ADVANCED STUDIES ON HEALTH MONITORING AND WARNING SYSTEM FOR ELECTRIC POWER-TRANSMISSION TOWERS

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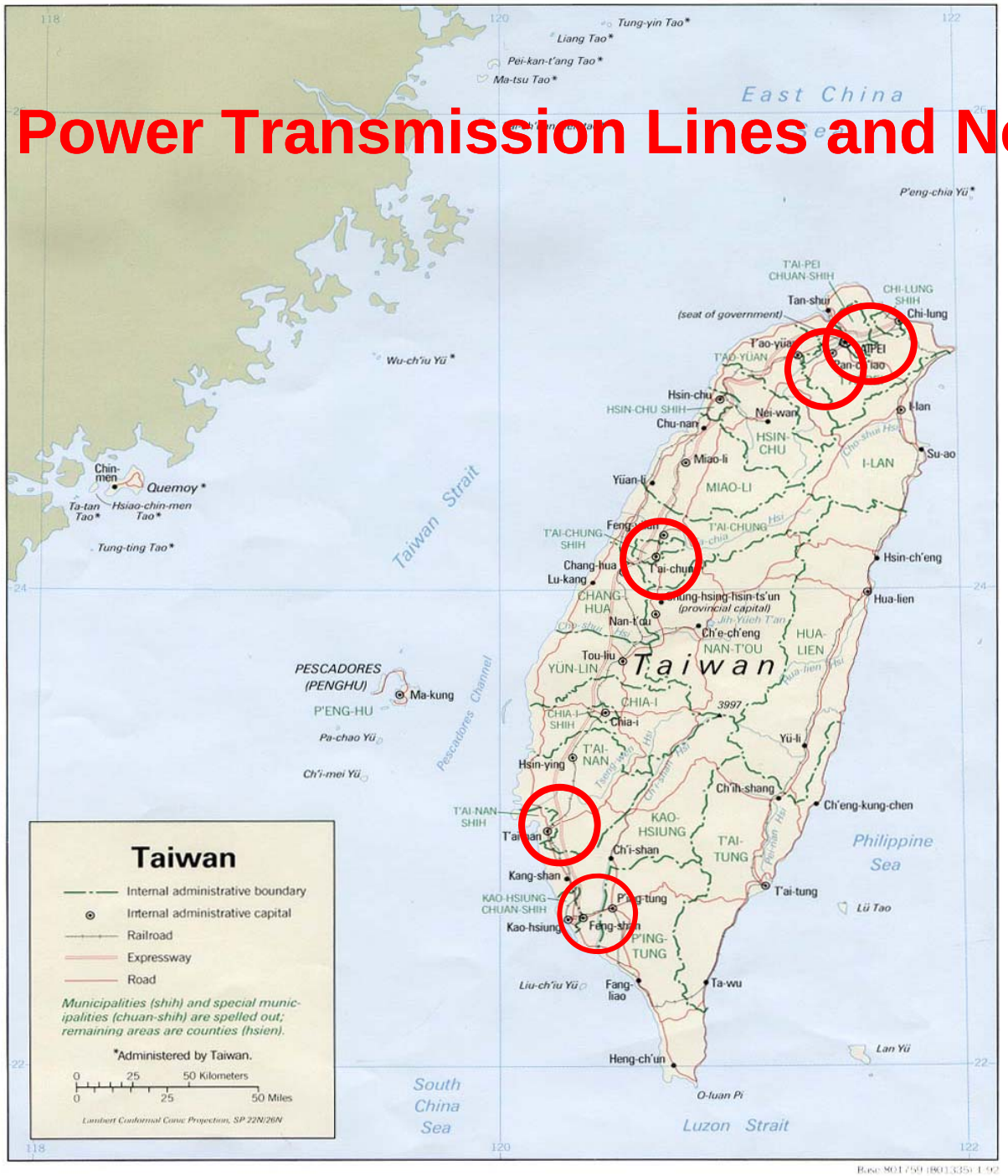
Electric Power Transmission Net in Taiwan

- The electric power transmission lines is one of the most important live lines those connect five mega cities in Taiwan.
- The safety and stability of the steel towers strongly influences the reliability of electric power supply of transmission lines and net in Taiwan.

Power Transmission Lines and Net Work



Types of Power Transmission Steel Towers

These steel truss towers can be classified as:

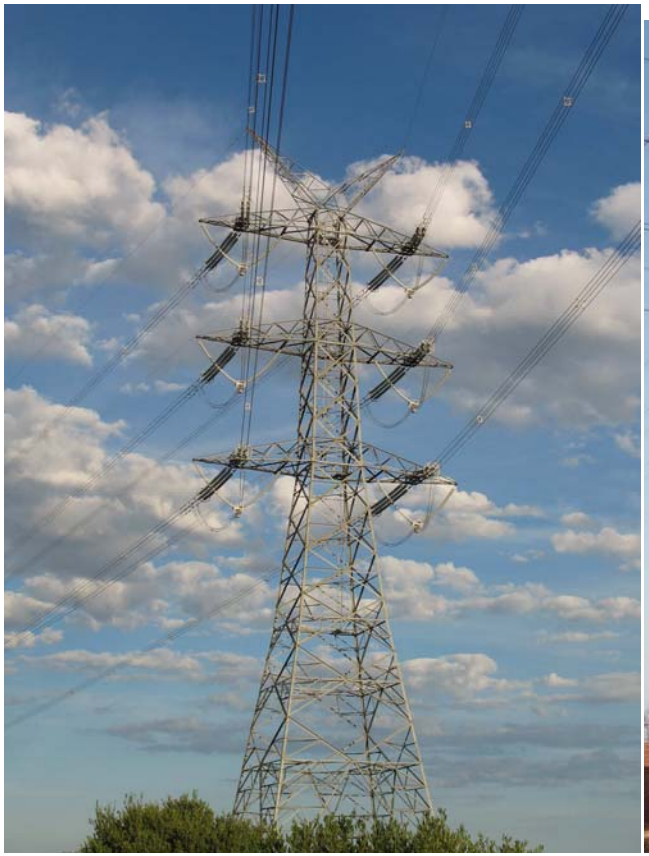
1. **Suspension towers**
2. **Strain towers**
3. **Terminal towers**

Types of Power Transmission

Steel Truss Tower

Type-A, Type-B, Type-F

Suspension Towers



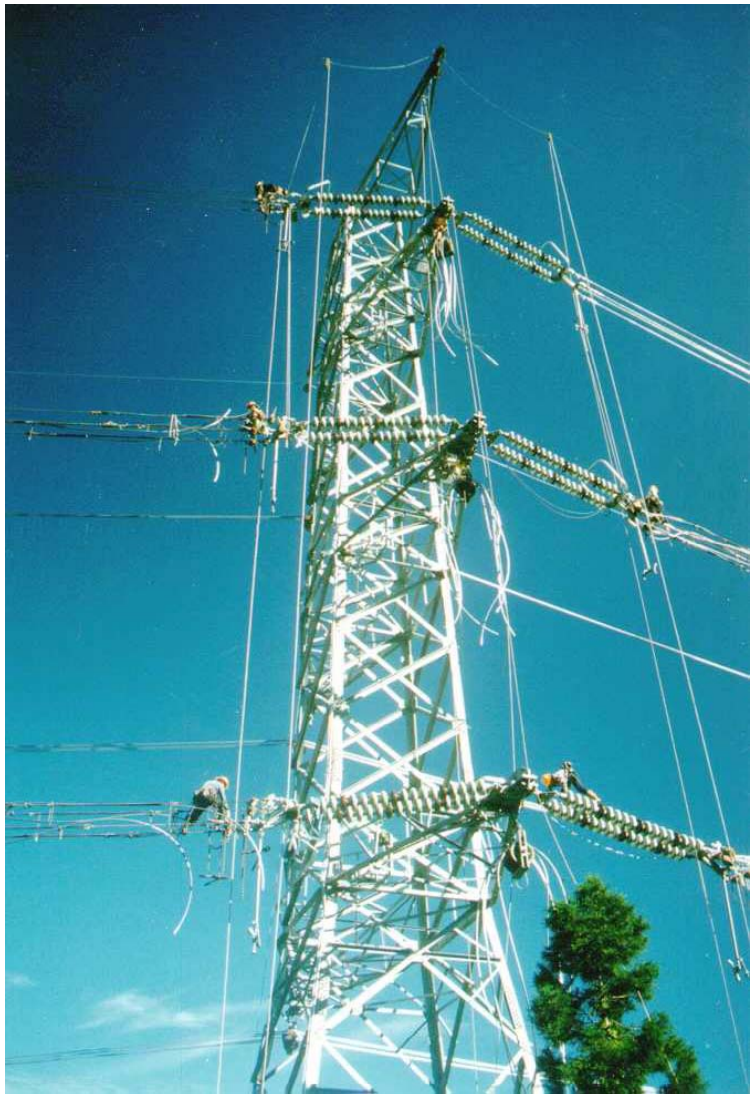
Types of Power Transmission
Steel Truss Tower

Type-C, D, E, G, X

Strain Towers

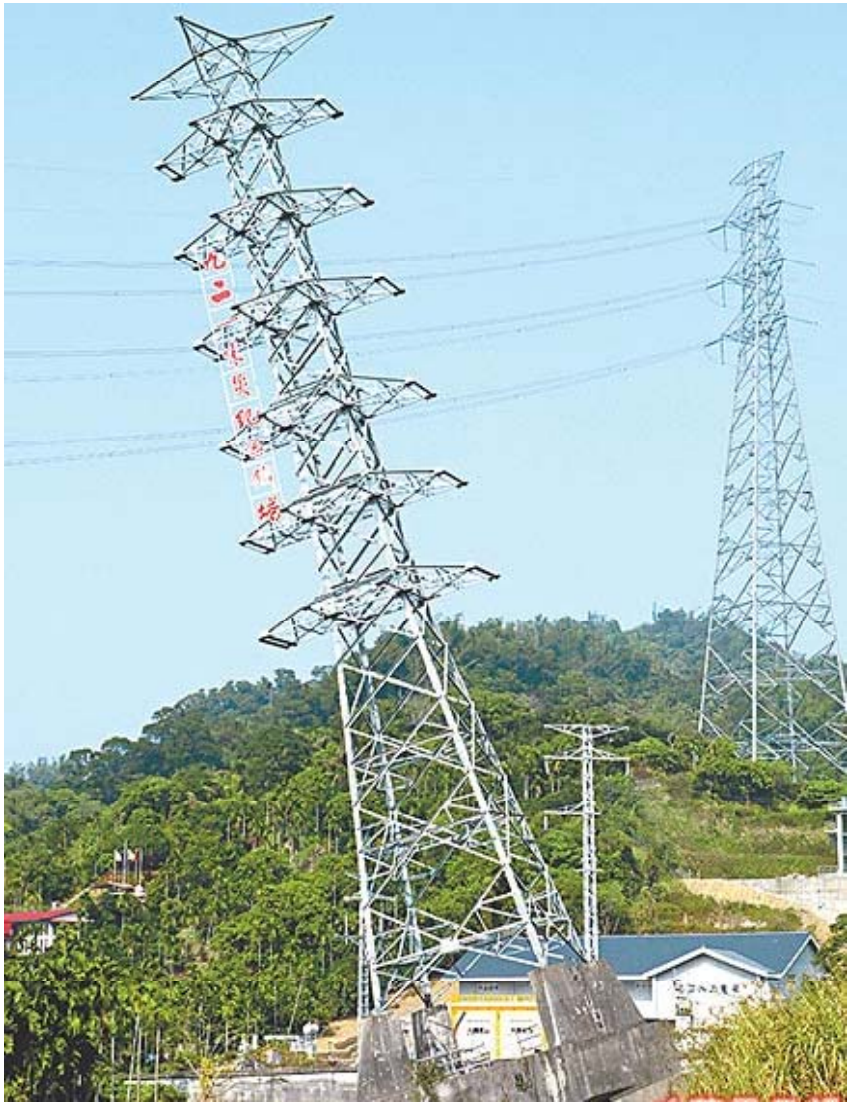
Types of Power Transmission Steel Truss Tower

Joint Tower ／ Composite Tower for 341KV &161KV



Power Transmission Steel Towers under construction

Damages of Power Transmission Steel Tower after 921 Earthquake 1999



Damages of the power transmission lines after typhon

Damages of the tower after snow storm

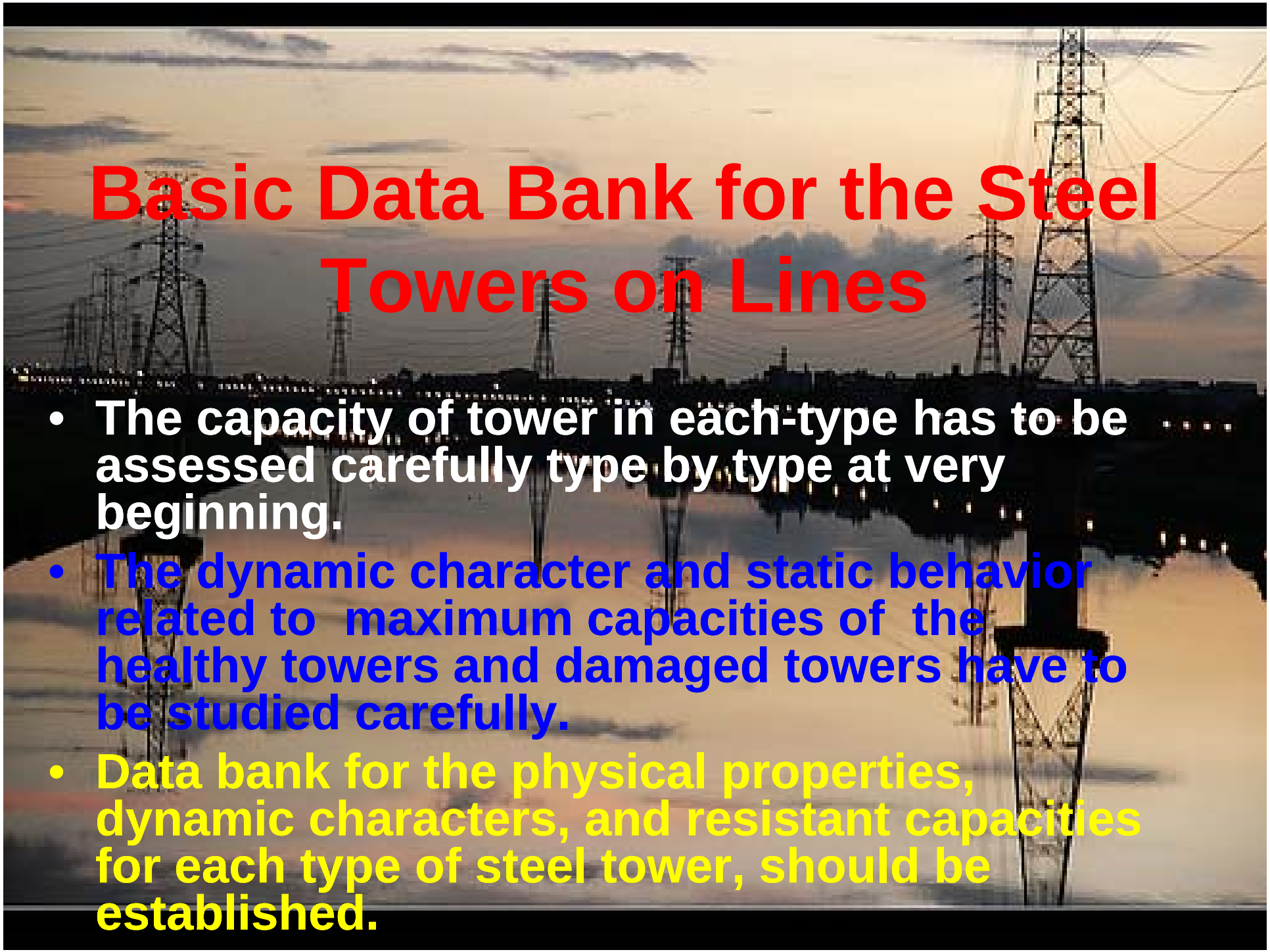
Identification of Tower Structural Damage

- The identification of structural damage is essential main purpose of structural health monitoring for these towers on power transmission lines and net.
- Stiffness changes and frequency changes of the steel structural tower will be paid highly attention on the structural health monitoring.

Acceleration Senor

Wind speed Measurement

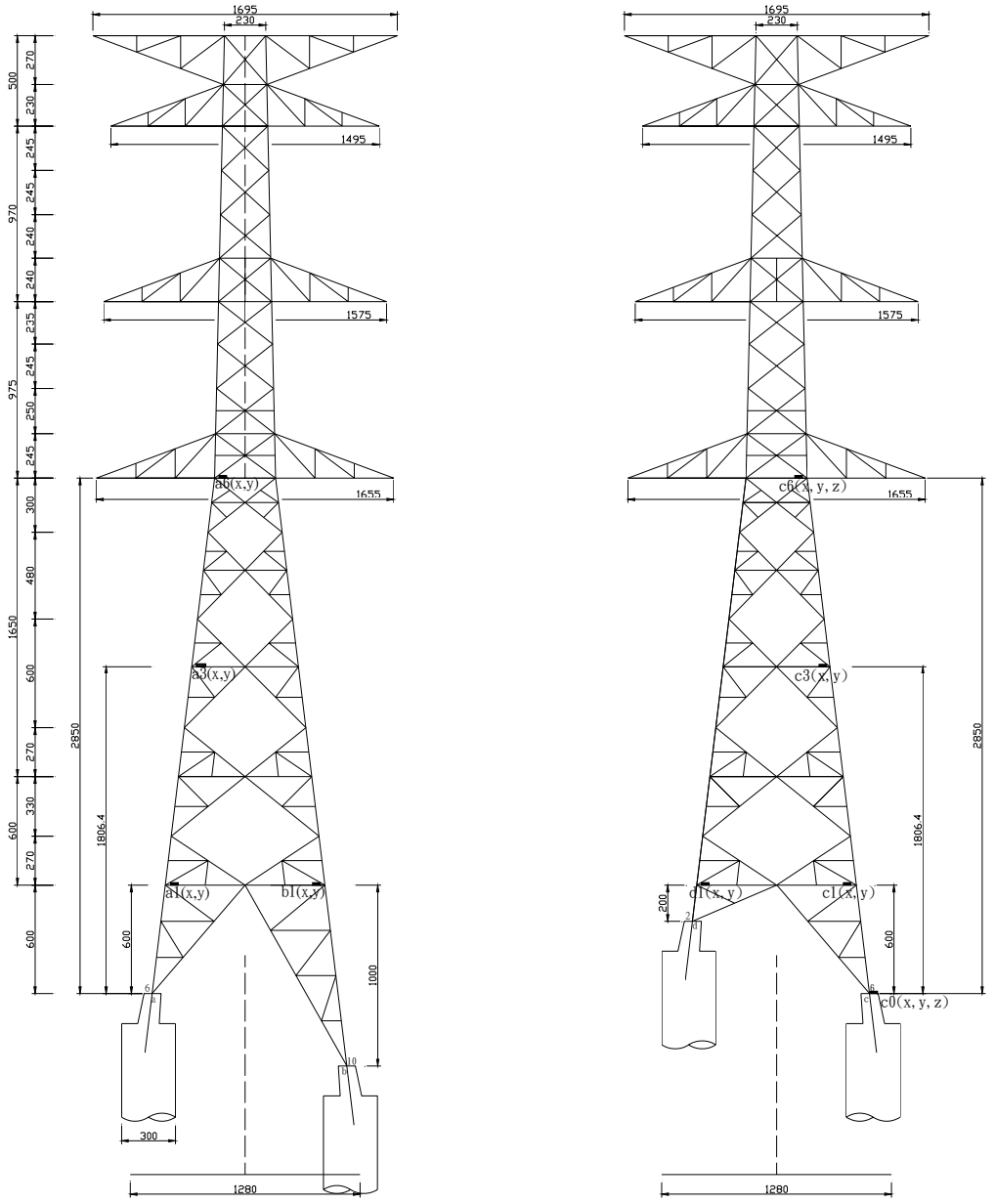
Sensor and Event Data Logger (SAMTAC-802H)



Basic Data Bank for the Steel Towers on Lines

- The capacity of tower in each-type has to be assessed carefully type by type at very beginning.
- The dynamic character and static behavior related to maximum capacities of the healthy towers and damaged towers have to be studied carefully.
- Data bank for the physical properties, dynamic characters, and resistant capacities for each type of steel tower, should be established.

Tower Measured



第一組量測儀器配置				第二組量測儀器配置				第三組量測儀器配置				第四組量測儀器配置			
點號	編號	項目	編號	項目	點號	編號	項目	編號	項目	點號	編號	項目	編號	項目	點號	編號	項目	編號	項目
c0	①	c0-y	②	c0-x	b1	①	b1-y	②	b1-x	c3	①	c3-y	②	c3-x	c6	①	c6-y	②	c6-x
	③	c0-z			c1	③	c1-y	④	c1-x	a3	③	a3-y	④	a3-x		③	c6-z		
					d1	⑤	d1-y	⑥	d1-x	a1	⑤	a1-y	⑥	a1-x	a6	④	a6-y	⑤	a6-x

附註：

Adaptive Sensing System and Warning System Studied

- An adaptive sensing system should be established and studied, such as HHT method,…etc..
- The warning system could be studied and established primarily by applying the on-line recursive and identification technique.

Lateral Resistant Capacities

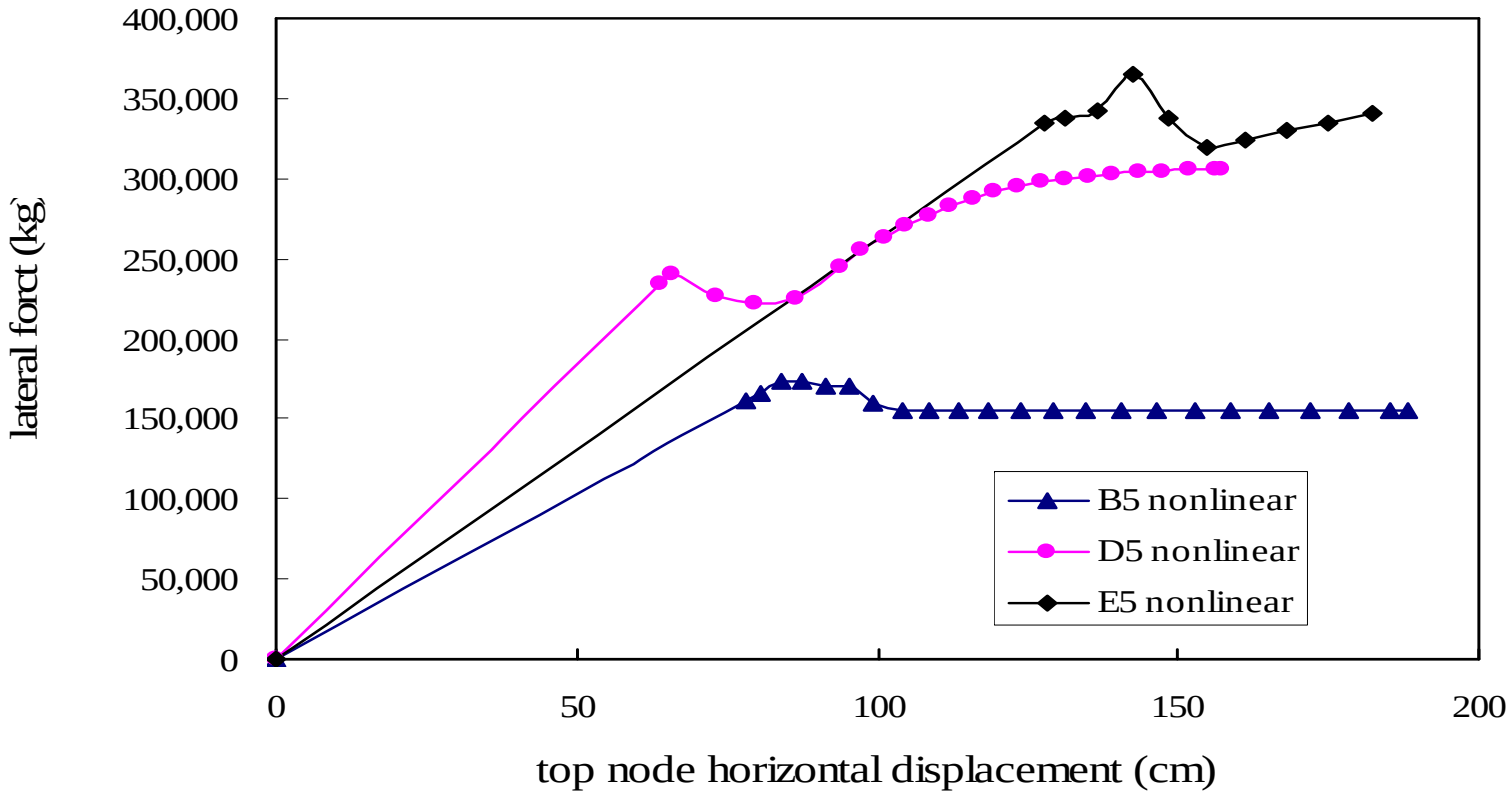


Fig14. tower lateral force versus top node horizontal displacement

The Ultimate Capacity for Steel Towers

tower	V_y (tf)	Δy (cm)	V_u (tf)	Δu (cm)	μ
B5	166.05	80.5	155.16	188.3	2.34
D5	239.68	65.8	305.63	157.4	2.39
E5	336.94	131.2	340.40	184.8	1.41

Conclusion Remarks

- *The electric power transmission lines and net work are extremely important infrastructure to economic construction improvements for mega cities in Taiwan for electric power supply in high quality. The alternative lines or net work in connecting between cities should be studied and set up.*

- *Data bank for these electric power transmission towers should be established dealing with structural member properties, design data, construction data, and maintenance data.*

- *The power transmission towers should be able stable enough to promise the electric power supply continuously, therefore the structural models for tower safety should be studied in more accuracy dealing with the supports, member connections, stability of power transmission cables related to the tower.*

- *The adaptive sensing systems for tower health monitoring and the warning systems related to severity ranks should be studied and established primarily by applying the on-line recursive and identification technique such as HHT method, ,..etc.*


Thank you very much
for
Your kind attention