BULETIN GEOTEKNIK

EDISI 1/2019

JKR21300-0084-19

TEMURAMAH EKSKLUSIF BERSAMA PENGARAH CKG

PENULISAN ARTIKEL KEJURUTERAAN GEOTEKNIK BERASASKAN IR 4.0

DARI PENA PENGARAH

Assalamualaikum dan Salam Sejahtera

Bersyukur kehadrat Allah S.W.T kerana dengan limpah kurnia dan izin-Nya Buletin Cawangan Kejuruteraan Geoteknik edisi pertama bagi tahun 2019 berjaya diterbitkan.

Adalah menjadi hasrat serta keinginan Cawangan ini untuk menjadikan **Buletin Geoteknik** ini sebagai satu medium dalam menyampaikan maklumat dan perkembangan semasa bidang Kejuruteraan Geoteknik kepada seluruh warga JKR dan pelanggan.

Harapan saya dan warga CKG semoga buletin ini dapat dimanfaatkan bukan sahaja di JKR tetapi juga untuk semua yang terlibat di dalam bidang Kejuruteraan Geoteknik amnya. CKG juga mengalu-alukan sebarang ulasan dan cadangan dari semua pihak berhubung penerbitan ini agar penambahbaikan yang sesuai dapat dilakukan dalam edisi akan datang. Saya juga menyeru warga CKG dapat terus menyumbangkan artikel-artikel yang bermanfaat untuk meningkatkan kualiti buletin ini seterusnya.

Akhir kata, di kesempatan ini saya ingin merakamkan ucapan tahniah dan syabas kepada semua yang terlibat secara langsung atau tidak langsung, terutama kepada penulis artikel, sidang redaksi, editor dan juga ketua - ketua Bahagian di CKG yang memberi sokongan dalam penerbitan buletin ini. Saya mendoakan agar kerjasama yang sedia ada terjalin dikalangan semua warga CKG akan berkekalan dan segala aktiviti yang dirancang dapat dilaksanakan dengan jayanya.

Sekian, terima kasih

Ir. Abdul Hadi Bin Abdul Aziz
Pengarah Cawangan
Kejuruteraan Geoteknik

BULETIN GEOTEKNIK

EDISI 1/2019

Sumbangan Redaksi mengalu-alukan sebarang sumbangan artikel dan pandangan yang membina bagi mengemaskini serta mempertingkatkan lagi mutu penerbitan **Buletin Geoteknik.** Sumbangan artikel boleh dialamatkan kepada :

Alamat :

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KANDUNGAN

SIDANG REDAKSI

Tahukah Anda :The Fourth Industrial Revolution (IR 4.0)

Penulis :
Mohd Hafiz Bin Shafie

Application

From buying our needs at the Shopping Complex to the Online Shopping, from traditional physical phone keypad to the simple interface touchscreen shows we are towards to the new era. We are living in the fast technology growth that we also do not know at which platform floor level we are now. Before we are going further steps, lets we study back what's exactly Industrial Revolution it is.

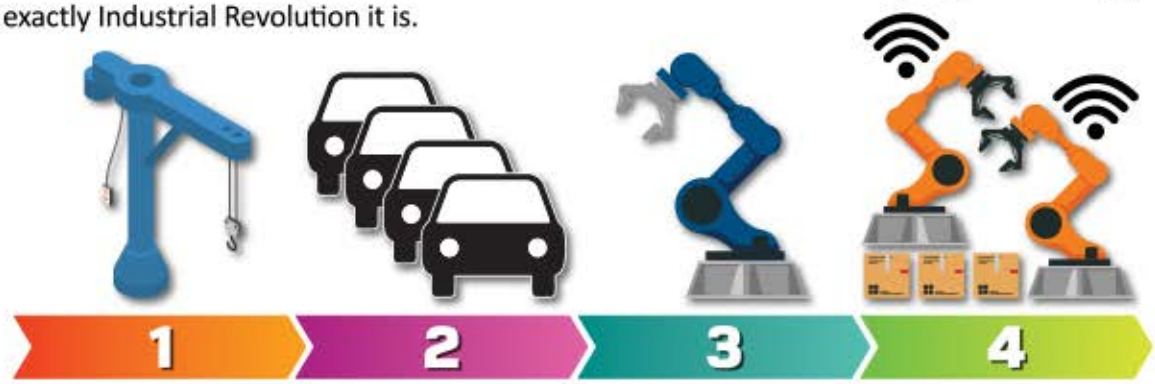

Figure 1 : *Flow of Industrial Revolution*

The revolution is changed from manual handled to the combination of cyber-physical system to produce products and services. Some other people said that revolution begin from traditional to the super power technology that changes from human involvement to fully computerized.

According to the Andreja Rojko, the ***first industrial revolution*** began in 1800s which brought transition from manual work to the first manufacturing processes especially in the textile industry. In addition, Ian Wright said the first revolution is start in the time between 1760 and 1840 with the means start at midst of 1700s. Its could be say that the first revolution is stated at early of 1800s when water and steam were used for production machinery.

The ***second industrial revolution*** start at the beginning of World War I around the end of 19th century and early of 20th century about 1870 to 1914. Contrary to the first revolution, the second revolution more focusing on the mass production enhance replacing water and steam into electricity power.

The ***third industrial revolution***, information technology was adapted in the industrial including combination of automation and the computer. It begins around early of 1960s and the sound of the industrial continues until recently. According to the Ian Wright, pinpointing the period of this third industrial revolution is tricky because at least some of the account we are still in it. In this revolution, the advancement was brought in the precision level and accuracy. Apart of that, the revolution also to be characterized as beginning of digitalization with introducing of microelectronics and automation.

As you know, we are in the ***fourth industrial revolution*** involve of kind physical fusion, digital, development of Information and Communication surely expected to change how we live, work and communicate. Based on the Andreja Rojko research, she said the fourth industrial revolution is reorganization from classical automation to self organizing cyber physical production system. The revolution was presented by Germany Government at the Hannover in year 2011. As we all know the Germany has one of the most competitive manufacturing industries in machinery and automotive manufacturing.

Figure 1 : *Flow of Industrial Revolution*

What The Situation Now?

According to The World Economic Forum, more than half student in the primary school today in the world today estimated will working in the job that haven't create yet. In conjunction with IR4.0, there are three categories work likely to be automated in future i.e. repetitive, based on rule and involve limited physicality. All of kind criteria the job will take place by robot to do the job. As we can see today, certain jobs were in mode like cashiers, team assemblers, groundskeeping workers, foodservice host, insurance claim, order clerk and salesperson. Most of the job be handled by computer and access of the internet. According to the study carried by StudyMalaysia.com, trends of current and future to be as follows:

- 10% of people will be wearing clothes connected to the internet.
- 80% will have unlimited (sponsored) backup space in the cloud.
- There will be one trillion sensors connected to the internet.
- 80% of the world's population will have internet presence.
- The first automobile entirely produced with a 3D printer.
- 90% of world population will own a smart phone.
- 90% of world population will have internet access.
- 10% of all vehicles on the road will be driverless
- More than 50% of home appliances will be connected to internet.

What the Things Are The Engineer Should Prepare?

We see the trend now mostly in line and nothing impossible to the repetitive and limited physicality likely to be taken place by Mr. Robot. According to the expert, there are three keys areas where humans beat machines that are:

Creative endeavors
Creative writing and entrepreneurship

Social interaction
No emotional intelligence by Mr. Robot

Physical dexterity and mobility
Practitioners in robot can't do dancing and swimming.

So, in can be concluded that the engineer should have this four (4) quality in the era of IR 4.0. That are:

Become more diligent and attentive workforce

- Focusing on the task at hand.
- Hone skills and talents in our line of work.
- Knowing how to integrate new technologies into workplace effectively.

Double up the opportunity and beat down the low production

- Development in other unexplored areas.
- Seek answers to the question unaffordable to respond in the past

Shifts in specializations

- The world is steering towards environmentally friendlier.

Keep up the rapid advancement in technology and devices

- Digging unprecendented technological advancements.
- Staying continuously informed about technology upgrades.
- Expanding research and study in artificial intelligence and quantum computing

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Temuramah Eksklusif Bersama Pengarah

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Perjalanan Kerjaya di JKR

1984
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1991
PENGARAH NEGERI
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2004
PENOLONG PENGARAH KANAN
JKR Pahang

2006
KETUA PENOLONG PENGARAH
Bahagian Geoteknik, Cawangan Jalan

2015
KETUA PENOLONG PENGARAH KANAN
Bahagian Kejuruteraan Asas,CKG

2017-2019
PENGARAH
Cawangan Kejuruteraan Geoteknik

Temuramah Eksklusif Bersama Pengarah

"Bolehkah Tuan ceritakan serba sedikit perjalanan kerjaya sepanjang berkhidmat di Jabatan Kerja Raya Malaysia?"

Sebaik menamatkan pengajian di University of Glasgow pada tahun 1984, saya kembali berkhidmat di Jabatan Kerja Raya dan ditempatkan di Unit JKR DARA Pahang Tenggara. Saya terlibat dalam kerja-kerja merangka dan mengurus projek-projek pembangunan Bandar Baru, selaras dengan Dasar Ekonomi Baru yang diperkenalkan oleh Y.A.B. Perdana Menteri ke 4. Sepanjang tempoh tersebut, saya banyak mempelajari dan memperolehi ilmu berkaitan kejuruteraan, terutamanya Kejuruteraan Geoteknik.

Pada tahun 1991, saya telah diberi tanggungjawab untuk memegang jawatan sebagai Ketua Cawangan di Pusat Khidmat Kontraktor (PKK) di Pahang, WP Kuala Lumpur, Sarawak dan Selangor selama 12 tahun untuk mewujudkan Kontraktor-Kontraktor Kerja.

Kemudian, kerjaya saya diteruskan lagi apabila dilantik sebagai Jurutera Awam Kanan di JKR Pahang bermula tahun 2004 hingga 2006. Saya di tempatkan di Bahagian Projek Khas di mana saya banyak terlibat dalam kerja-kerja audit serta pemantauan pembinaan kerja jalan. Antaranya, menaiktaraf jalan Temerloh - Mentakab, pembinaan Jambatan Chenor dan pembinaan jalan Jerantut – Maran Pakej 5B. Banyak pengalaman yang saya tempuhi samada suka dan duka sepanjang penglibatan dengan projek tersebut kerana terpaksa menempuhi hutan tebal bersama rakan-rakan seperjuangan demi menyediakan kemudahan untuk orang awam.

Pada tahun 2006, saya telah ditukarkan ke Unit Sokongan (Bahagian Geoteknik), Cawangan Jalan sebagai Ketua Penolong Pengarah. Penglibatan saya dalam bidang kejuruteraan geoteknik diteruskan sehingga tahun 2015 di mana saya telah dinaikkan pangkat sebagai Ketua Penolong Pengarah Kanan. Saya terus diberi kepercayaan untuk mengetuai Bahagian Rekabentuk Asas di CAWANGAN KEJURUTERAAN GEOTEKNIK (CKG). Sepanjang tempoh tersebut, saya banyak terlibat dalam kerja-kerja merekabentuk serta membuat kajian dalam bidang kejuruteraan geoteknik. Selain itu, saya juga terlibat dalam pengauditan dan menjadi penasihat kepada projek-projek berkaitan Kejuruteraan Geoteknik.

Setelah tiga dekad saya menempuhi pelbagai cabaran dan halangan, akhirnya pada Julai 2017 saya telah dilantik sebagai Pengarah Cawangan Kejuruteraan Geoteknik.

Temuramah Eksklusif Bersama Pengarah

"Selaras dengan misi Cawangan Kejuruteraan Geoteknik untuk menjadi pemberi perkhidmatan utama dalam bidang kejuruteraaan geoteknik menerusi aplikasi amalan kejuruteraan terbaik, boleh Tuan Pengarah huraikan tentang penglibatan dalam projek yang banyak memberi impak yang positif dalam kerjaya?"

Geoteknik merupakan satu bidang tugas yang amat penting di mana bermulanya sesuatu pembinaan atau bangunan adalah bermula dari kerja geoteknik. Antara projek yang berimpak besar yang terlibat sebagai AJK Penyiasat Pembinaan adalah seperti berikut:

- PKFZ Pulau Indah, Arahan Jabatan Peguam Negara
- Pembaikan tanah runtuh Bukit Antrabangsa , Majlis Ampang Jaya
- Penyiasatan keselamatan pembinaan Kilang Nadi Bumi Lynas Kuantan, Lembaga Atom Negara
- Penyiasatan Bebas KLIA 2, Jabatan Audit Negara
- Jawatankuasa Penyiasatan Bebas bagi Kajian Kemungkinan Keselamatan 2 Blok di Highland Tower, Ulu Klang
- Ahli Jawatankuasa Khas Siasatan Paip Pecah di pembinaan Lebuh Raya West Cost (WCE), SPAN
- Technical Committe TC D.4 Rural Road and Earthworks World Road Association Mondiale De La Route (PIARC)
- Pengerusi Kerja-Kerja Geoteknik Standard Malaysia
- Technical Committee Peat Soil, CREAM CIDB

"Seperti yang kita ketahui, banyak sumbangan dan pencapaian yang membanggakan telah tuan berikan kepada Jabatan. Boleh tuan kongsikan apakah sumbangan dan pencapaian sepanjang 36 tahun berkhidmat di JKR?"

Matlamat utama saya adalah untuk mengetengahkan keperluan utama Kejuruteraan Geoteknik kepada semua warga JKR dan masyarakat umum.

Temuramah Eksklusif Bersama Pengarah

"Apakan pesanan dan nasihat kepada pegawai-pegawai muda bagi meningkatkan kompetensi dalam bidang kejuruteraan Geoteknik?"

Ilmu dalam bidang Kejuruteraan Geoteknik memerlukan proses pembelajaran yang mendalam dan ***Hands-On*** kerana sifat fizikal tanah terlalu sukar untuk dipelajari dan sentiasa dipengaruhi oleh keadaan persekitaran. Pegawai- pegawai juga perlu tekun dan proaktif dan sentiasa mencuba cabaran baru atau kajian-kajian baru ke arah inovasi.

"Dalam menjadikan JKR sebagai sebuah jabatan teknikal yang kekal elevan, JKR perlu menunjukkan budaya inovasi, *optimization* dan proaktif dalam melaksanakan semua tugasan. Apakah pandangan tuan berhubung perkara ini?"

Kakitangan JKR perlu proaktif dan bijak menjangkakan apa yang akan berlaku pada masa akan datang serta tindakan yang perlu dibuat. Selain itu, kita hendaklah sentiasa bersedia untuk menghadapi cabaran dan kita tidak sepatutnya menjadi "seperti pahat dengan penukul" jika mahu berjaya pada masa akan datang.

Temuramah Eksklusif Bersama Pengarah

"Realitinya, cabaran yang kita hadapi pada hari ini memerlukan kita sentiasa bertindak secara proaktif dan pantas berubah mengikut peredaran semasa. Pengabaian kepada teknologi baru atau tidak bersedia menerima perubahan akan menyebabkan kita ketinggalan. Sepanjang 2 tahun tuan menggalas jawatan sebagai Pengarah CKG, apakah harapan tuan bagi CKG pada 10 tahun akan datang?"

Saya berharap pada masa akan datang Data-Data Geoteknikal Sistem G Maklumat yang kita bangunkan ini lebih tersusun dan teratur dari segi data maklumat seperti data-data *SI, Foundation Work, Geotechnical Work* dan *Forensic* sejajar dengan saranan *IR 4.0 (Big Data)* kerana Cawangan ini sentiasa memerlukan data-data tersebut agar ia mudah untuk dikaji dan dianalisis bagi kegunaan masa akan datang dalam bidang Geoteknik.

"Sebelum mengakhiri temubual pada hari ini, apakah impian Tuan Pengarah selepas bersara nanti?"

Impian saya adalah untuk merangkumkan kerja Geoteknik dengan alam semulajadi ke arah sesuatu yang inovasi untuk menyelesaikan kerja-kerja Geoteknik berasaskan *environmental sustainability*, kelestarian InshaAllah.

Geophysical Methods For Geotechnical Investigation

Penulis :
Hisam Bin Ahmad

Introduction

Geophysical methods can be defined as exploring or determining the subsurface characteristics by measuring physical properties of the earth materials. The techniques can be used on land, at sea or in the air. In each case, basic techniques are modified, but the same physical properties are involved irrespective of the environment.

The survey methods can offer considerable savings in both time and cost within investigations, and/or can significantly reduce the risk of encountering unforeseen ground conditions during construction. Geophysical surveys may also be used to check the interpretation of the geological structure between the boreholes during the drilling programme. Furthermore it can also be categorized as non-destructive method of investigation, that has minimal impact to the environment and surroundings.

Application

In geotechnical investigation, the common geophysical methods applied are Seismic Refraction, 2-D resistivity, Ground Penetrating Radar (GPR) and Microgravity as listed in ***Table 1***. These methods and coupled with other site investigation data i.e borehole are best operated and processed by experienced geophysicist and interpreted with good knowledge of geology.

The design of a geophysical investigation should take into account and incorporate, as appropriate, the primary objectives of engineering geophysical surveys which are listed in ***Table 2***, that is for geological investigation, determination of engineering properties of the ground and buried artefacts. The application of the various methods for different geotechnical problems should also be taken into account.

Method	Measure Parameter	Operative Physical Property
Seismvic	Travel times of reflected/refracted seismic waves	Density and elastic moduli, which determine the propagation velocity of seismic waves.
Gravity	Spatial variations in the strength of the gravitional field of the earth.	Density
Electrical		Electrical conductivity
Resistivity	Earth resistance	Electrical capacitance
Induced polarzation	Polarization voltages of frequency - dependent ground resistance	Electrical conductivity
Self-potential	Electrical potentials	Electrical conductivity
Electromagnetic	Response to electromagnetic radiation	Electrical conductivity and inductance
Ground Penetrating Radar	Travel times of reflected radar pulses.	Dielectrical constant

Table 1 : *Geophysical Methods*

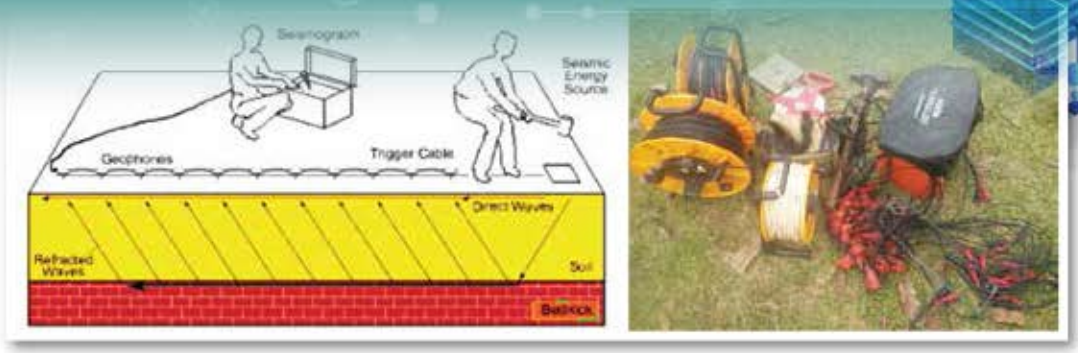
Figure 1 : *Geophysical methods and equipments*

Problem		Example	Methods and remarks
Geological Investigation	Lithological	Soils over rock : • *Sands and gravel over rock, water table low in sands and gravels* • *Sands and gravels overlying clay, water table high in sands and gravels* • *Clay over rock* • *Weathering profile*	• *Seismic refraction* • *Resistivity* • *Resistivity or seismic refraction* • *Seismic refraction*
		Sediments over rock	Marine Continuous seismic reflection profiling Continuous resistivity profiling
	Erosional for caverns, see "Shafts..." below	Buried channel	Seismic refraction Resistivity for feature wider than depth of cover
		Burried karstic features (cavities, irregular profile, pinnacles, floater, sink hole)	2D & 3D Resistivity tomography, Cross-hole seismic methods, resistivity & Induced Polarization (IP) methods, microgravity, Transient Electromagnetic Method (TEM)
	Structural	Buried faults, dykes	2D & 3D Resistivity tomography, Seismic reflection or refraction Magnetic and gravimetric (large faults), Cross hole, seismic tomography
Engineering properties	Modulus of elasticity, density and porosity	Dynamic deformation modulus Check on effects of ground treatment	Seismic velocity T surface, or with single or multiple boreholes. (Crossholes transmission) Borehole geophysics.
	Pile length	Depth of pile below structure	Borehole geophysics, parallel seismic, borehole Ground Penetrating Radar (GPR), borehole fluxgate magnetometer.
	Rock rippability	Determination of P wave velocity and method of excavation.	Seismic refraction survey.
	Corrosivity of soils	Pipeline surveys	Surface resistivity, Redox potential.
Buried arterfacts	Unexploded ordinance (UXO)	Any site development	Magnetometer, Electromagnetic (EM), GPR
	Cables and pipes	Trenches on land	Magnetometer, GPR Electromagnetic field detectors
	Submarine cables and pipes	Submarine trenches Submarine pipelines	Echo sounding, side scan sonar Side scan sonar, magnetic, continuous seismic profiling (especially if thought to be partially buried) with high frequency pinger
	Shafts, adits and caverns	Shaft, sink holes, mine workings	Resistivity. Magnetics, electromagnetic, radar; infra-red air photography on clear areas. Crosshole seismic measurements. Detailed gravity for large systems
	Archaeological remains	Foundations, burried walls, crypts, ditches	Magnetic, electromagnetic resistivity and GPR

Table 2 : *Geophysical application in geotechnical investigation*

GEOPHYSICAL METHOD	GEOTECHNICAL APPLICATION	ADVANTAGES	DISADVANTAGES
Seismic	Bedrock determination, excavation classification, RQD and Poisson's Ratio determination, pavement strength, pile/column detection	• Penetration depth depend on seismic sources. • Qualitative and quantitative data.	• Workability depends on site. • Sensitive to noise. • Hidden layer problem
Electrical Resistivity	Map different strata, fault zones, slope failures, cavities, boulders, water table and groundwater.	• Penetration depth up to 150m. • Easier data interpretation.	• Workability depends on site. • Sensitive to conductive materials.
Ground Penetrating Radar (GPR)	Map subsurface features such as voids, fractures in rock and utilities such as cables, pipes etc.	• Easy to conduct. • Less expensive.	• Limited depth. • Sensitive to conductive materials. • Difficulties data interpretation.
Microgravity	Determine the location of large faults and to find the extent of large buried channels, cavities etc	• Easy to conduct. • Less expensive.	• Difficult to detect small anomalies • Sensitive to vibration. • Complex data processing.

Table 3 : *Advantages and disadvantages of geophysical methods*



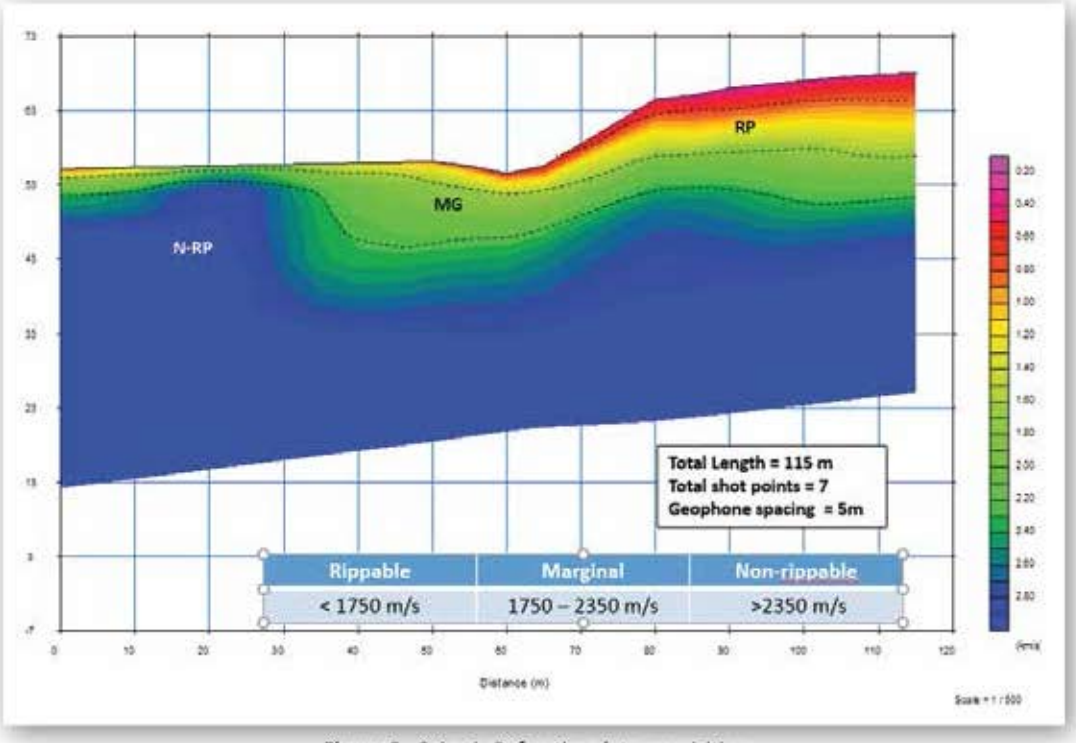


Figure 2 : *Seismic Refraction data acquisition*

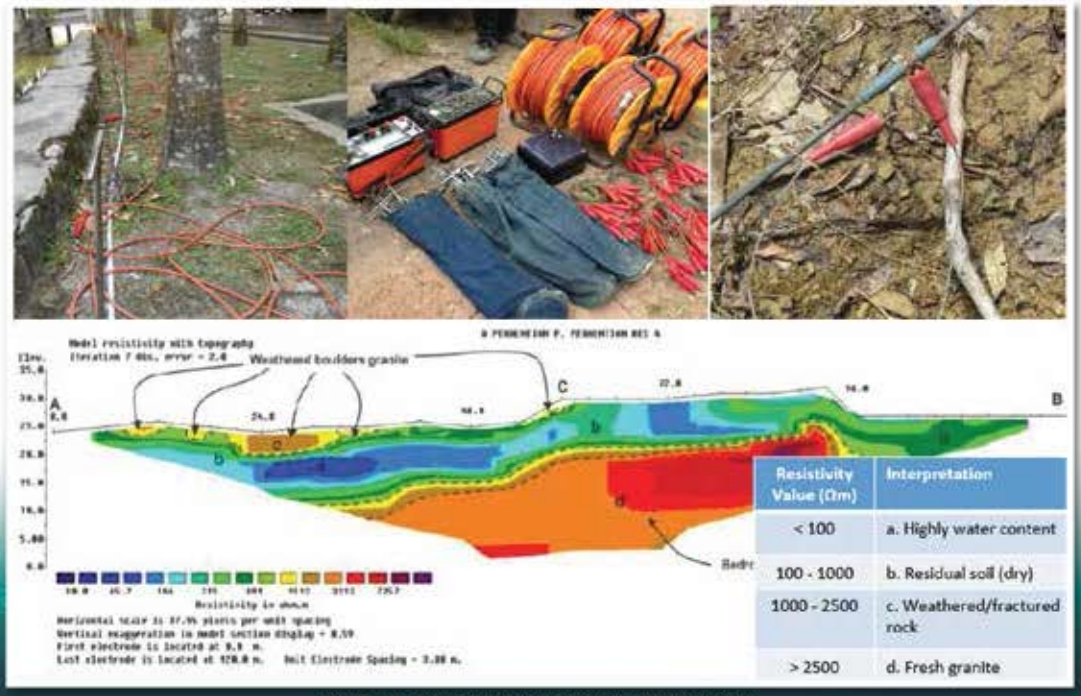


Figure 3 : *Electrical Resistivity data acquisition*

Figure 4 : *GPR data acquisition*

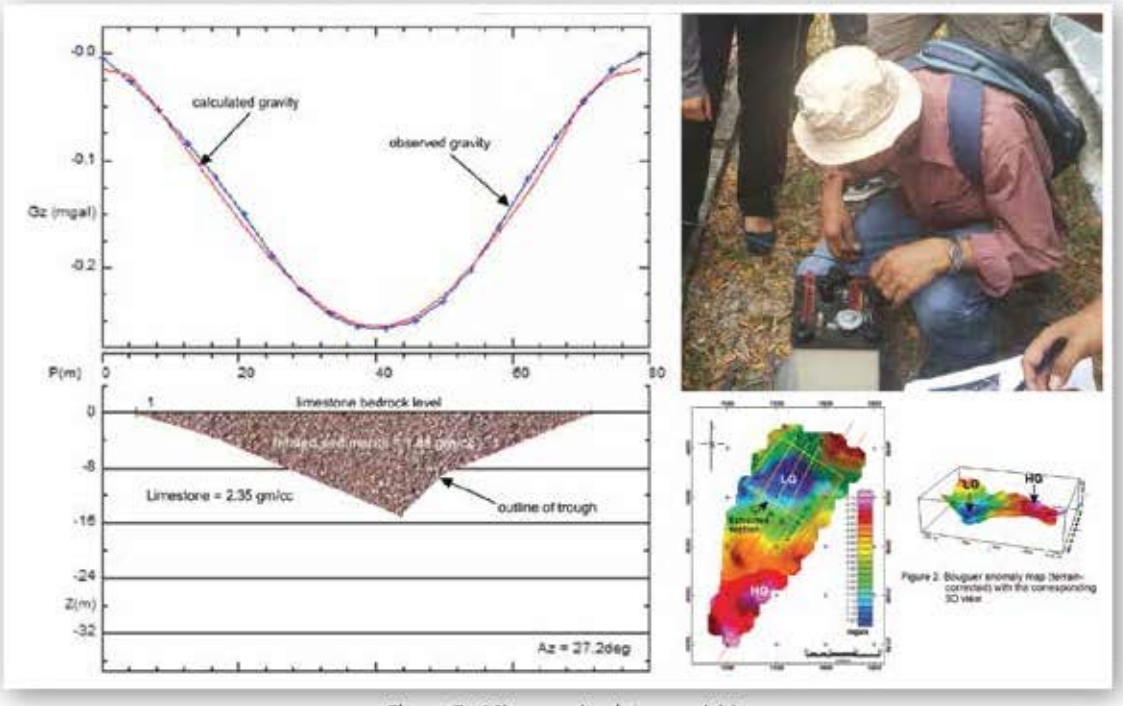


Figure 5 : *Microgravity data acquisition*

Conclusion

Geophysical method provides a new dimension in more advanced site investigation works in order to provide more alternative geotechnical solutions.

Geophysical method are encouraged to be used in areas requiring more detailed investigations.

Geophysical method is cost-effective and useful to determine subsurface characteristics for regional sites as well as for correlation/verification of borehole data.

Polyurethane Flatbed : An IngeniousSolution To Resolve Settlement of Soft Ground

Penulis :
Dr. Ismacahyadi Bagus Bin Mohamad Jais
Universiti Teknologi MARA, Shah Alam, Selangor

Introduction to Soil Volume Change Behaviour and Buoyancy

Settlement is divided into three phases which are immediate settlement due to the load applied, consolidation settlement due to the dissipation of excess pore water pressure generated during the applied constant load and secondary settlement which takes into account the reorientation of the soil particles as excess pore water pressure has fully dissipated. If Terzaghi and Frohlich (1936) concept is an ideal implementation to engineering application, secondary compression is expected to cease as it reaches 90% consolidation. However, in the real world, volume change behaviour occurs in three (3) dimensions where vertical and lateral in the major and minor direction occur simultaneously. Assuming that the lateral stresses are equal in all directions, the soil is said to be isotropic and the changes in all lateral directions are said to be equal. Therefore, after the soil has achieved 90% consolidation, there is the idea of secondary compression that occur infinitely through time and it is a gradual movement.

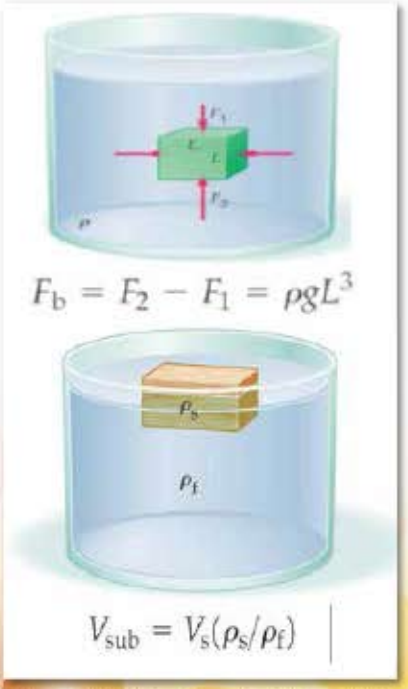


Figure 1. *Archimedes principle to exhibit buoyant force*

The concept of buoyancy was first introduced by Archimedes in 250 BC where he stated that any object, totally or partially immersed in fluid is buoyed up by the force equal to the weight of the fluid displaced by the object. The force or up thrust causing the object to float is known as buoyant force. When the object with higher density than water is immersed, the object will sink as it displaces less water volume. However, with the object of lower density than water causing more water to be displaced, hence the object will experience upward thrust and floats as shown in ***Figure 1.*** This is the key concept in designing lightweight blocks such as expanded polystyrene system where it is said to float since the density of the block is lesser than the density of water. Chian et al. (2014) provides an example of floatation mechanism where the buoyant force of a structure (FB) is governed by the Archimedes principle is equivalent to the displaced volume of water when the structure is immersed, multiplied by the unit weight of water. Therefore, the value of net uplift force (FNET) is equal to the summation of buoyancy (FB) and generated excess pore water pressure (FEPP) subtracted to the summation of weight of the structure (FT), weight of the overlying soil (FWS) and the shear resistance of the soil (FSP) as exemplified in ***Figure 2.***

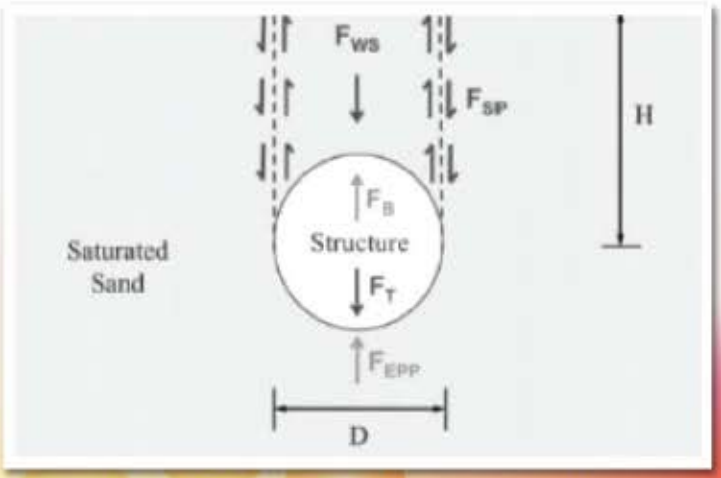


Figure 2. *Forces acting on a pipe in saturated soil (Chian et. al., 2014)*

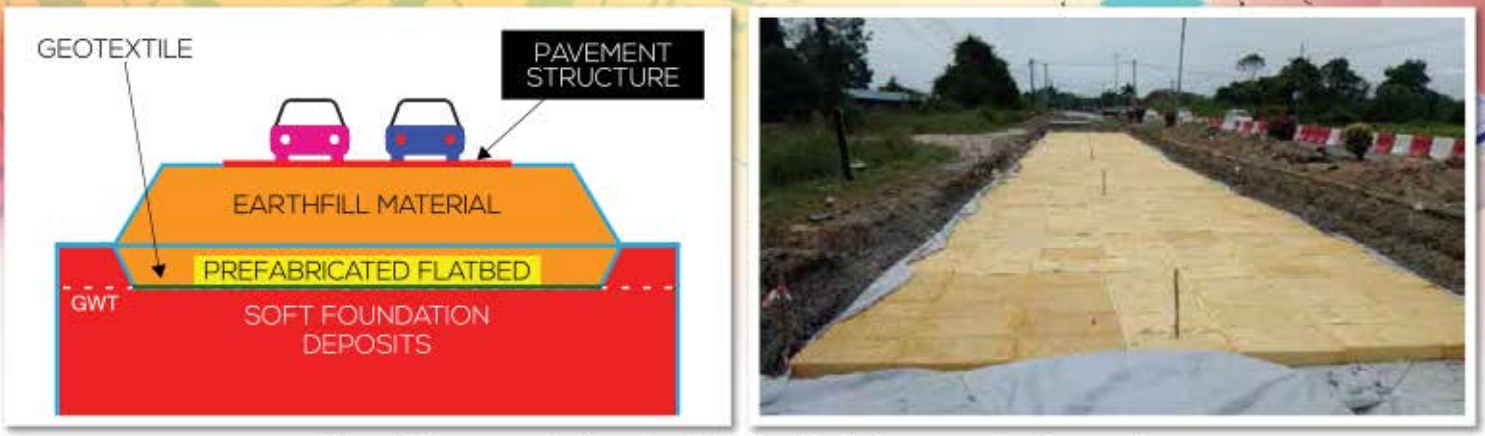


Figure 3. *The concept of polyurethane flatbed application for construction of new roads.*

Polyurethane (PU) Flatbed

With the emergence of PU foam as one of the alternative method to solve ground settlement issues and rehabilitation of existing superstructure and infrastructure, an ingenious solution using polyurethane (PU) flatbed was introduced to reduce the overburden pressure for the new construction of embankments and platforms. Since it is lightweight buoyancy is introduced to reduce the issue of settlement on soft aturated deposits. This idea of integrating consolidation and buoyancy is the key in designing PU flatbed to support the platform above and provide buoyancy, hence reduces the consolidation settlement of soft ground. Polyurethane flatbed is a lightweight mattress technique for ground remediation of existing depressed road embankments and development of new road embankments and platforms. The objective of this system is to provide buoyancy and to reduce the overburden pressure, hence reduce the amount of settlement of soft ground. In addition, the lightweight properties help to reduce the development of excess pore water pressure from the overburden pressure, which in turn becomes buoyant force to support the lightweight material. ***Figure 3*** shows the concept on the use of PU flatbed.

Description	Value	Unit
Dimension, W x L	500 x 1,000	mm^2
Unit weight, γ	0.8 – 1.5	kN/m^3
Stiffness modulus, E	10,000 - 15,000	kN/m^2
Poisson's ratio, v	0.3	
Compressive strength, UCS	2.2 - 16	MPa
Permeability, k	1×10^{-12}	m/s

Table 1. *Geometrical and material properties of PU flatbed.*

Table 1 provides the geometrical dimension and properties of the PU flatbed prepared. Material propertiestests executed in the laboratory include scanning electron microscope (SEM), expansion rate test, compression test, consolidation test using modified Rowe's cell, permeability test using hydraulic cell and buoyancy test.

Construction Sequence

For a road construction, the unsuitable material is to be excavated to the groundwater level, usually common in soft ground conditions, the depth of the groundwater is between 1 - 1.5 m below ground level (BGL). As illustrated in ***Figure 4***, Once the formation level was encountered, a layer of geotextile separator will be placed to separate the soil and the PU flatbed. Then the PU flatbed is placed on top of the geotextile separator and glued to form a solid homogenous mattress like layer. Once the PU flatbed is laid, the earthen material is placed up to the formation layer and is allowed to consolidate based on the duration specified by the designer. During this period, it is advised that a monitoring programme be implemented to evaluate and observe the performance of the fill embankment and the PU flatbed to ensure that the design consideration and requirements are met. Then the construction of the pavement structure is executed accordingly.

Figure 4. *Sequence of construction for the installation of PU flatbed.*

Performance Evaluation

Settlement monitoring was conducted at Sultan Idris Shah Polytechnic, Sabak Bernam, Selangor where PU flatbed was installed at six (6) walkway locations that undergone excessive settlement. The settlement monitoring procedure was executed after the installation has completed for two (2) walkway locations, which are near the swimming pool and the hotel kitchen. Details of the instrumentation is given in ***Figure 5***. A total of eight (8) settlement markers are placed at two (2) of the locations mention earlier and two (2) of them are located on the existing corridor as a stationary point.

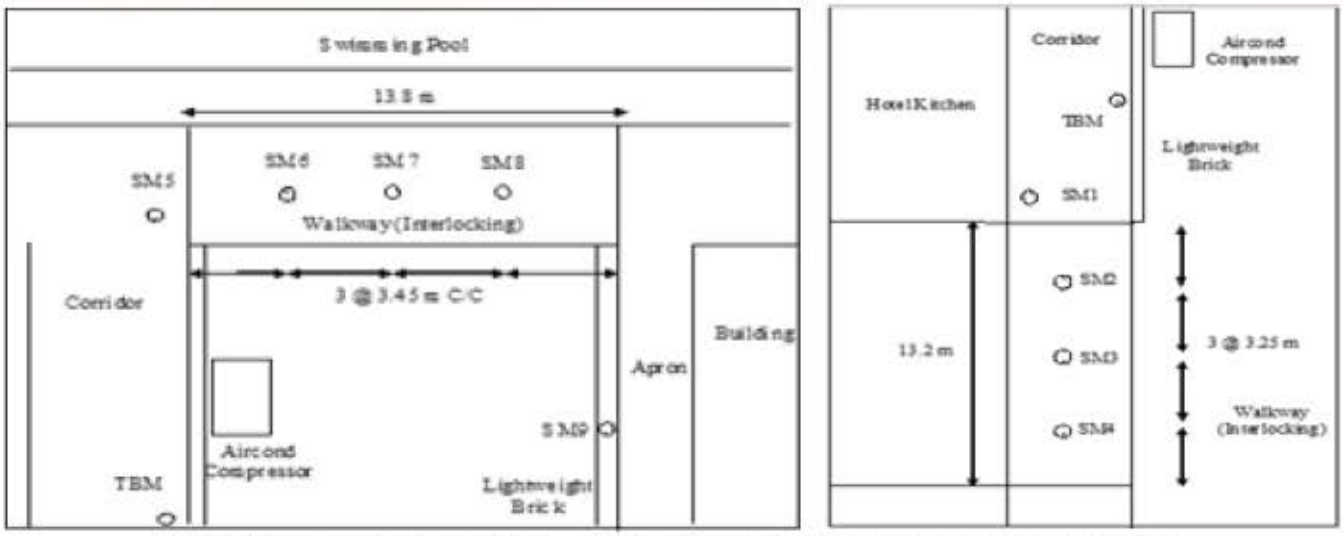


Figure 5. *Location of the instrumentation. 1) By the swimming pool and 2) adjacent to the hotel kitchen.*

Based on the monitoring data observed, the maximum settlement recorded was 8.1 mm at the walkway by the swimming pool and 11 mm adjacent to the hotel kitchen after 6 months of monitoring. This is an average of 1.35 mm and 1.83 mm, respectively for both locations. ***Figure 6*** and ***Figure 7*** illustrate the settlement plots and settlement profiles of the monitoring locations. The settlement is said to be uniform throughout the walkway within the tolerable limits of 25mm. However, there is a slight sagging to the walkway due to these differences but is unnoticeable visually since the settlement values are still within the tolerable limit. It is seen that the PU flatbed has reduce the settlement significantly since the walkway as restored to its original level only settle slowly within six (6) months after the rehabilitation work.

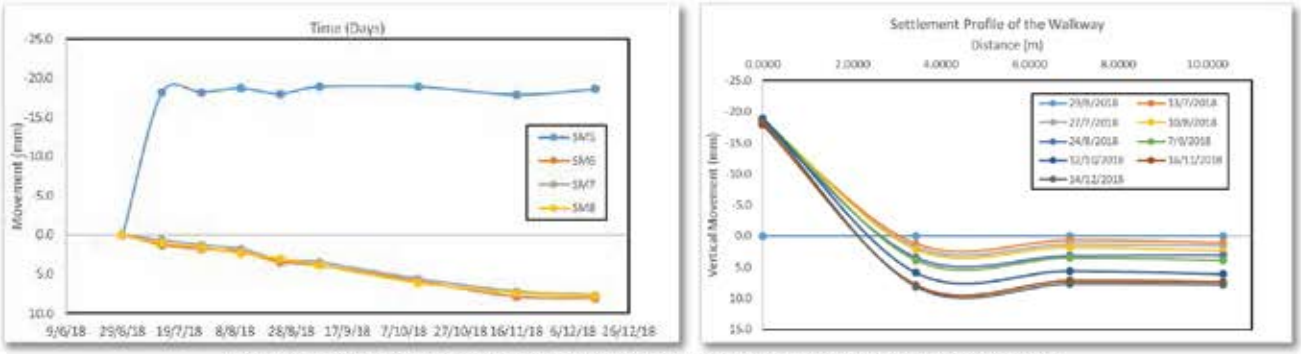


Figure 6. *Recorded settlement and profile at the walkway adjacent to the swimming pool.*

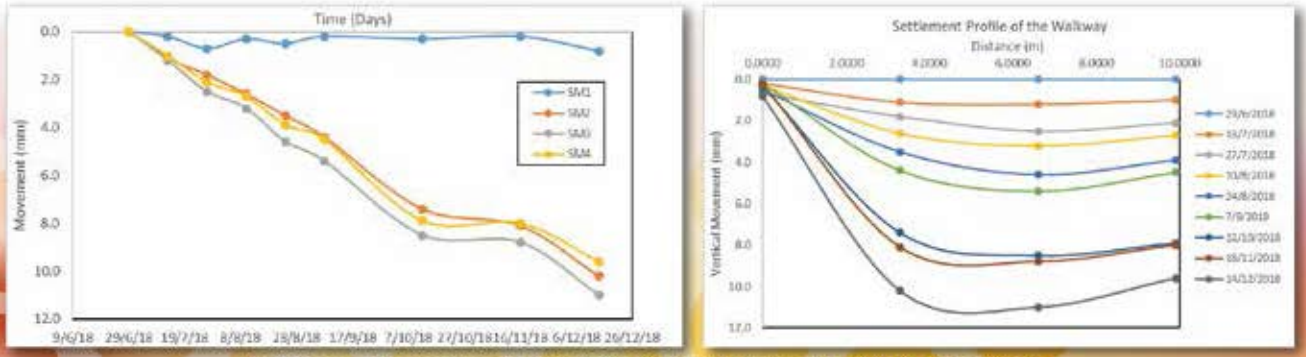


Figure 7. *Recorded settlement and profile at the walkway adjacent to the hotel kitchen.*

Advantages and Disadvantages of PU Flatbed

From the performance results presented, there are several advantages and disadvantages of using PU flatbed as an alternative to solve ground settlement which are:

Advantages

01 Shorter rehabilitation time and the PU flatbed can be placed and constructed less than two (2) weeks, depending on the size of the project. Therefore, traffic can be opened immediately after the pavement has been reinstated.

02 High compressive strength and buoyant. Therefore, it is resistant to additional or excessive load and reduces vibration to the rehabilitated ground.

03 Lightweight, reducing the likelihood of primary settlement or further subsidence and imposing extra overburden pressure to the foundation soil.

04 Void-filling and low permeability characteristics of the material reducing the chance of water infiltration.

Disadvantages

01 For rehabilitation, the installation requires the existing ground to be excavated, thus traffic operators need to provide temporary closure during excavation, installation, and reconstruction;

02 Since it is lightweight, the counterweight (usually soil fill) must be more than the calculated uplift force to prevent uplift of the system.

Summary

As a summary, the use of PU flatbed has provided many advantages in the aspect of providing geotechnical reinforcement and ground improvement to reduce the effect of settlement. Several key points have been proven from the performances whereby:

- The strength and stiffness of the fill has increased and the fill has been rehabilitated to ensure that volume change of the modified soil or settlement can be reduced, hence increases the bearing pressure of the foundation layer.
- PU flatbed provides additional buoyancy to reduce the effect of primary settlement, hence reducing the dissipation of excess pore water pressure to become buoyant force.
- The PU flatbed is water resistant providing a discontinuous layer between the fill and the foundation soil, thus reducing the effect of infiltration and capillary rise.
- The fill material provides counter balance to the uplift pressure from the fluctuating water table, hence, there is no need of a concrete slab to act as a counter balance to the PU flatbed.
- The work provisions are simple, reducing the time of construction, cost of additional construction material, mobilization and transportation.

Future Prospect of PU Flatbed

Lightweight material construction is now preferred since it partly resolves the issue of ground settlement. Moreover, design and construction of this material requires additional stability and uplift calculations to ensure that the system is at its optimum. Therefore, the use of PU Flatbed as an alternative for ground settlement solution reduces time, hassle of installation, maintenance and the cost of construction, hence will assist stakeholders in the planning and development of potential soft ground and weak soil conditions.

Acknowledgement

The author would like to acknowledge CREaTE JKR Malacca for providing the research fund and extend his gratitude to Cawangan Kejuruteraan Geoteknik (CKG) JKR for the support and supervision of this research. The author would also like to extend his gratitude to Geocon Engineering Sdn Bhd and the people involved in providing ideas and material for the proposed research work.

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Naziran Perolehan (Pembelian Terus/ Lantikan Terus) 2018 Oleh Bahagian Akaun, Kementerian Kerja Raya

Penulis :
Ahmad Luqman Bin Halit

Pengurusan Tertinggi Jabatan Akauntan Negara Malaysia (JANM) telah melaksanakan transformasi naziran mulai tahun 2018 selaras dengan pelaksanaan perakaunan akruan seluruh negara bagi menggantikan Program Naziran Sistem Perancangan dan Kawalan Belanjawan Elektronik (eSPKB) yang diguna pakai sebelum ini. Maka bagi tahun 2018, penilaian telah dijalankan ke atas Perolehan (Pembelian/Lantikan Terus) bagi semua Pusat Tanggungjawab dibawah setiap Pejabat Perakaunan. Penilaian telah dijalankan dengan menggunakan kaedah Pengauditan Berasaskan Risiko bagi mengenal pasti tahap kawalan dalaman pengurusan pembelian terus (bekalan dan perkhidmatan) / lantikan terus (kerja) di jabatan. Aspek utama yang akan dilaporkan melibatkan empat risiko yang terdiri seperti rajah di sebelah:

Naziran Perolehan (Pembelian Terus/Lantikan Terus) 2018 oleh Bahagian Akaun Kementerian Kerja Raya (KKR) telah berlangsung sepanjang tahun 2018. Sebanyak 27 PTJ Kementerian Kerja Raya terlibat di dalam Naziran Perolehan tersebut dan Cawangan Kejuruteraan Geoteknik (CKG) merupakan salah satu PTJ yang terpilih untuk diadakan Naziran Perolehan bagi Separuh Tahun Kedua 2018 (Jun sehingga Disember 2018).

Program Naziran Perolehan (Pembelian Terus/Lantikan Terus) telah dilaksanakan di CKG pada 7 November 2018 mulai jam 9.00 pagi. Pasukan Naziran tersebut diketuai oleh En. Noor Izatul Hisham bin Ab. Rahim bersama - sama ahli naziran yang lain iaitu Pn. Raja Nur Adilah bt Raja Muhammad, Pn. Nor Asikin Binti Abdullah, En. Muhammad Azeim bin Che Omar dan Muhammad Hazrul Nazran bin Abdul Hadi. Mesyuarat Pembukaan Naziran Perolehan tersebut dipengerusikan oleh Pn Norzani bt Mahmood sebagai bagi pihak Pengarah CKG pada masa tersebut. Mesyuarat penutupan bagi naziran tersebut pula diadakan pada 26 November 2018 pada jam 2.30 ptg yang telah dihadiri oleh Ketua Akauntan KKR, Pn Norhaslina binti Muhamad. Mesyuarat penutupan tersebut dipengerusikan oleh En Ismail bin Mohamad selaku bagi pihak Pengarah. Pembentangan hasil naziran tersebut telah dibentangkan oleh Bahagian Akaun KKR. Berdasarkan penilaian berasaskan risiko yang dijalankan Bahagian Akaun, KKR mendapati prestasi bagi setiap skop penilaian bagi CKG adalah cemerlang.

Skop	Prestasi
A. Kawalan Peruntukan	Cemerlang
B. Kelulusan Perolehan	Cemerlang
C. Tatacara Perolehan	Cemerlang
D. Pengurusan Pembayaran	Cemerlang
E. Pengurusan Kontrak	Cemerlang

Penilaian ini meliputi aspek pematuhan pekeliling/prosedur dan arahan kewangan berkaitan pengurusan pembelian terus (bekalan & perkhidmatan) / lantikan terus (kerja) sepanjang tempoh Januari 2018 sehingga Jun 2018. Penilaian menunjukkan prestasi keseluruhan adalah cemerlang dengan markah 99%.

Diharapkan dengan pencapaian ini, CKG akan terus cemerlang dalam pengurusan kewangan bukan sahaja pada kaedah perolehan, malah juga pada aspek-aspek kewangan yang lain di masa hadapan.

tahniah & syabas!

An Introduction to Using QR Codes in Attendance Record

Penulis :
Mohd Hafiz Bin Shafie

Nowadays it is commonplace in modern style existence how frequently QR codes are used. QR Code known as Quick Response Code uses in numerous like Wi-Fi network login, code payment, URLs etc. has exploded to the point where they are legitimately used in our daily life. In term of marketing uses, QR codes have the potential to help people find out more about a special access through the codes. Perhaps, in future the QR Codes could expand their expertise to give more valuable meaning to shorten access in term of work quality, communication flow and marketing wise.

What Is a QR Code?

It was been created in 1994 by Denso Wave incorporated, Japan. The main objective of QR Code is designed for car manufacturing plants to manage the inventories of car part. A QR code is the abbreviation for quick response code, which is a machine-readable optical label with information on the associated item or product. In barcodes, information is coded in one direction or one dimension only. On the other hand, in a two-dimensional code, which the QR code is, information is coded in two directions: horizontally and vertically. It can be read easily and capable of holding a great deal of information. Although Denso Wave could choose to retain the patent rights to the QR code, the company declared that it would not exercise them, with the aim that QR codes be used by as many people as possible. Thus, QR codes can be used at no cost and without worrying about patent problems. They are becoming a public code used worldwide.

Five (5) Benefit of QR Code VS Bar Code

Figure 1: *Capacity of a QR code that encodes 300 alphanumeric characters*

Figure 2: Micro QR code

Figure 3: Example of destroyed or damaged of QR codes

1) High Capacity Encoding of Data

Several QR code features are worth examining in more detail. The QR code's most important characteristic is the encoding of enormous quantities of data. Conventional bar codes can store up to 20 digits. On the other hand, QR codes can provide up to a hundred times more information than bar codes. QR codes can manage all types of data, for example, letters, numbers, graphics, and audio or video files. One QR code can encode up to just over 7,000 characters.

2) Small Printout Size

Since a QR code symbol is designed with a two-dimensional structure, it can encode 10 times more data than a barcode of same size. A micro QR code may be used for a smaller print size as shown in Figure 2.

3) Dirt - and Damage-resistant Durability

The QR code has an ability to perform error correction. Data in QR codes can be recovered even if parts of the symbol have been destroyed or damaged. Data restoration is dependent on the proportion of damage. Refer to Figure 3.

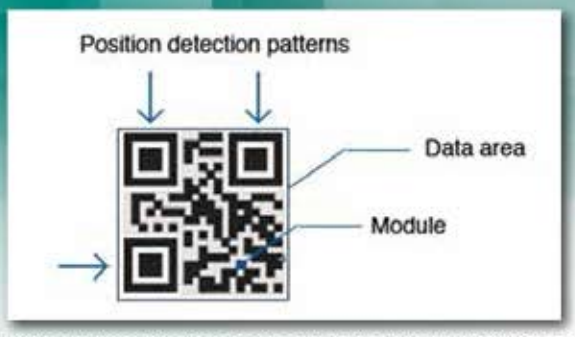


***Figure 4** : Pattern is designed to evade background interference.*

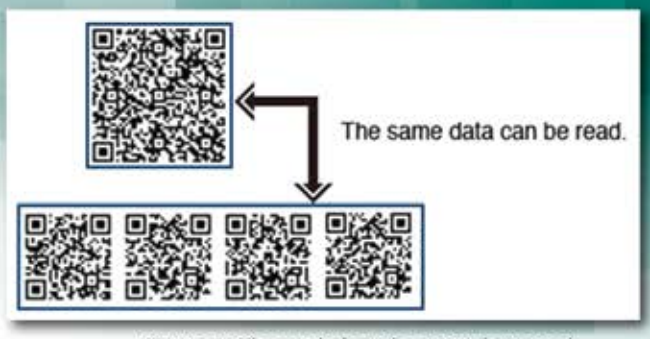


***Figure 5** : The symbol can be printed grouped*

4) Readable from Any Direction in 360 Degrees

A QR code is designed to be rapidly readable from any direction in 360 degrees. This is possible due to the position detection patterns at three corners of the symbol. These patterns make the QR code symbol quickly readable. Figure 4 show the pattern is also designed to evade background interference.

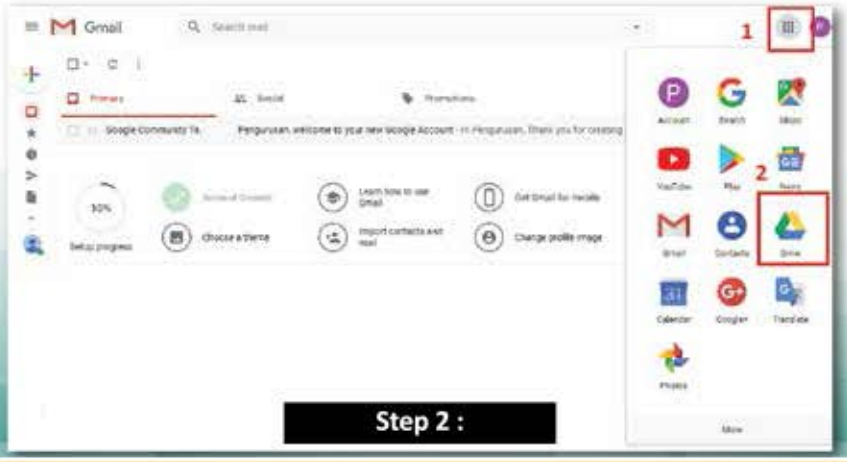
5) Structured Appending Feature

Another feature of the QR code is its structured appending feature. One QR code symbol can contain up to 16 separate smaller symbols, each of which contains different unique information. The advantage of this structure is that it can be printed in a smaller space. Conversely, multiple QR code symbols can be grouped in a single data symbol as shown in ***Figure 5.***

10 Steps to Create QR Code for Meeting Attendace

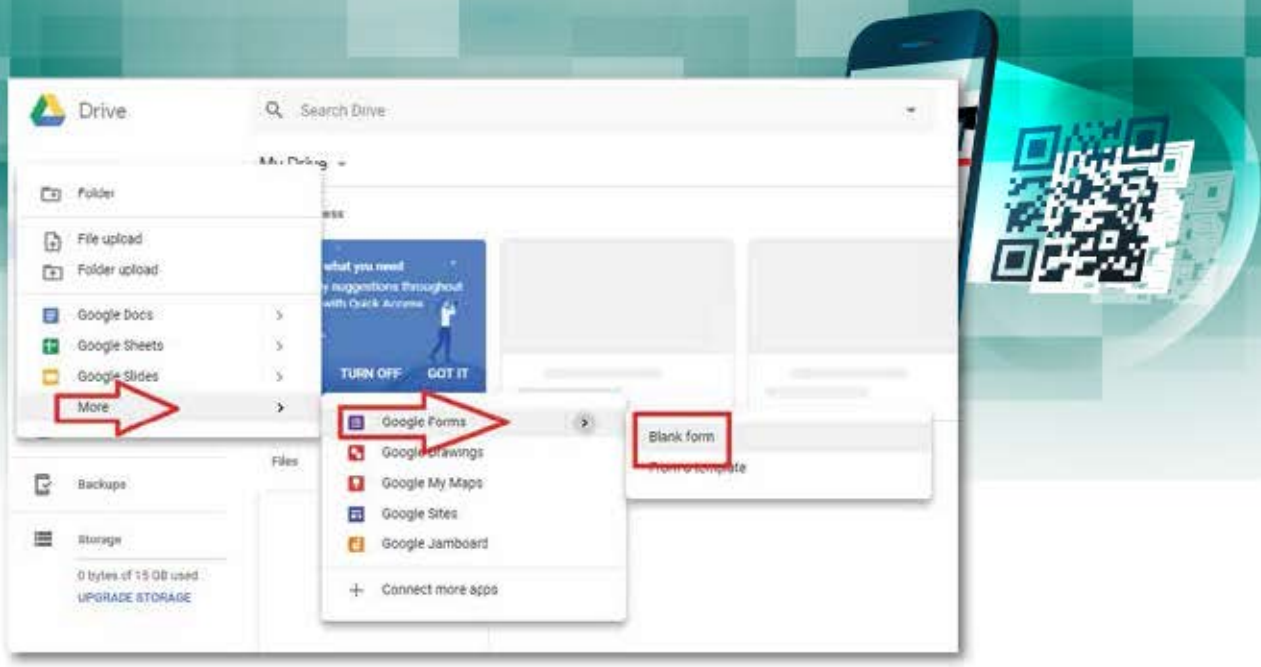
Step 1 :

Create New Account for the department/database to be stored using gmail.com due to all the data shall processes by Google Drive application.



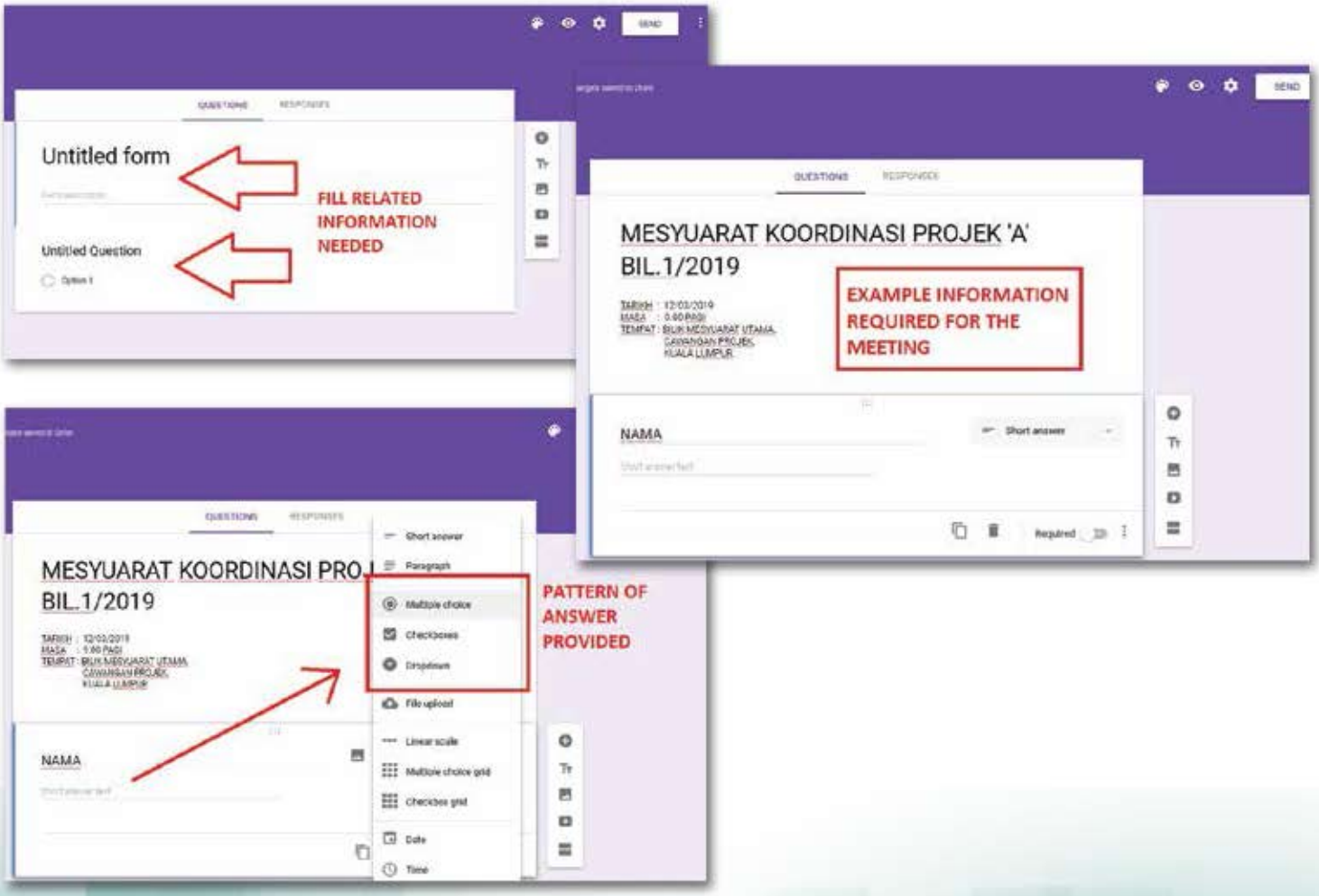
Step 2 :

Open your Google email and choose Drive as shown in the figure above.



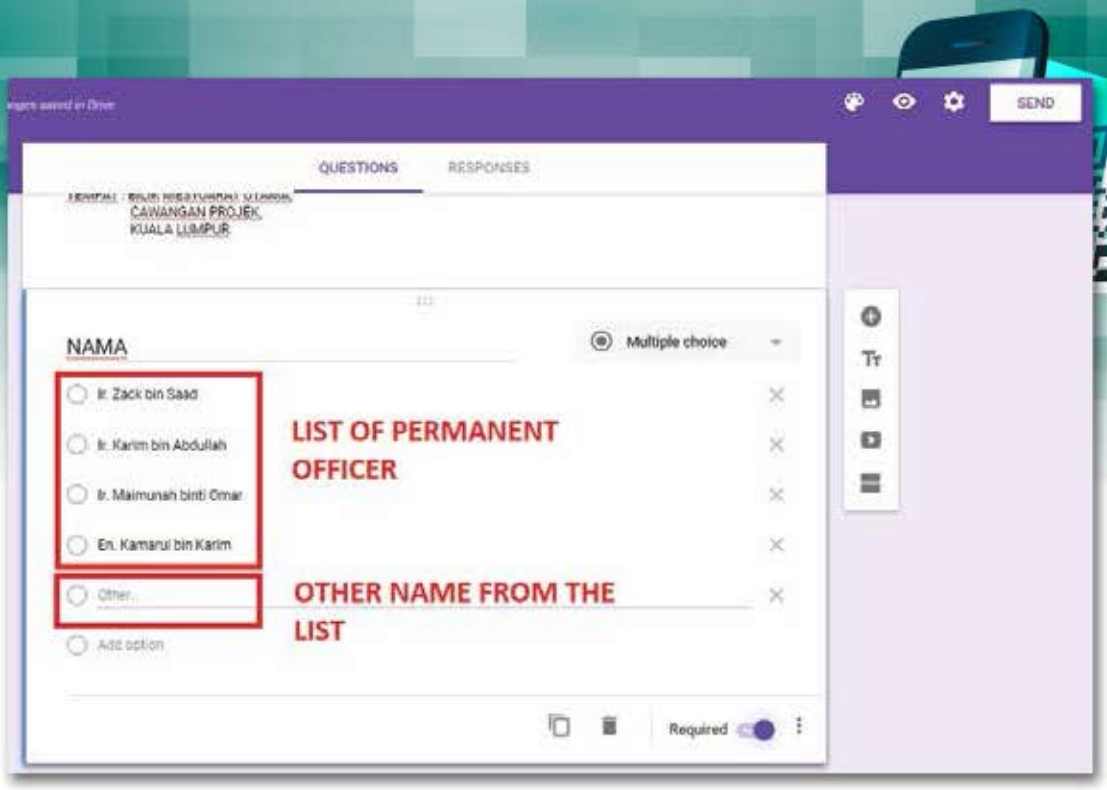
Step 3 :

After select the Drive, the applicant could proceed to select New and open up the Blank Form as shows below and modification of form is needed to suit of conventional Standard Attendance List.



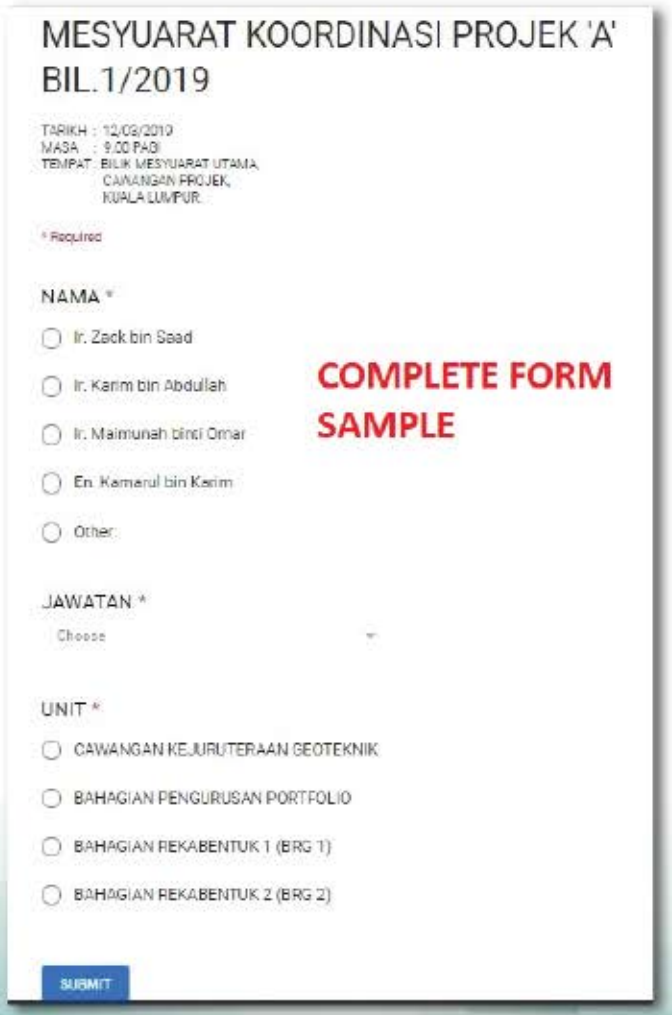
Step 4 :

The applicant need to be ***naming*** the meeting or discussion title and information needed in the ***Attendance List Form***. In this sample ***'NAMA', 'JAWATAN'*** and ***'UNIT'*** are placed as required information need for attendance. Choose answer pattern whether in multiple choice, checkboxes or dropdown.



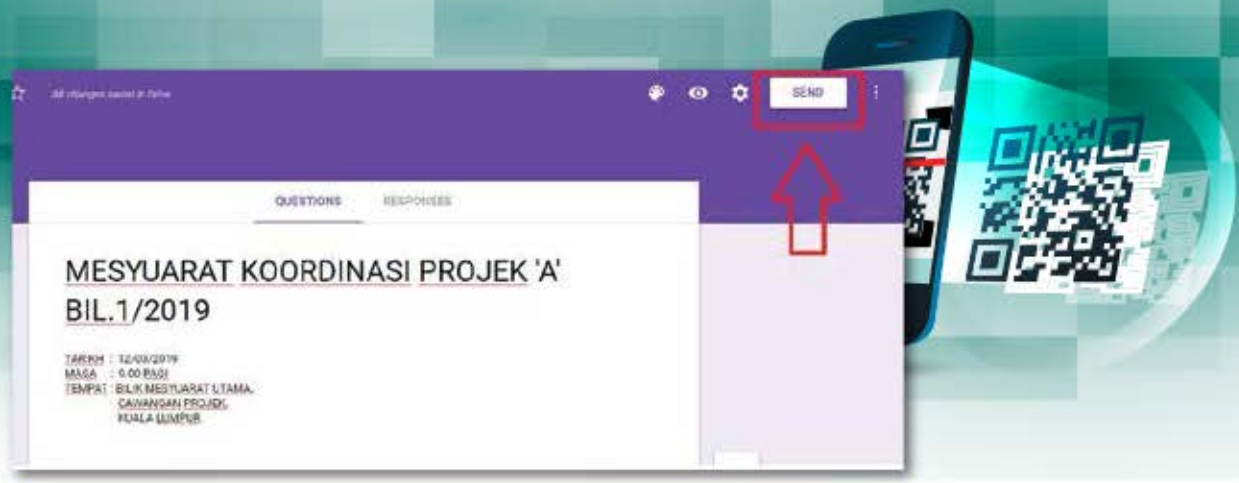
Step 5 :

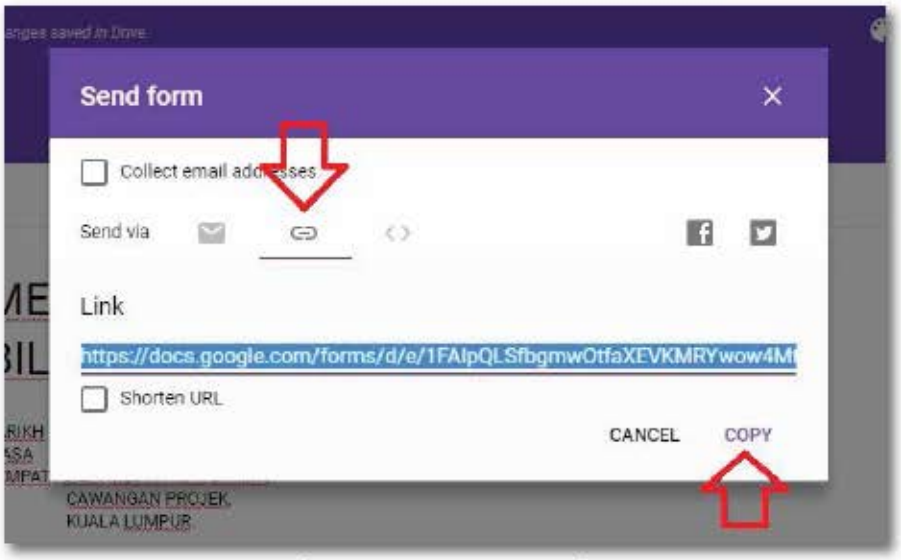
List down name of the attender (permanent attender) as mentioned below and **Other** for remain.



Step 6 :

Sample of comp-lete Form before generating the QR Codes.



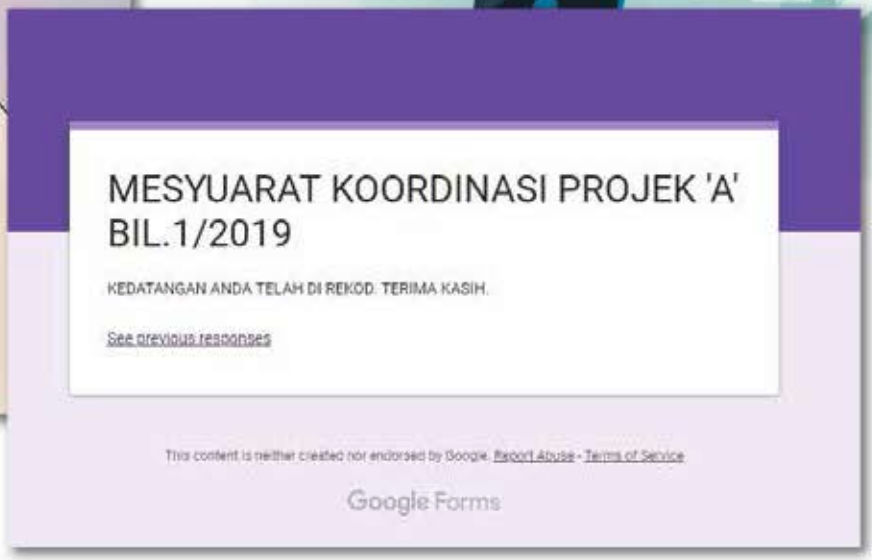


Step 7 :

After all the infomation complete, click the button SEND to prompt out the types generate and choose link to get URL Link and copy it.

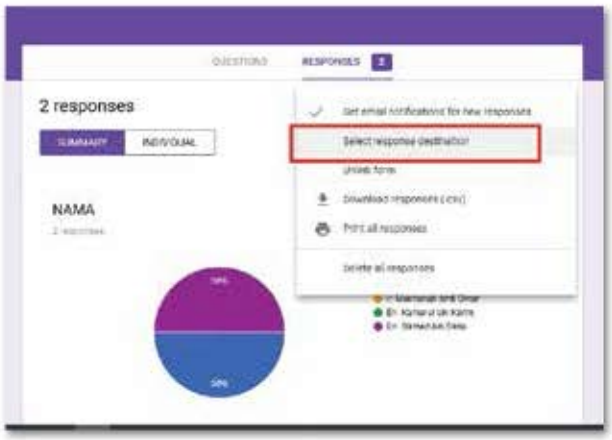
Step 8 :

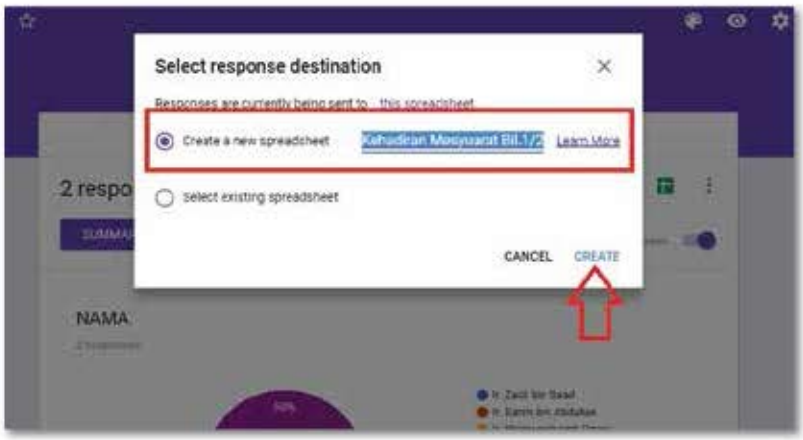
After copy the URL Link from the Google Form, open up the website www.qr-code- generator.com and paste at given as per figure above. Then Click button CREATE QR CODE to generate Codes at the right corner and DOWNLOAD. Then, a .png file is generated after DOWNLOAD button is Click.

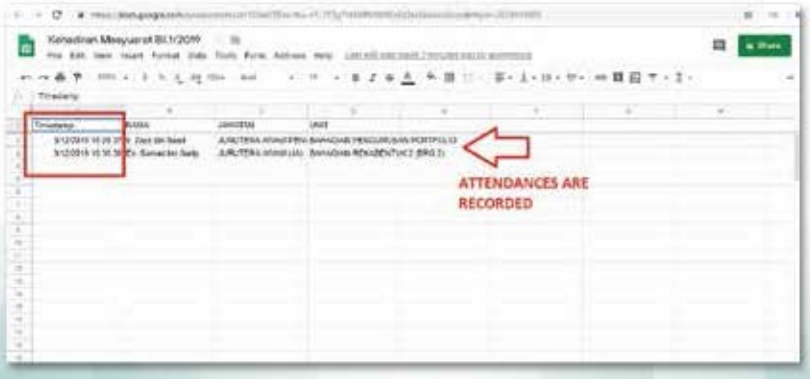


Step 9 :

The attender must scan the QR Codes using their smartphone (IOS use built in camera while Android must download QR Reader) before enter the meeting and fill the form accordingly and Click SUBMIT for recorded.







Step 10 :

To review all the attendance, the secretariat able to generate Google **Excel to tracking date and time stamp** for all the attendance and record for future reference.

ANUGERAH PERKHIDMATAN CEMERLANG

CAWANGAN KEJURUTERAAN GEOTEKNIK JABATAN KERJA RAYA

Ir. Lim Keat Eng
J52
PMO

Ir. Norziaty Binti Mohd Noor
J48
BRG3

Ir. Zairul Yasli Bin Alias
J44
BRG2

Hisam Bin Ahmad
C44
BST

Ir. Mohd Saiful Azlie Bin Ahmad
J41
BRG1

Mohd Rizal Bin Ibrahim
JA29
BST

Dinie Ajmal Bin Deris
JA29
BPP

Abdullah Bin Mat Kuri
H11
BPKS

Tahniah di atas Kecemerlangan dan Komitmen Anda!

ANUGERAH TOKOH CAWANGAN

CAWANGAN KEJURUTERAAN GEOTEKNIK JABATAN KERJA RAYA
TAHUN 2018

Dayang Azwa Binti Abang Adenan

Pegawai Pengurusan Dan Profesional Gred 41 hingga 44

Mohd Asmirol Bin Mohd Asri

Pegawai Pengurusan Dan Profesional Gred 41 hingga 44

Mohd Azlin Bin Mohamad

Kakitangan Sokongan 1 Gred 17 hingga 40

Mohd Taufiq Bin Wahid

Kakitangan Sokongan I Gred 17 hingga 40

Masli Bin Mohd Amin

Kakitangan Sokongan II Gred 16 hingga ke bawah

Elanchellan A/L Sinnasamy

Kakitangan Sokongan II Gred 16 hingga ke bawah

Tahniah di atas Kecemerlangan dan Komitmen Anda!

SENARAI PEGAWAI CKG YANG MENDAPAT GELARAN Ir. TAHUN 2018

BIL.	NAMA PEGAWAI	BAHAGIAN	JAWATAN	GRED
1.	Ir. Razali Bin Che Imbi	BPKS	Jurutera Awam Penguasa Kanan	J54
2.	Ir. Gnana Sekaran A/L Doraisamy	BRG 3	Jurutera Awam Penguasa Kanan	J54
3.	Ir. Lim Keat Eng	PMO	Jurutera Awam Penguasa	J52
4.	Ir. Tengku Normardziah Binti Tuan Mahmood	BPP	Jurutera Awam Penguasa	J52
5.	Ir. Roslan Bin Majid	BST	Jurutera Awam Penguasa	J52
6.	Ir. Marzaki Faizi Bin Mat Din	BRG 3	Jurutera Awam Penguasa	J52
7.	Ir. Zairul Yasli Bin Alias	BRG 2	Jurutera Awam	J44
8.	Ir. Noor Akma Binti Mohd Naru	BRG 1	Jurutera Awam	J41

Pengenalan Pegawai Baru Tahun 2018

CAWANGAN KEJURUTERAAN GEOTEKNIK JABATAN KERJA RAYA

Ir. Mohd Faiz Bin Mohd Faudzi (J44)
Jurutera Awam Gred J44 Dari JKR Daerah Kuala Langat dan ditempatkan di Bahagian Penyelidikan & Pembangunan.
Berkuatkuasa mulai 2 Januari 2018

Nurul Badiin Binti Abdul Ghani (J41)
Jurutera Awam Gred J41 Dari Cawangan Dasar dan Pengurusan Korporat, Ibu Pejabat JKR Malaysia dan di tempatkandi Bahagian Rekabentuk Geoteknik 3 (Khidmat Pakar & Forensik)
Berkuatkuasa mulai 15 Januari 2018

Senorita Joseph (N19)
Pembantu Setiausaha Pejabat Gred N19. Dari Cawangan Perancangan dan Pengurusan Jabatan Mineral dan Geosains Malaysia dan di tempatkan di Bahagian Rekabentuk Geoteknik 1 (Kejuruteraan Tanah)
Berkuatkuasa mulai 3 Januari 2018

Jibeh Bin Gonolon (J48)
Dari Cawangan Kejuruteraan Elektrik dan di tempatkan di Bahagian Khidmat Pakar & Forensik.
Berkuatkuasa mulai 2 Februari 2018

Mohd Shahruzzaman Bin Hj Sihab (J52)
Daripada CREaTE, Melaka. Ditempatkan di Bahagian Penyelarasan Dan Khidmat Sokongan (BPKS)
Berkuatkuasa : 19.02.2018

Md Sallehuddin Bin Che Aziz (J44)
Daripada Kementerian Kesejahteraan Bandar,Perumahan Dan Kerajaan Tempatan (KPKT) Ditempatkan di Bahagian Penyelarasan Dan Khidmat Sokongan (BPKS)
Berkuatkuasa : 19.02.2018

Nur Quratul Aini Binti Hamidun (J44)
Jurutera Awam Gred J44 Dari Cawangan Dasar Dan Pengurusan Korporat dan ditempatkan di Bahagian Rekabentuk Geoteknik 2. Berkuatkuasa mulai 1 Ogos 2018

Noor Akma Binti Mohd Naru (J41)
Jurutera Awam Gred J41. Dari Cawangan Kejuruteraan Cerun, Ibu Pejabat JKR Malaysia dan ditempatkan di Bahagian Rekabentuk Geoteknik 1. Berkuatkuasa mulai 8 Mei 2018

Syed Baharin Bin Syed Shamir (N36)
Ditempatkan di Bahagian Penyelarasan Dan Khidmat Sokongan (BPKS)
Berkuatkuasa : 26.02.2018

Mohamad Fazir Bin Bahari (J44)
Daripada Cawangan Dasar Dan Pengurusan Korporat (CDPK) Ditempatkan di Bahagian Siasatan Tapak (BST)
Berkuatkuasa : 20.02.2018

Ir. Mohd Fahmi Bin Mohamad (J44)
Daripada Cawangan Jalan, IP JKR. Ditempatkan di Pejabat Pengurusan Portfolio (PMO)
Berkuatkuasa : 20.02.2018

Mohamad Yustafari Bin Yunus (J44)
Daripada JKR Negeri Pahang. Ditempatkan di Bahagian Rekabentuk Geoteknik 3 (Khidmat Pakar Dan Forensik)
Berkuatkuasa : 19.02.2018

Ahmad Luqman Bin Halit (J41)
Ditempatkan di Bahagian Penyelarasan Dan Khidmat Sokongan (BPKS)
Berkuatkuasa : 26.02.2018

Nurul Shuhadah Binti Yahya (J41)
Ditempatkan di Bahagian Rekabentuk Geoteknik 3 (Khidmat Pakar Dan Forensik)
Berkuatkuasa : 26.02.2018

Mu'azzah Binti Abd Hamid (J41)
Ditempatkan di Bahagian Penyelidikan Dan Pembangunan
Berkuatkuasa : 26.02.2018

Norhafsah Binti Selamat (J41)
Ditempatkan di Bahagian Rekabentuk Geoteknik 2 (Kejuruteraan Struktur Asas)
Berkuatkuasa : 26.02.2018

Amera Nadia Binti Juril (J41)
Ditempatkan di Bahagian Rekabentuk Geoteknik 2 (Kejuruteraan Tanah)
Berkuatkuasa : 26.02.2018

Ir. Nor Fardzilah Binti Abdul Rahman (J52)
Jurutera Awam Penguasa Gred J52. Dari Cawangan Jalan, Ibu Pejabat JKR Malaysia dan di tempatkan di Bahagian Rekabentuk Geoteknik 1
Berkuatkuasa mulai 19 April 2018

Pegawai Bertukar Tahun 2018

CAWANGAN KEJURUTERAAN GEOTEKNIK JABATAN KERJA RAYA

Hani Nadzrah Binti Razali

Ditempatkan Cawangan Kejuruteraan Bangunan Am 1 di Ibu Pejabat JKR Malaysia.
Berkuatkuasa mulai 2 Januari 2017

Chai Boon Tak

Daripada Bahagian Siasatan Tapak (BST). Ditempatkan ke Kementerian Kesejahteraan Bandar, Perumahan Dan Kerajaan Tempatan (KPKT). Berkuatkuasa mulai 20.02.2018

Umi Fairoz Binti Mahad

Daripada Bahagian Penyelarasan Dan Khidmat Sokongan (BPKS) Ditempatkan ke Cawangan Kejuruteraan Cerun
Berkuatkuasa mulai 26.02.2018

Khairul Abidin Bin Hashim

Jurutera Awam Gred J41. Ditukarkan ke Kementerian Sumber Asli dan Alam Sekitar (Kader) dan ditempatkan ke Jabatan Laut Malaysia. Berkuatkuasa mulai 9 April 2018

Zamrul Bin Che Hap

Pemandu Kenderaan Gred H11. Ditukarkan ke JKR Cawangan Kejuruteraan Elektrik
Berkuatkuasa mulai 2 Julai 2018

Nur Aziaswani Binti Abdullah

Jurutera Awam Gred J44. Ditempatkan Cawangan Kejuruteraan Cerun.
Berkuatkuasa mulai 16 Januari 2019

Ir. Zakaria Bin Semail

Daripada Bahagian Rekabentuk Geoteknik 2 (Kejuruteraan Struktur Asas). Ditempatkan di JKR Wilayaih Persekutuan Kuala Lumpur.
Berkuatkuasa mulai 19.02.2018

Aedia Juhana Binti Abdul Rahim

Daripada Bahagian Rekabentuk Geoteknik 3 (Khidmat Pakar Dan Forensik). Ditempatkan ke Cawangan Kejuruteraan Cerun.
Berkuatkuasa mulai 19.02.2018

Ir. Kanagarajah Rasiah

Jurutera Awam Penguasa Kanan Gred J54. Ditempatkan Cawangan Kejuruteraan Bangunan Am 2 di Ibu Pejabat JKR Malaysia.
Berkuatkuasa mulai 2 April 2018

Marzaki Faizi Bin Mat Din

Jurutera Awam Kanan Gred J48. Ditempatkan Cawangan Jalan, Ibu Pejabat JKR Malaysia dan ditempatkan ke Pasukan Projek Wilayah Pantai Timur (ECER). Berkuatkuasa mulai 28 Mei 2018

Daini Bin Hj. Ismail

Pemandu Kenderaan Gred H11. Ditukarkan ke JKR Cawangan Kerja Kesihatan
Berkuatkuasa mulai 2 Julai 2018

Abdullah Bin Ab Wahab

Penolong Jurutera (Awam) Gred JA38. Ditempatkan Cawangan Kejuruteraan Awam dan Struktur, JKR.
Berkuatkuasa mulai 16 Oktober 2018

Ir. Hj. Mohd Shahruzzaman Bin Hj. Sihab

Jurutera Awam Penguasa Gred J52. Ditempatkan JKR Negeri Melaka dan ditempatkan ke Bahagian Bangunan
Berkuatkuasa mulai 01 Oktober 2018

Mohamad Fadly Bin Rosli

Jurutera Awam Gred J44. Ditempatkan Cawangan Kejuruteraan Awam Dan Struktur
Berkuatkuasa mulai 18 Januari 2019

Ramli Bin Sulaiman

Penolong Jurutera (Awam) Gred JA38. Ditempatkan Kementerian Pendidikan Malaysia.
Berkuatkuasa mulai 16 Oktober 2018

Farah Nazirah Binti Mohd Johari

Jurutera Awam Gred J41. Ditempatkan JKR Wilayah Persekutuan Kuala Lumpur.
Berkuatkuasa mulai 19 November 2018

Syed Eddy Asyraf Bin Syed Abdullah

Daripada Bahagian Rekabentuk Geoteknik 2 (Kejuruteraan Tanah) Ditempatkan ke Cawangan Jalan, IP JKR.
Berkuatkuasa mulai 19.02.2018

Pegawai Bercuti Tanpa Gaji

Ir. Aini Sakinah Binti Esa

Jurutera Awam Gred J41.
Cuti Tanpa Gaji Mengikut Pasangan mulai 1 Januari 2019 sehingga 31 Disember 2019

Pegawai Bersara Tahun 2018

Siti Shafikah Binti Hj. Sham

Pembantu Tadbir Gred N19
Bersara wajib umur 60 tahun pada 17 September 2018

Hazmi Bin Mat Som

Pembantu Operasi Gred H11
Bersara wajib umur 60 tahun mulai 30 Ogos 2018

Terima Kasih

Ir. Abdul Hadi Bin Abdul Aziz

(RAZALI)

(SHAIK)

(Norzani)

(TENGKU)

AZIM

- HAFIZ -

ROSLAN MAJID

- Fuziah -

bayang Azwa

HAFEDZ

AA-

- MARIA -

- SALLEH -

NOR FARDZILAN

- BAT -

MARZAKI

- MSA brg 2

INTAN

AZRI

YUSLINA

- KHIM -

- Syira -

- Afiq -

(ZAITON)

Firdaus -

SENORITA

- YUS -

- HISAM

- SHUHDA -

Numi

- FARIS -

NORZIATY

- ROS -

Ikhwan

ADI

Selamat bersara Tuan Pengarah.

Saiful

- JIBEH -

- AZMIN -

Hafizah

ELAN

LUQ

Selamat Bersara

Fauzi

Othman

SALHANA

- SYAHRUM -

- SHAWAL -

- ADDA -

ZAFRAN

- NIK -

KHAIRUL

- Farahin -

- MAI -

SAFIAH

FAHMI

- Husna -

- Linda -

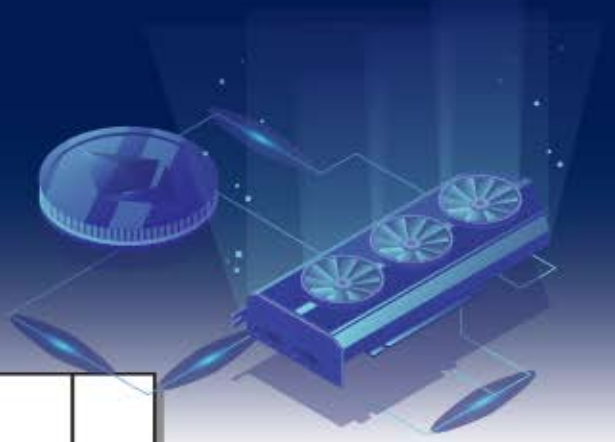
Daripada Warga SLR Cawangan CKG

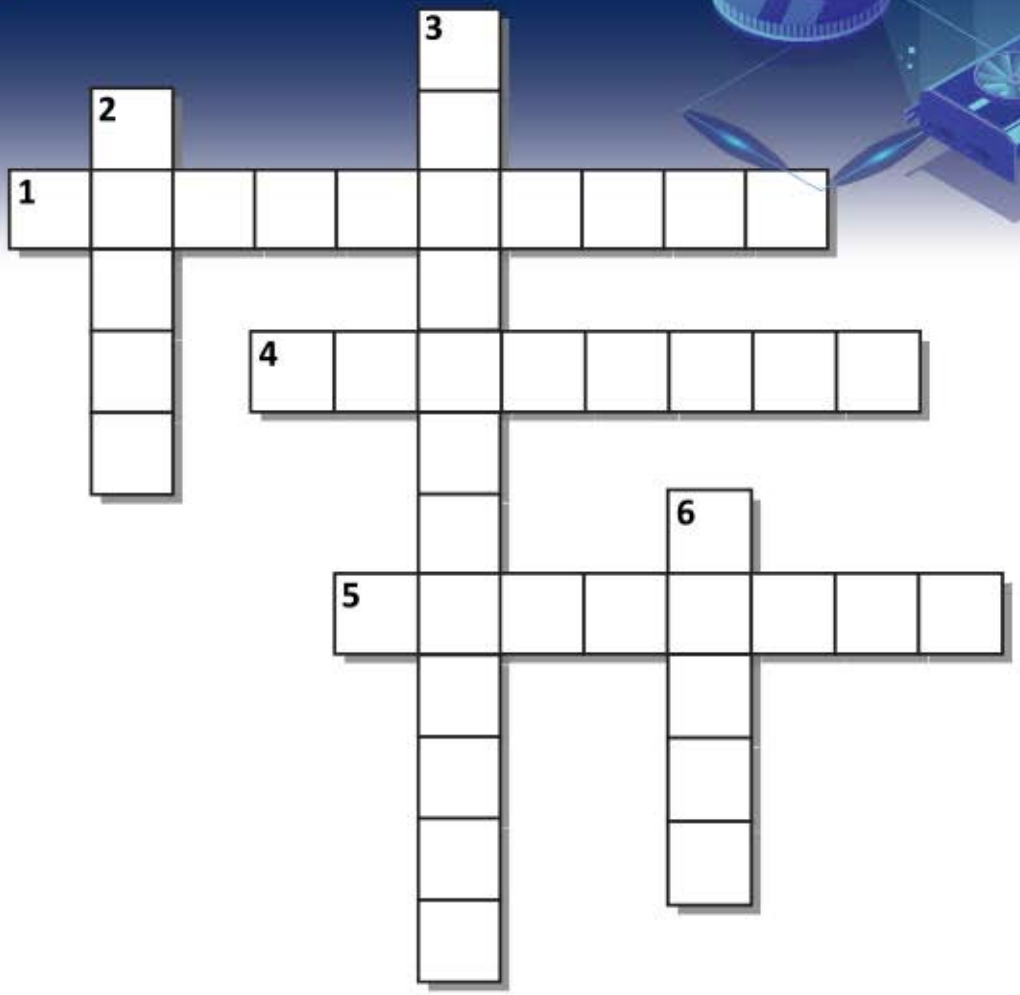
AZMAN

SEP

- Sofia -

Geotechnical Puzzle





Soalan:

1. ..... can be used to determine rock rippability of earth materials.

2. QR Codes has been created in 1994 by ..... Wave incorporated, Japan to manage inventories of car part.

3. ..... is the best method to investigate cavities in urban area.

4. Polyurethane (PU) Flatbed is designed based on the integration of consolidation and _____ concept that works as an alternative method to solve ground settlement issue on soft saturated deposits.

5. Aspek utama yang akan dilaporkan bagi mengenal pasti tahap kawalan dalaman pengurusan pembelian terus (bekalan & perkhidmatan) / lantikan terus (kerja) di jabatan melibatkan empat risiko iaitu Risiko Penyelewangan, Risiko Kewangan, Risiko Operasi dan Risiko _____.

6. A QR code is designed to be rapidly readable from any direction in 360 degrees and possible due to the position detection patterns at three corners of the symbol. In term of definition, what is 'Q' for QR Code itself?

Jawapan:
1) Refraction
2) Denso
3) Microgravity
4) buoyancy
5) maklumat
6) Quick

Cawangan Kejuruteraan Geoteknik
Ibu Pejabat JKR Malaysia
Tingkat 26, Menara PJD
No. 50, Jalan Tun Razak
50400 Kuala Lumpur