

# Talk on Introduction to Tunnelling by Drilling and Blasting

TUNNELLING AND UNDERGROUND SPACE TECHNICAL DIVISION



reported by Ir. Hj. Look Keman bin Sahari

Ir. Hj. Look Keman bin Sahari is a mining engineer with M.Sc in Explosives Ordnance Engineering from Royal Military College of Science, Cranfield University. He retired from the Mines Department in 1996 and had been working as Consultant Blasting Engineer specialising in Explosives, Mining and Quarrying ever since. He is a committee member of TUSTD. He had given lectures at IEM on construction blasting and Drill & Blast for tunnelling work.

The talk was conducted on 6 December 2014 by Ir. Hj. Look Keman a committee member of IEM TUSD and Engr. Mohammad Razif bin Kemat from Tenaga Kimia Bhd the largest supplier of explosives and accessories and the sole manufacturer of emulsion explosives in the country.

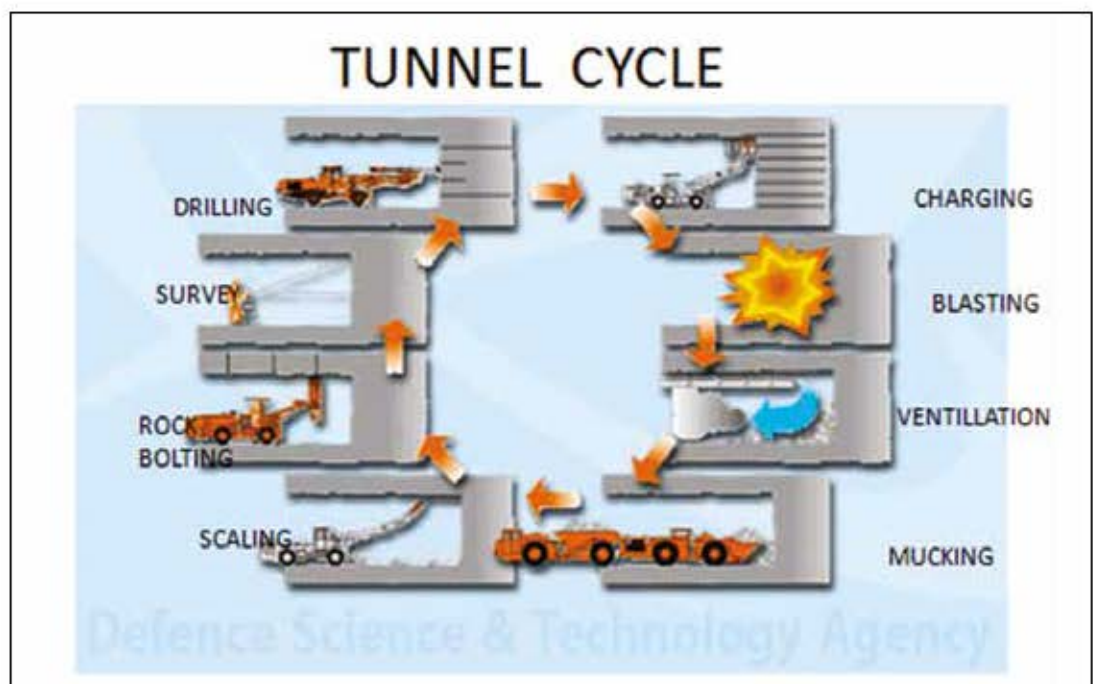
Ir. Hj. Look Keman said tunnelling work dated back to the time of the Roman Empire. The Romans dug tunnels to transport water to Rome and sewage out of the city.

When gun powder was discovered more than 200 years ago, it was used in the drilling and blasting of tunnels in mines. This was a common method for obtaining minerals underground. The deepest mine in the world is about 4000 metres underground and powerful explosives are needed to break up the ore in the extremely hard rock. The techniques used to break rock in mine tunnels are different from that used in civil engineering work. Mine tunnels are not designed to be permanent and do not need

a comprehensive support system. Generally, tunnels in mines are abandoned once the ores are obtained. In civil engineering work though, it is quite common to design tunnels that can last for 100 years.

Ir. Hj. Look Keman said the sequence in tunnelling by drill and blast begins with a survey to ensure the tunnel is proceeding in the right direction and that the holes are drilled at the right location, followed by the charging process. The explosives and the accessories are then inserted in the boreholes with a correct pattern and delay system to ensure safety and efficiency. The boreholes in the centre are charged by using bulk explosives while at the perimeter, small cartridge explosives are used to minimise overbreak. The explosive charges are then detonated or blasted according to the correct sequence.

After blasting, dust from fragmented rock and fumes from explosives are removed through the ventilation system. When this is done, broken rocks are then removed using



The sequence in tunnelling cycle/Explosives used in the industry

## EXPLOSIVES USED IN THE INDUSTRY



*Explosives used in the Industry*

excavators and dump trucks. The loose rocks from the tunnel are then scaled out to prevent rock falls which may endanger workers and machineries.

The roof support system, such as rock bolt, is then installed where required, followed finally by shotcreting. The process is repeated in the same cycle.

Next, he talked about the training of shotfirers and blasting engineers.

Currently in Malaysia, there is no specific training for those working in drilling and blasting tunnels. All shotfirers actually learn their trade from the quarrying industry and proceed to learn tunnel blasting on the job. There is no specific course available on drilling and blasting for tunnelling, even though arrangements can be made to conduct such courses with the local explosives manufacturer and local institution of higher learning.

The next speaker, Engr. Mohammad Razif, talked about explosives and accessories available from his company and currently available for the quarrying, mining and construction industry. Emulsion explosives used in tunnelling are available in various formulations to suit different applications.

When additional energy is needed in tunnelling to overcome heavy confinement, aluminium powder is added. In tunnelling application, about 8% aluminium is added. Shock tube initiation system is normally used to provide in-hole delays and the surface delays while the detonating cord and the electric detonator will initiate the whole system. The shotfirer will fire the charges from the safe distance. The tunnel perimeter holes are charged with small cartridge emulsion explosive while remainder with exception with a few uncharged boreholes at the centre were charged with bulk explosives.

Short videos on charging and blasting were shown to illustrate blasting work. The participants were then shown samples of explosives dummies and accessories used in tunnelling, mining and construction work. The talk ended with a lively question and answer session. The speakers were asked about the availability of blasting engineers who are needed to supervise blasting work, particularly in highly

sensitive residential and commercial areas as tunnelling below such areas may cause damage to the existing structures. Some participants were interested in the blast design and other advanced subjects related to blasting work in tunnelling.

The speakers will look into conducting more specific courses on drilling and blasting for tunnelling in the future with the aim to produce more professional shotfirers and blasting engineers.

The talk ended at 11.00 a.m. ■

Note: This is continuation of the list of building fund donation list which was first published on page 36 in March Issue 2015.

Pengumuman  
yang ke-80

SENARAI PENDERMA KEPADA WISMA DANA BANGUNAN IEM

Institusi mengucapkan terima kasih kepada semua yang telah memberikan sumbangan kepada tabung Bangunan Wisma IEM. Ahli-ahli IEM dan pembaca yang ingin memberikan sumbangan boleh berbuat demikian dengan memuat turun borang di laman web IEM <http://www.iem.org.my> atau menghubungi sekretariat di +603-7968 4001/5518 untuk maklumat lanjut. Senarai penyumbang untuk bulan April 2015 adalah seperti jadual di bawah:

NO.	NO. AHLI	NAMA	NO.	NO. AHLI	NAMA
117	14183	LAM HUNG MAN	175	24335	NG CHIU MING @ ROLAND NG
118	32619	LAU SUN WAH	176	17352	NG CHNG BOON
119	26936	LAU YING LEE	177	01408	NG KENG LIAN
120	45867	LEE FEI HAN @ LEE KOT CHUEN, LENIOR	178	03248	NG KIM KEE
121	12477	LEE KEE BAU	179	47035	NIRESH KUMAR A/L SOMASUNDRAM
122	24733	LEE LIN KHENG	180	17049	NOOR AZAM BIN MD SAAD
123	47102	LEE MENG TZE	181	17306	NOOR RAZMAN BIN ABDUL RAZAK
124	23881	LEE SHING SHYANG	182	17883	NOOR SAMSUDIN BIN KANDAR
125	24391	LEE TOH HOCK	183	10928	NOR ASIAH BT. OTHMAN
126	08001	LEE TUCK CHOY	184	48104	NOR HAZRIL BIN MOHD NOOR
127	13409	LEONG SOW KHEAN	185	13470	NORAZIDAH BTE TAUFEEK
128	25073	LEOW CHEE KEAT, CHRIS	186	37044	NORSADIN BIN SAMSHUDDIN
129	21938	LEW SAN CHONG	187	23973	NURIYATI ARMIDA BINTI MD RASHID
130	15803	LI THANG FAI	188	50728	NURSHAHNAWAL BINTI YAACOB
131	14505	LIEW KHEE LEONG @ LAM KHEE LEONG	189	28999	NURUL HUDA BIN ROMLI
132	00912	LIEW KHOOI CHENG	190	52344	ONG EU NEE
133	13275	LIEW LEONG TING	191	19192	ONG GEOK CHENG
134	06765	LIEW YAN SIN	192	10347	ONG HOCK GUAN
135	56819	LIM CHEE KIANG	193	35643	OOI KIM HUAT
136	13215	LIM CHEE KOK	194	18183	PAN KOK LOONG
137	04530	LIM CHEE PENG	195	25681	PHANG SIN YEN
138	07526	LIM CHIN KEAT	196	20490	PROF. DR SITI HAMISAH BINTI TAPSIR
139	43171	LIM HENG TEAN	197	27636	PUKALENTHI A/L SUBRAMANIAM
140	12092	LIM SHU YIN	198	19721	RADZILAN BIN ABDUL RAHMAN
141	04314	LIM TAI ENG	199	56822	RAJASELVAM A/L GOVINDARAJU
142	04777	LIM WEI KHONG	200	06161	RAJASKANDA S/O THAMOTHARAM
143	43083	LING SIE ONG	201	41210	RAMASAMY CHETTEAR A/L PERIASAMY
144	06440	LINGANATHAN S/O V THILLAINATHAN	202	15346	RAMAYA A/L RAMAN
145	01994	LOH ENG WAH	203	00661	RASATHURAI CHELLIAH
146	73378	LOK JUN JIA	204	36363	ROSIDISYAM BIN SAMSUDIN
147	12209	LOOI TUCK CHUNG	205	36853	ROSLI BIN ABU BAKAR
148	23672	LOURDES RAJ A/L DHOMNIC	206	15416	ROSLI BIN MOHD TAIB
149	15197	MASKAN BIN MD. HASSAN	207	38692	SAIDDI ALI FIRDAUS BIN MOHAMED ISHAK
150	21576	MD YUSLAN BIN MD YUSOF	208	36923	SAMUEL BIN EDWARD ATIT
151	10383	MD. NASIR BIN BAHAROM	209	16870	SAW WOOL KOON
152	03568	MEGAT MUKHTAR BIN MEGAT NASIR	210	13505	SDR. CHUA BOON HWEE
153	30635	MEHERON A/L SELOWARA JOO	211	72747	SDR. MOHAMED WASHIM BIN NASIR
154	25517	MICHAEL KOAY	212	08917	SDR. NOORDIN BIN MOHD YUSOF
155	16199	MOHAMAD AZAN BIN OTHMAN	213	32626	SDR. TING HONG YEW
156	72591	MOHAMAD AZIZUL BIN HAMDAN	214	14537	SEE CHENG SENG
157	66791	MOHAMED AL-HAFIZ BIN ZAINUDDIN	215	27125	SHEK POI NGIAN
158	16323	MOHAMED AZMI BIN ABDUL KARIM	216	37023	SHOFI BIN AHMAD
159	15311	MOHAMED REZA BIN MURUSAL IBRAHIM	217	53726	SIM SHENG KAI
160	46788	MOHD ADLI BIN ADANAN	218	69499	SIM WEI TAT
161	45858	MOHD AS'ARI BIN HUD	219	51669	SITI FAIRUS BINTI ZAKARIA
162	13578	MOHD AZAHAR BIN DON	220	66770	SOH KWONG CHEAN
163	24312	MOHD FARIS BIN ARIFFIN	221	22654	SREE GANESH A/L NARAYANAN
164	66441	MOHD KHAIRUL NA'IM BIN UYUP	222	09817	SULAIMAN BIN MOHAMAD TAIB
165	12915	MOHD SAIFUZZAMAN BIN HOESNI	223	07946	SULAIMAN BIN MOHD. DAUD
166	24197	MOHD SANY BIN MD SO'OD	224	56821	SYED ZULKARNAIN SHAH BIN SYED AHMAD KAMAL
167	38687	MOHD TARMIZI BIN ABDUL HAMID	225	08165	TAI FONG NG
168	25731	MOHD. ROSLI BIN SALIM	226	07750	TAM KAH YEN, STEVEN
169	02903	MOKHTAR BIN SHEIKH MOHAMED	227	21296	TAN HUA CHUN
170	41502	MUHAMMAD AZAHARI BIN MUSTAPHA	228	08113	TAN JIT HOO
171	42430	MUHAMMAD MAHADI BIN MOHAMAD	229	01167	TAN KHENG CHIONG
172	33877	MULIADY BIN CHE HAMAT	230	07242	TAN SEE CHEE
173	35564	MUSA @ MUSLI BIN MISNAN	231	11486	TAN SIEW LEE
174	18171	NG BOON KIAT	232	59874	TAN WEI KEAT