RESILIENT CONSTRUCTION+DESIGN GUIDE

ILLUSTRATED GUIDE BY THE KORADESIGNGROUP FOR A DISASTER-RESPONSIVE DESIGN AGAINST EARTHQUAKES, TYPHOONS AND OTHER HAZARDS
Illustrations on the damaging effects of typhoons on a structure

- Sub-standard foundation footing joint connection result to lifting and detachment.
- Sub-standard anchorage design and poor workmanship allows roof to be easily detached and blown away.
Illustrations on the damaging effects of typhoons on a structure

Extended overhang roof more susceptible to damage

Typhoon with heavy rain in long duration results to flooding-damages the structure
- Roofs should have a minimum of 25° slope to allowable 45° slope
- Avoid low pitched roof
- Avoid long eaves
- Avoid long extended overhangs

Hip Roof  High Gable  Lean-To  Almost Flat

Hip roofs are found to be more typhoon-resistant than the gable, lean-to and almost flat roofs. The high angle slope allows wind to circulate with least resistance. Another positive attribute of hip roofs is its four-sided high slope which is aerodynamic in form.
Roofs

EAVES
LONG EAVES
SHORT EAVES

OVERHANGS
Wind speed and pressure

Typhoon-generated wind increases the pressure of the internal surfaces while generating a suction effect on the external surface.

Windward side of the house or structure will collapse under strong wind pressure.

Wind pressure may be relieved by providing an opening along the leeward side.
Sub-standard anchorage result to the detachment of all the joint components of the structure leading to a collapse.

Above is an illustration of wind pressure pushing on different directions combined with the suction effect.

Above is an illustration of an uprooted or overturned structure—this is the problem of light structures whose weight is insufficient to resist the pressure.
Basic planning configurations

SQUARE
(BEST)

RECTANGLE

LONGITUDINAL

L-SHAPE

SHAPE OF ONE OF THE MOST IMPORTANT FACTOR IN DETERMINING THE PERFORMANCE OF THE STRUCTURE (SHAPE=DETERMINANT) AGAINST TYPHOONS AND STORMS.

SQUARE PLAN ALLOWS HIGH WIND TO MOVE FORWARD ON ITS SIDE. IT IS SIMPLE AND SYMMETRICAL, STABLE AND BEST TO RESIST HIGH WINDS.
Basic planning configurations

Row planning creates wind tunnel effect

Zig-zag plan avoids and shields from wind
Basic planning configurations

**AVOID LONG DIMENSIONS**

- Avoid Long Dimensions
- Break Long Dimension by Wall Partition

- Avoid High Walls
- Break Long Dimension by Wall Partition
Basic planning configurations

**WINDWARD SHOULD FACE SHORTER SIDE**

Avoid longer walls facing the direction of the wind.

Let the shorter side face the wind direction for less resistance.
INTEGRATING DESIGN ELEMENTS IN THE LIKES OF STILTS AND RAISED FLOORING FOR PROTECTION AGAINST FLOODING AND EROSION. STRUCTURAL ELEMENTS ENCOURAGED WOULD BE THE ADDITION OF COLUMN PEDESTALS AND MATT FOUNDATION.
1. Select site to build where there are natural barriers as protection from wind and flooding.
Principles of typhoon-resistant structures

2 USE SIMPLE PLAN LAYOUT-EFFECTIVE FOR AVOIDING THE CONCENTRATION OF PRESSURE
Principles of typhoon-resistant structures

3 Design and plan a roof that has a 30° to 45° angle for a more aerodynamic character which prevents the lift action.

4 Avoid wide extended overhangs. It is advisable to use a separate overhang attachment from the main roof.
Principles of typhoon-resistant structures

5. Make sure that the critical joint connections are safely anchored—firmly fixed and fastened.

Make sure that the roof is properly attached using above standard materials, to prevent lifting.

6. Reinforce main structural frame by installing bracing and cross-bracing on walls, roof frame to strengthen and increase resistance to seismic and wind movement.
Principles of typhoon-resistant structures

7. In case of an emergency, where door and window openings are forced open, make sure that there are opposing openings to reduce pressure build-up.

8. Plant trees in the perimeter of the structure to act as wind shield and delay flood water.
Site selection: natural wind barriers

NATURAL BARRIER FROM HIGH WINDS IS A NATURAL GEO-PHYSICAL SHIELD BUFFER AS PROTECTION
Site selection: natural wind barriers

Absence of barriers - no protection

Vegetation as natural wind barriers
Site selection: natural wind barriers

GROUND LEVEL: RISK OF INUNDATION  CONSTRUCTION ON STILTS OR ON AN ELEVATED ENVIRONMENT
Structural elements: frames and foundations

FLOODING/STORM SURGE
RAISED FLOORING ON STILTS ON LOWLANDS AND FLOOD-PRONE AREAS

RAISED FLOORING ON STILTS

FLOOD WATER

RAFT FOUNDATION
USED ON SOFT SOIL—FOR WIDER LOAD DISTRIBUTION
STRIP FOUNDATION
BEST IN FLOOD-PRONE AREA, RESISTS EROSION

COLUMN FOUNDATION
ADD GROUND/TIE BEAMS FOR MORE SUPPORT
Earthquake-resistant structural design
Earthquake-resistant structural design

MAT-STRIP FOOTING/
COLUMN/ COLUMN PEDESTAL
Thank you.

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