CURRENT PROGRESS ON UNDERGROUND UTILITY MAPPING IN MALAYSIA

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MAP OF MALAYSIA
**JUPEM AND LAND SURVEYORS AS PLAYERS IN UTILITY MAPPING**

- JUPEM – a government agency responsible for cadastral and mapping activities including underground utility mapping in Malaysia.
- In the private sector, Licensed Land Surveyors are now beginning to establish themselves as the prime service provider for utility detection and mapping.

**DATA PROVIDERS**

- Data providers are major players in providing underground utility information
  - Tenaga Nasional – Electricity
  - Telekom – Telecommunication
  - Water Authorities - Water
  - IWK – Sewerage
  - Gas Malaysia - Gas
  - Private entities or government link companies
  - Controlled and governed by legislation but not legislatively mandated to deposit their data to any repository body
As an Authority on Underground Utility Mapping

- Entrusted by the government to compile and manage underground utility information due to frequent disruption of services caused by damage to underground utilities.

- Damage due to unknown or inaccurately determined location and depth of underground utilities.

Issues of Damages to Underground Utilities

- Damages and accidents happened during earth excavation for road widening and shifting of underground utilities.

Activities during Installation of Underground Utility
There is little coordination between utility providers resulting in damages to underground utilities.

Reported Damages to Underground Utilities

Consequences due to damage underground utility Installations

- Increase in cost for project
- Delays to project implementation
- Disruption to consumers and industries
- Increase in Insurance premium
Main reasons for Damages

- Data in the form of design Layout
- Data not up-to-date (existence of gaps)
- Surveying not done during installation
- Works done by unqualified parties

JUPEM’s Initiatives

- To mitigate the problem JUPEM established a Utility Mapping Division in 2006.
- Started with a workforce of 55 personnel.
- Development of National Underground Utility Database known as PADU.
NATIONAL UNDERGROUND UTILITY DATABASE (PADU)

- Seamless database consisting of 4 major components; 1:500 base map, cadastral data, utility data and imageries

Utility Map by JUPEM

An 1:500 scale utility map showing position of utilities and important topographic features with centimetre accuracy
Managing Underground Utility Mapping Activities

- JUPEM collaborates with utility providers and related agencies to ensure an orderly management of utility data.

- Specification, standards and guidelines in Utility Mapping to allow standardization vital for data sharing.

- Several Circulars produced by JUPEM:
  - 2006 Guidelines for Underground Utility Mapping
  - 2007 Guidelines for utility surveying and detection
  - 2013 Guidelines for surveying of New Utility Installation

UTILITY MAPPING GUIDELINES

- Circular KPUP 1/2006 – describes the roles of stakeholders, quality levels in utility mapping, way of obtaining utility information, deliverables and the national underground utility database (PADU) maintained by JUPEM.
  - Circular KPUP 1/2007 – provides surveyors with the recommended technique and practice for the execution of utility detection for quality level A and B.

- Circular KPUP 1/2013 – provides surveying procedures for installation of new underground utility.
Quality of Utility Data

• Getting accurate data from utility providers remains the biggest challenge.

• Data quality varies based on providers specification.

• Comparison made with field verification shows large positional differences.

• Mainly due to data kept comprise of proposed/design/schematics plans rather than as-built plans where survey are not required during installation.
EQUIPMENT AND TECHNOLOGY

• Available technology has accuracy limitation and requires skilled operators and knowledgeable personnel to analyse the results.

• The different type of detection equipment (EML & GPR) have its advantages and disadvantages in the form of:
  • Equipment Cost
  • Capabilities and Limitations
  • Size
  • Etc.

• Proper equipment calibration required.

GROUND PENETRATING RADAR (GPR)

• To detect all type of utilities.

• Requires expert knowledge in interpreting the GPR profiles or tomographic images.
ELECTROMAGNETIC LOCATOR (EML)

- Limited to detecting utilities made of metal

Gyro-Based Inertial System

- For detection of utilities installed using Horizontal Directional Drilling (HDD) a gyro-based inertial measurement system is recommended before the utility is installed
- Could be done during the drilling or before installation of utility
GPR Calibration Facility

- Appropriate testing and calibration of GPR equipment is necessary to maintain data integrity
- In the latest development - JUPEM is building an indoor build-for-purpose GPR Testbase where equipment are tested in a controlled environment.

Location of GPR Calibration Facility

- Located within JUPEM Complex in Kuala Lumpur
Design of GPR Calibration Facility

Legislation On Underground Utility Mapping

- Regulatory bodies governing utility providers, eg. Malaysia Communication & Multimedia Commission (MCMC) and National Water Services Commission (SPAN) have own requirements and guidelines
- However there is lack of legal requirement to provide sharing of accurate data
- Difficulties is usually attributed to collecting, sharing, contributing and maintaining of data
National Repository for Underground Utility Data

- There is no national repository body sanctioned by law for safe keeping of utility data.

- Utility mapping is the responsibility of every utility provider.

- JUPEM (through the cabinet decisions) is given the responsibility of compiling and managing underground utility data from providers for the purpose of data sharing thereby acting as national repository centre.

Available Acts

- No specific Act governing utility mapping.

- However, power is given to the local government to impose conditions necessary under Street, Drainage and Building Act 1974 but silent on mandatory requirement for utility mapping.

- Condition set by local government such as submission of “as-built survey plan” upon completion of any project can become a good source for updating but there is no requirement to provide the information to any repository centre.
Latest Government Decision On Underground Utility Mapping

• A decision by the National Council for Local Governments on 18th September 2014:
  • All new underground utility installed using open trenching must be surveyed during instalation.
  • An Accurate positioning method must be used when installing using HDD method.
  • Needs for engagement of qualified surveyors for surveying work and for producing digital utility data and as-built plan.
  • A copy of the digital data must be submitted to JUPEM for updating on PADU.
  • The requirement to become part of the approval criteria in the Development Order.

Accreditation and Role of Qualified Land Surveyors

• LLS will be involved directly in:
  – Survey of newly laid utilities before they are covered.
  – Preparation of as-built plan (this will also include detected utilities if any).
  – Submission of plan to JUPEM.
A new standard rates have been introduced for utility detection work and as-built survey during utility installation.

The latest revision on Malaysian Standard 1759 – Geographic Information/Geomatics Feature and Attribute Codes allows inclusion of more features for better data sharing amongst users.

A new guidelines on standard markings and colour codes to depict the location of all underground utilities at site has been introduced.
COMPETENCY IN UTILITY MAPPING

• LLS or utility players must keep abreast with latest knowledge on:
  • Equipment for detection and surveying
  • Techniques used and equipment limitation
  • Coordinate systems
  • Understand of existing laws and regulations.
  • Understand health and safety aspect as require under the Occupational Safety and Health Acts (OSHA, 1994):

SHORT COMPETENCY COURSES AND ACCREDITATION

• To mitigate the shortage of experts in Utility Mapping:
  ➢ On-going short professional courses leading to certificate of competency in utility mapping is being conducted by Land Surveyors Board (LJT) for the licensed land surveyors yearly.
  ➢ Current number of Qualified Surveyors with competency certificate is approximately 79.
**Education, Capacity Building and Researches**

- Effort made to create interest by introducing subject at tertiary level educations:
  - Introduced as part of syllabus for geomatic undergraduate studies at UiTM and USM and master program at UTM.

- On-going activities by Professional body in collaboration with universities in conducting training and research on:
  - Technical aspect
  - Policy and law

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**3D Utility Mapping**

- JUPEM is investing in 3D mapping of underground utility
  - This allows depiction from 3D perspective
  - Allows informed and intelligent decision making and planning
Progress in Utility Data Collection

- Data collected from utility providers for whole of Klang Valley completed for the following utilities:
  - Water
  - Sewerage
  - Electricity
  - Gas
  - Telecommunication

Progress in Utility Data Detection

- Utility detected by JUPEM covering the following districts in the Klang Valley:
  - Putrajaya, Cyberjaya, Petaling Jaya, Shah Alam, Subang Jaya and Kajang
  - A total of 815.8 km completed

- Utility Map produced by JUPEM – 296 Sheet
The initial role of the JUPEM at each state is to accept all as-built plan submitted by LLS, populate and manage the database at state level.

JUPEM has expanded its underground utility activities nationwide.

CONCLUDING REMARKS
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• National Underground Utility Mapping Database will be the basis for National Data repository for underground utility.

• The decision by the National Council for Local Governments enabled JUPEM to obtain accurate and quality data from development projects under the jurisdiction of Local Councils where:
  • All new utilities must be surveyed during installation.
  • A copy of the as-built plan forwarded to JUPEM for safe keeping and future references.

Concluding Remarks

• Accuracy and quality of data obtained with the involvement of professional land surveyors as stipulated in the latest guidelines.

• The survey work is classified under the Professional Services with standard rate available for both detection and survey works.

• JUPEM is spearheading utility mapping for the country with plans for nationwide expansion.
Thank you for your attention ....