



India-Sri Lanka Wind Energy Knowledge Exchange Program

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Type Certification of Wind Turbines In India

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Standards & Certification Unit

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Standards & Certification Unit (S&C) – Services

- **Develop and maintain type certification systems.**
- **Accord type certification to wind turbines in accordance with Type Approval - Provisional Scheme (TAPS-2000).**
- **Prepare Indian standards on wind turbines.**
- **Issue the list of wind turbine models and manufacturers viz., RLMM**

Requirements on Type Testing and Certification



- Wind turbines being installed in India, since late 1980s
- Need to streamline the growth of the industry
- Guidelines being issued by the Ministry to facilitate healthy and orderly growth of the wind sector
- Requirement of Type Certificate for wind turbines installed was made mandatory by MNRE to ensure quality and safety

Requirements on Type Testing and Certification



- Around 10 Wind Turbine manufacturers
- More no. of new wind turbine manufacturers with new wind turbine models- Under pipeline

Type Certification of Wind Turbines



Wind Turbine Type Certification



Product Certification

Type Certification

Evaluation procedure to verify that a wind turbine type conforms to the specified requirements

The purpose of the type certification is to confirm that the wind turbine type is designed, documented and manufactured in conformity with design assumptions, specific standards and other technical requirements.

Type Certification applies to a series of WTs manufactured under the same design.

Type Certification of Wind Turbines

Need for Type Certification ?

To ensure the quality of the wind turbines used in a wind farm project

Safety and reliability are assessed

Provides Confidence to various stakeholders

Type certification of Wind Turbine is often included in the contract as a condition by developers, investors, financial institutions and/or insurance companies.

Type Certification of Wind Turbines



Type Certification - Road Map

- *Evaluation of*
 - Design documentation including safety systems
 - Test / measurement reports
 - Quality system documentation including manufacturing system inspection
- *Issue of Type Certificate*
- *Renewal of Type Certificate*

National Certification Systems



- **Danish Certification Scheme**
- **Dutch Certification Scheme**
- **Germanischer Lloyd's Certification Scheme**
- **Indian Certification Scheme**
TAPS - 2000 (Amended in 2003)

International Certification System



Comparison of the schemes based on National schemes and codes is difficult.

The industry trend seems to be a move towards standardisation

IEC Certification Scheme

Type Certificate in compliance with IEC WT 01

Type Approval Provisional Scheme - TAPS-2000



General

- Formulated by C-WET
- Discussed with various stakeholders
- Issued by MNRE, Govt. of India
- PTC - 3 Categories - As per TAPS-2000
- Gives special guidance concerning Indian conditions

Type Approval-Provisional Scheme(TAPS-2000)



Categories of Type Approval- Provisional Scheme

Category I

Provisional Type Certification for type certified or approved WT.

Category II

Category I supplemented by provisional type test at the test site / field

Category III

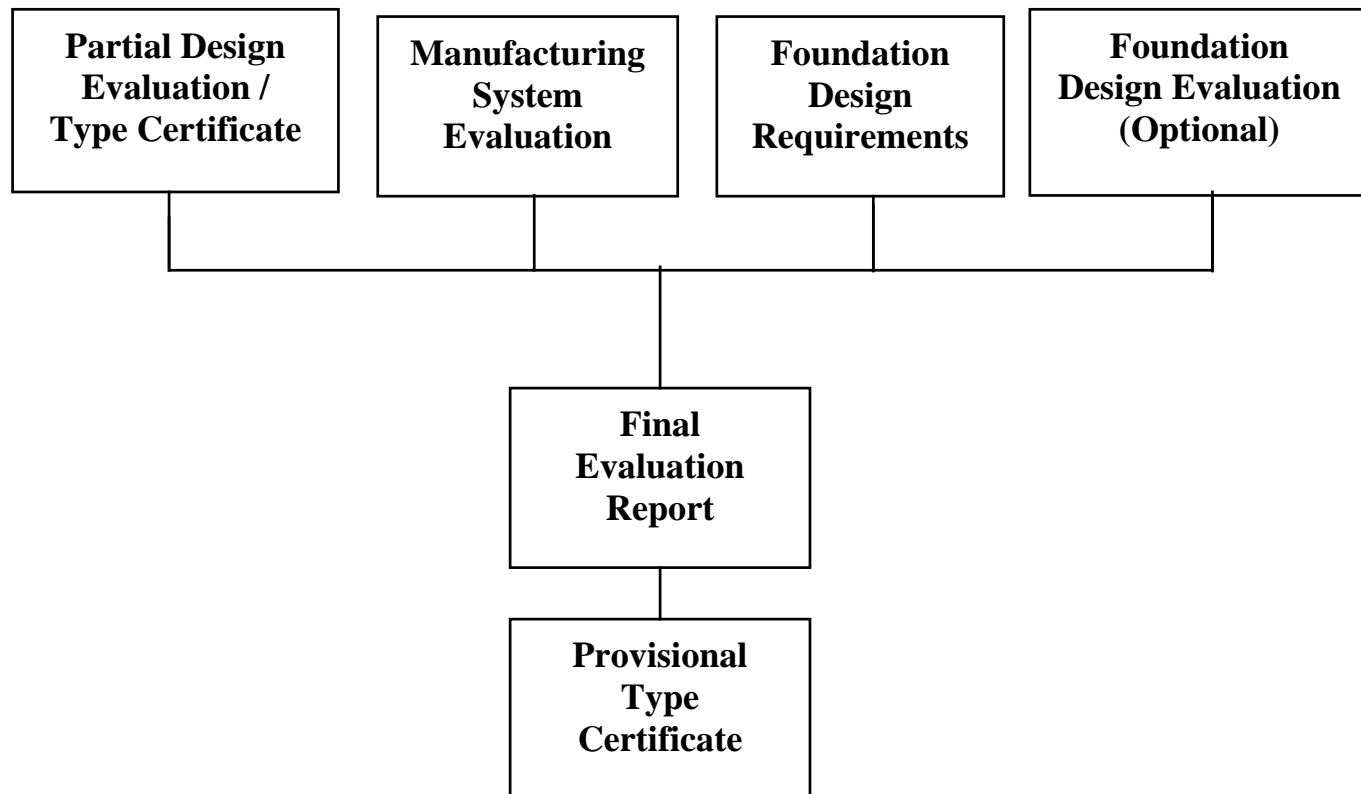
Provisional Type Certification/ approval for new or significantly modified WT through provisional type tests at the test site / field

Type Approval-Provisional Scheme(TAPS-2000)



Category I

Certification based on certificates from Internationally accredited bodies



Type Approval-Provisional Scheme(TAPS-2000)



Partial Design Evaluation

- Type Certificate
- Minor Changes in WT without affecting their loading, durability and operation.
- Appropriate safety and reliability are ensured with the external conditions considered in the design of a WT.
- Safety Systems verified through simplified Tests

to be continued

Type Approval-Provisional Scheme(TAPS-2000)



- **External Conditions**
- WT is subjected to various external conditions, which may affect their loading, durability and operation.
- To ensure the appropriate safety and reliability, the external conditions shall be considered in the design of a WT.

to be continued

Type Approval-Provisional Scheme(TAPS-2000)



- **External conditions**
 - Wind Conditions
 - Normal
 - Extreme
 - Climatic Conditions
 - Site Conditions
 - Operational Conditions

(Contd..)

Type Approval-Provisional Scheme (TAPS-2000)



WT classes

- ↑ WT classes are defined in terms of wind speed and turbulence parameters
- ↑ Three WT classes and Special class.
- ↑ Intended to represent most sites.
- ↑ Site assesment ncessary.

Type Approval-Provisional Scheme (TAPS-2000)



Table 1 – Basic parameters for wind turbine classes¹

Wind turbine class		I	II	III	S
V_{ref}	(m/s)	50	42,5	37,5	Values specified by the designer
A	I_{ref} (-)	0,16			
B	I_{ref} (-)	0,14			
C	I_{ref} (-)	0,12			

V_{ref} - Reference Wind Speed average over 10 min.

A,B,&C - Categories for high, medium and low turbulence characteristics

I_{ref} - Expected value of Turbulence intensity at 15 m/s

Type Approval-Provisional Scheme(TAPS-2000)

External Conditions



- Wind potential sites with high extreme wind speed (Cyclone at any direction with grid outage)
- Varying grid voltage range :
 - +/- 10 % of nominal value
- Varying grid frequency range :
 - 3 Hz and +1 Hz of nominal value
- High number of electrical network outages :
 - 350 times per annum

Type Approval-Provisional Scheme(TAPS-2000)



Category I (contd..)

Manufacturing System Evaluation

The purpose of manufacturing system evaluation is to assess if a specific WT type is manufactured in conformity with the design documentation

- Quality System evaluation
- Manufacturing inspection

Type Approval-Provisional Scheme(TAPS-2000)



Category I (contd..)

Quality System Evaluation

Case I

Quality system is certified in conformance with
ISO 9001: 2000

Case II

Quality system is not certified.

- Following Ten Aspects to be evaluated

Type Approval-Provisional Scheme(TAPS-2000)



Category I (contd..)

Manufacturing System Evaluation (contd..)

- Responsibilities
- Control of documents
- Sub-contracting
- Purchasing
- Process control
- Inspection and testing
- Corrective measures
- Quality recordings
- Training
- Product identification and traceability

Type Approval-Provisional Scheme(TAPS-2000)



Category I (contd..)

- **Foundation Design Requirements**

The objective of evaluation of the foundation design requirements is to verify the tower bottom loads, which are considered for the design of the foundation.

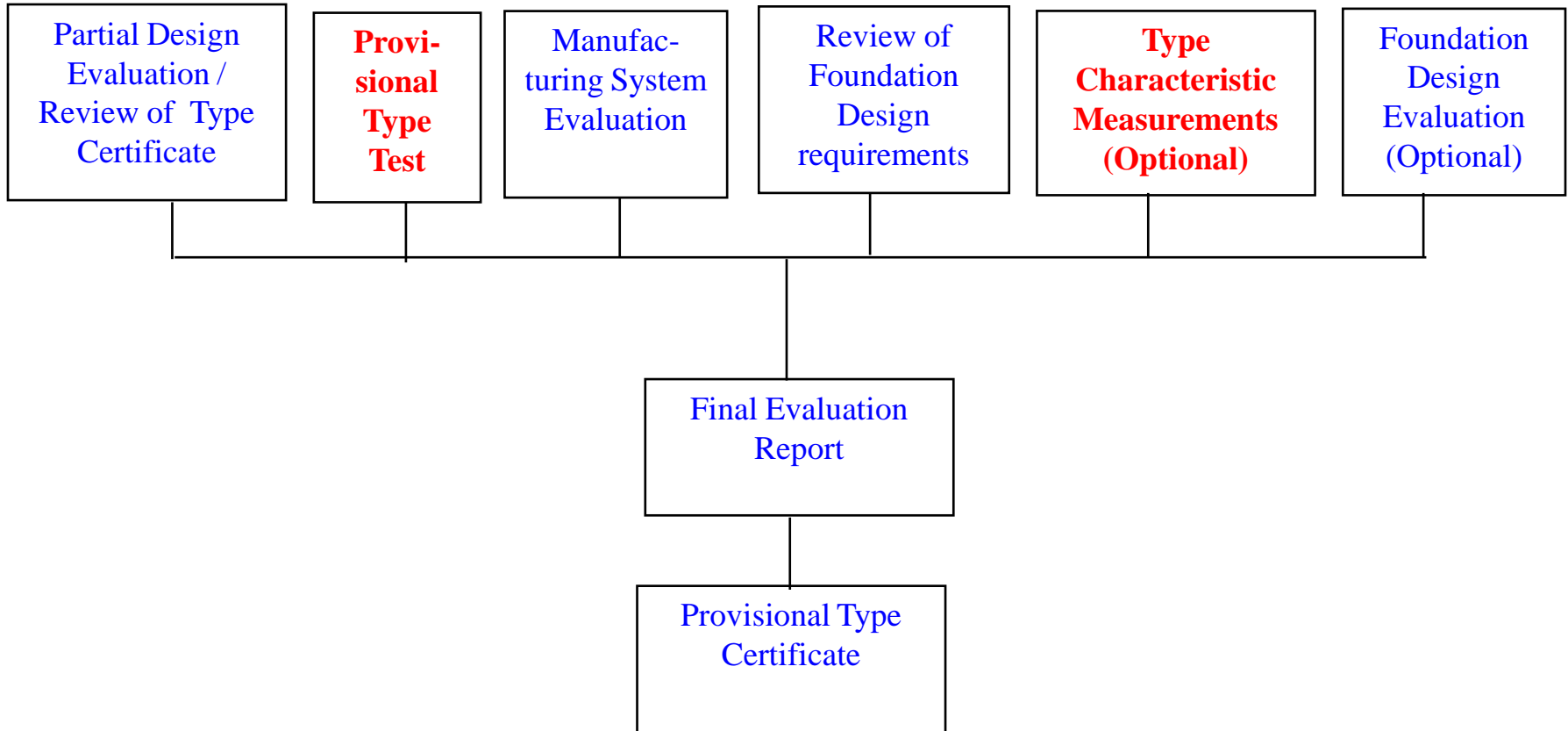
- **Extreme Loads**
- **Fatigue Loads**

Type Approval-Provisional Scheme(TAPS-2000)



Category II

Category I supplemented by documentation for changes and Provisional Type Tests



Type Approval-Provisional Scheme(TAPS-2000)



Category II (contd..)

Provisional Type Test

- Power performance measurements
- Safety and function tests
- Yaw efficiency measurements
- Static blade test edge wise and flap wise
- Load Measurements
- Measurements on natural frequencies

Type Approval-Provisional Scheme(TAPS-2000)



Category II (contd..)

Type Characteristic Measurements (Optional)

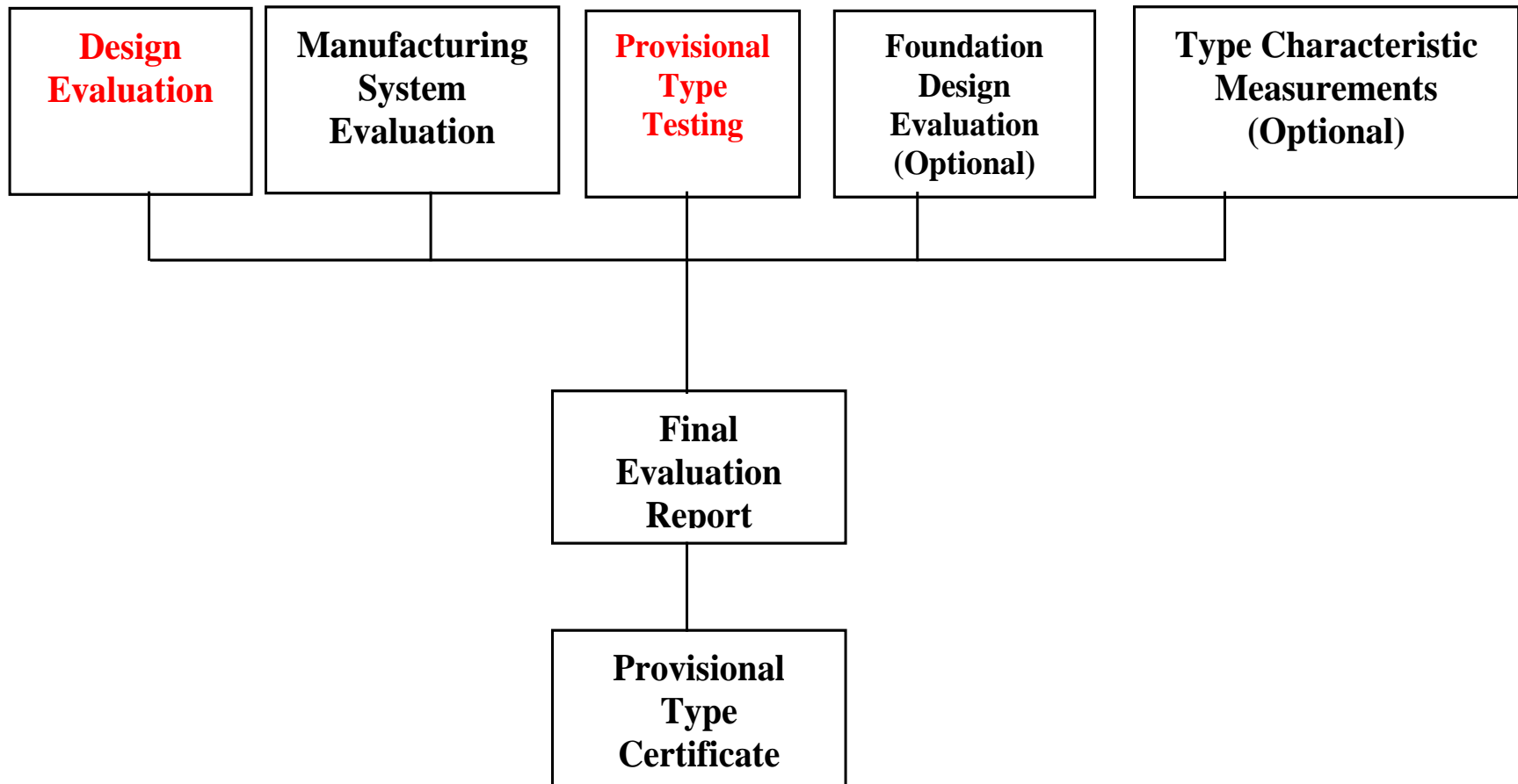
The purpose of type characteristic measurements is to include performance related characteristics of WT type, other than power performance.

- Power quality tests

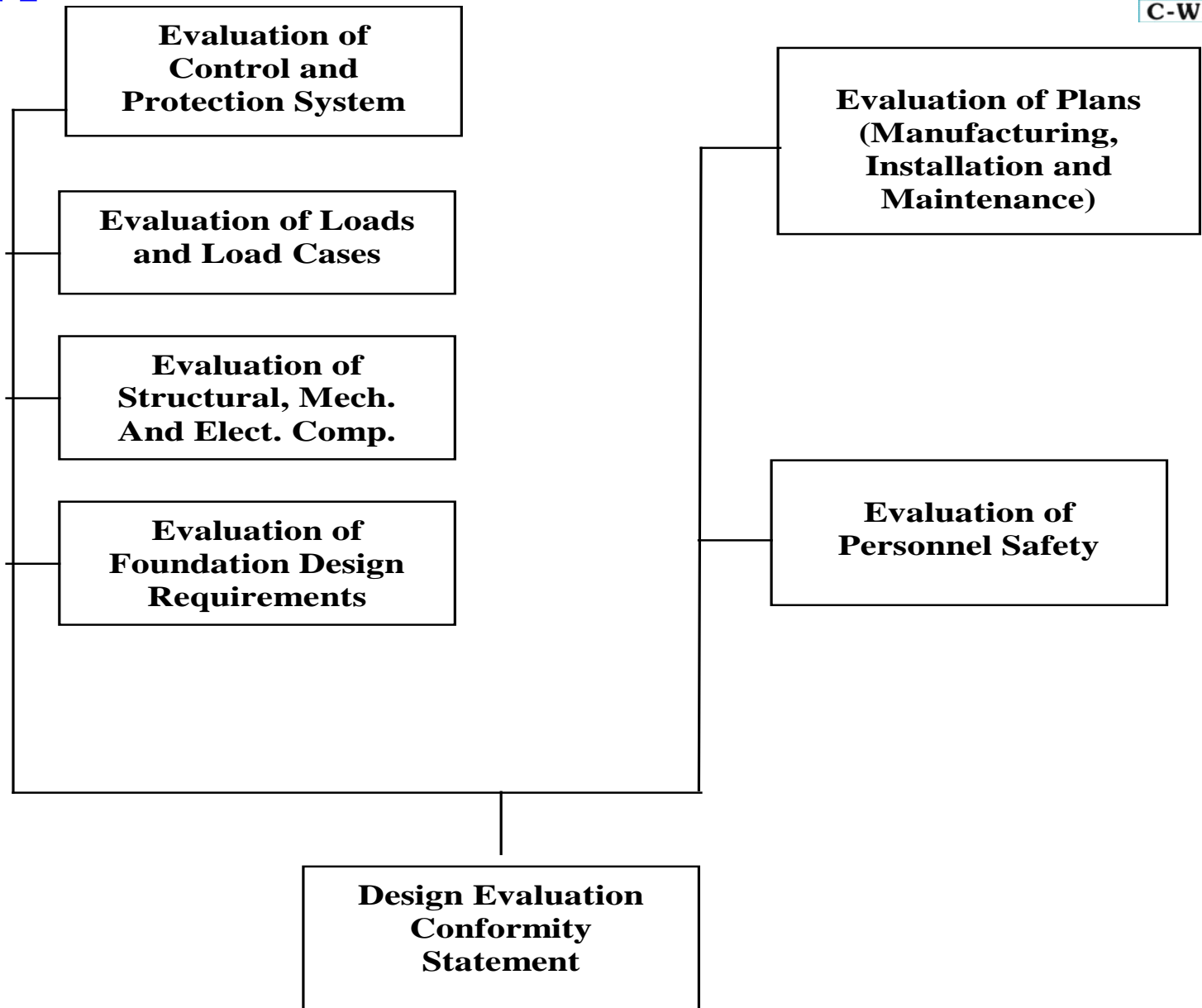
Type Approval-Provisional Scheme(TAPS-2000)



Category III - New or significantly modified WT



Type Approval-Provisional Scheme(TAPS-2000)



Type Approval-Provisional Scheme(TAPS-2000)



Maintenance/renewal of certificate:

- Application for renewal
- List of erected wind turbines
- Report of all failures and incidents
- Documentation for QA
- New or alternative components(or design conditions)
- Any changes in design or QMS
- Clarification of outstanding issues

Certification Systems

International Standards



- IEC WT 01 IEC System for Conformity Testing and Certification of Wind Turbines
- IEC 61400-1 Design Requirements
- IEC 61400-12-1 Power performance Measurements of Electricity Producing Wind Turbines
- IEC 61400-13 Mechanical load measurements
- IEC 61400-21 Measurement and assessment of power quality characteristics of grid connected wind turbines
- IEC 61400-23 Full-scale structural testing of rotor blades for WTs
- IEC 61400-24 Lightning protection for wind turbines

Centre For Wind Energy Technology Standards & Certification



Thank you