Integrity of Engineering Consultancy

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Engineering is the application of scientific knowledge/theories into actual practice.

Successful applications depend on

- Adequate knowledge
- Adequate experience
- Good resources
- Ability to overcome risks

Old scientific knowledge is put into actual practice and also improved by the engineering profession as time goes on.

In the process, unknown obstacles or restrictions maybe encountered.

Engineers have to explain why theoretical expectations are not achieved and find the solutions by checking the causes, make adjustments to the original application process, until the obstacles are overcome.

Efforts made to study and confirm the causes can be tedious, very time consuming and costly. However, once the obstacles are truly identified and overcome, and the intended applications are achieved, the engineers will find great satisfaction and honour.

On the other hand, if engineers do not provide honest explanation on the unexpected failures and make no effort to overcome the obstacles / hindrances, their professional integrity will be doubted.

Engineering Consultancy provides the services of design, advice on implementation methods, operation of constructed systems and their maintenance.

Engineering consultants are relied on their sufficient knowledge, past experience and ability to overcome risks.

Past experience are important, but unexpected environmental risks may be encountered Consultants have to face and overcome risks with integrity and not to avoid them.

Engineering Consultants have to face unexpected risks squarely with calmness, examine them carefully, propose solution and have the courage to shoulder the responsibility for the new proposed solutions.

Examples of an M&E consulting engineer's experiences, on encounters of unexpected hindrances / obstacles and solutions are presented in the following slides, viz

a) Power transformers under the shed,

b) Armoured cables run overhead.

a-1) Power Transformer Under The Shed (Cooling By Stand Fan)

This cooling method aims to save capital & electricity consumption cost.

a-2) Estimate of Heat Removal By The Fan

Velocity of stand fan, v = 6.0 m/s

The diameter of the stand fan, d = 600 mm

Area of stand fan, A = $\pi \left(\frac{d}{2}\right)^2$

$= \pi \left(\frac{0.6}{2}\right)^2$

$= 0.283\ m^2$

Density of air, $\rho = 1.225\ kg/m^3$

Specific heat capacity, $c = 1015\ J/KG℃$

Air Flow Rate = Area of stand fan × Density of air x air velocity

$= 0.283\ m^2 \times 1.225\ kg/m^3 \times 6.0\ m/s$

$= 2.08\ kg/s$

Q_{loss} **(Heat Removed By Fan)=** $mc\Delta t$

$= (2.08\ kg/s) \times (1015\ J/KG℃) \times (44\ ℃ - 35\ ℃)$

$= (2.08\ kg/s) \times (1015\ J/KG℃) \times (9\ ℃)$

$= 19{,}000.8\ J/s$

$= 19{,}000.8\ W$

We compare this heat removed by the stand fan with the load loss of transformer from QTC catalogue: (rated power=3000 kVA) = 32,500 W

Heat removal of stand fan = 19,000.8 W which is approximately 58% of 32,500 W

In conclusion, we will provide 2 fans to remove the heat from the transformer

(b) Armoured Cables Run Overheard

Per consumer's request, we proposed **2 alternatives** for the internal electricity supply to biomass plant:

Alternative No. 1

Proposed 11kV supply to biomass plant using **cable run U/G.**

The cable run near the river and might facing soil erosion.

Alternative No. 2

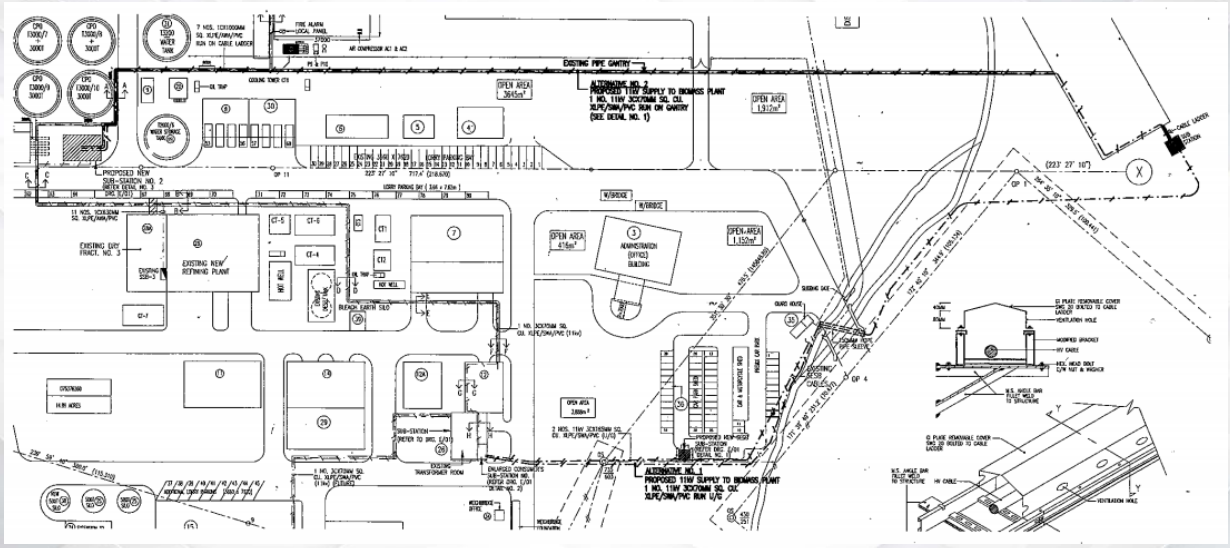
Proposed 11kV supply to biomass plant using **cable run on cable ladder on gantry**.

The cost for this alternative is more expensive due to the cost to make the cable ladder on gantry.

b-1) Comparison Of Prices For the 2 Alternatives

Item	Description	Unit	Quantity	Rate (RM)	Amount (RM)
(B)	**ELECTRICAL SYSTEM**				
	Alternative 1				
1.0	Consumer's (Existing) Sub-Station No.1				
	Extension To Existing 11KV Switchboard; by adding				
	a) 11 KV Switchgear	No.	1		35,323.00
	b) Terminations of 11KV cables	L.S.	1 Lot		900.00
2.0	11KV cables				
	a) From SESB Sub-Station No. 1 to Biomass Plant 11KV Switchboard, using 1 No. 3C x 70 mm sq XLPE/SWA/PVC (U/G)	M.R.	370	90.00	33,300.00
3.0	HDPE pipe sleeve	M	25	60.00	1,500.00
4.0	Any other items which are necessary to complete the works in accordance with specification and drawings (please Specify)				
	a) _____				
	b) _____				
	c) _____				
	Total Alternative 1				71,023.00
	Alternative 2				
1.0	Consumer's Sub-Station No.2				
	Extension To Existing 11KV Switchboard; by adding				
	a) 11 KV Switchgear	No.	1		35,323.00
	b) Terminations of 11KV cables	L.S.	1 Lot		900.00
2.0	11KV cables				
	a) From Consumer's Sub-Station No. 2 to Biomass 11KV Switchboard, using 1 No. 3C x 70 mm sq XLPE/SWA/PVC run on cable ladder on Gantry	M.R.	500	105.00	52,500.00
3.0	Any other items which are necessary to complete the works in accordance with specification and drawings (please Specify)				
	a) _____				
	b) _____				
	c) _____				
	Total Alternative 2				88,723.00

b-2) Site Plan Showing The Cable Route For The 2 Alternatives



b-3) Cable run on cable ladder on gantry (to avoid soil erosion)

To enable engineering consultants to be updated with new technologies, it will necessary to have them published periodically by the ACEM; following the example of The Board of Engineer Malaysia's "The Ingenieur" with more information on proven application of these new technologies in Malaysia.

THANK YOU

Committed to Engineering Excellence

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15