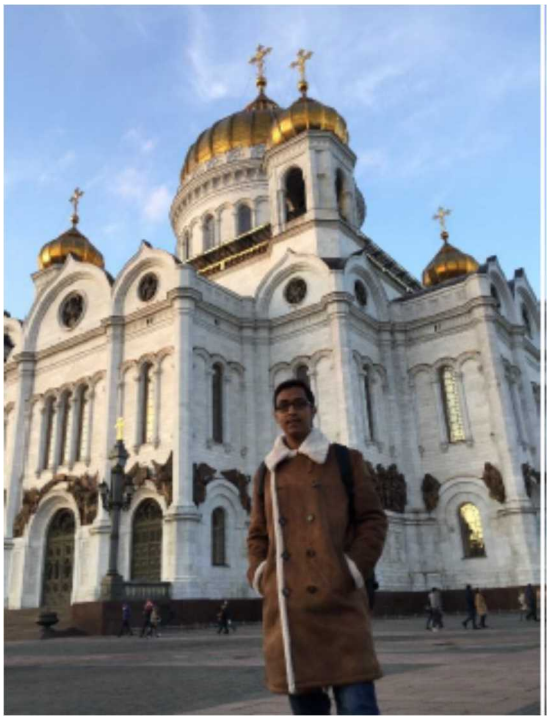

Fig. 9 Picture with Cathedral of Christ the Savior

Visiting the magnificent St. Basil's cathedral has always been on my bucket list and I was very glad to visit it (figure 8). I explored numerous other cathedrals and churches in Moscow and was enamored by the beauty of those exquisite and elegant architectural marvels (figure 9).

During my sojourn in Moscow, I learnt myriads of novel geotechnical testing techniques adopted in Russia. Furthermore, I was extremely impressed by the Russian hospitality and friendliness. I was fortunate enough to make a lot of Russian friends and they were immensely helpful and supportive to me during my entire stay in Moscow.