Design considerations for tropical wet and dry climate with respect to winery

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Abstract **- Climate, winery and architecture shares a connection with an equal impact on each other. climate is an important factor which plays a big role for architecture involves nature and people. This paper gives idea about how a climate is largely influenced the surrounding through architecture for people and with people. and climate responsive architecture gives us a more nature friendly yet sustainable structure and surrounding. when a structure is completely relied on climate in terms of architecture.**

Keywords**— climate, architecture, winery, vineyard**

I.INTRODUCTION

Architecture and climate have always been linked in a pattern of mutual influence. In its role as a provider of shelter, architecture intentionally modifies the climate of an immediate area. Charles Correa, a well-known architect once said, "form follows climate". This thought essentially suggests that a built environment can respond to climate or use it as an advantage. Solar passive or climatic design creates a comfortable setting and can also have an enormous impact on reducing operating cost of building. "A building that responds to climate essentially harvests light, water and air by using various design techniques," says Architect Sanjay Mohe. Wineries represent a specific type of industrial complex, but also a tourist destination for wine lovers. Facilities for visitors, which have appeared alongside with the expansion of wine tourism, are one of the factors that distinguish wineries from the established perception of the industry.

II.BASIC DESIGN CONSIDERATIONS

A. Flow Of Design with Requirements

The technological process of wine production is essential part of each winery, while facilities for workers and various tourist facilities, such as restaurants and tasting rooms. Within the wine production process, the following stages areidentified -1) grapes receiving and selection; 2) primary grapes processing;3) fermentation in tanks;4) wine maturation in tanks; 5) wine maturation in barrels; 6) bottling;7) wine aging in bottles; 8) packaging and distribution of wine in bottles or barrels.

B. Terrain:

As a rule, wineries are built in vineyard regions because of visual experience and micro-climate, which in combination with ground provides optimal conditions for wine aging. Soil is an important factor in terms of load capacity and production, since the future quality of the wine depends on its composition. The slope of the terrain and its configuration are one of the most important factors, because they directly affect disposition of the facilities through the floors and define whether the winery will be built as above-ground, semi-underground or underground building.

Above-ground wineries are built on flat or on terrains in slight slope. Semi-underground wineries are partially integrated into the slope of the area, with the structure that develops mostly cascading. The underground wineries are characteristics for hilly areas and are positioned at the top of the slope or at its bends.

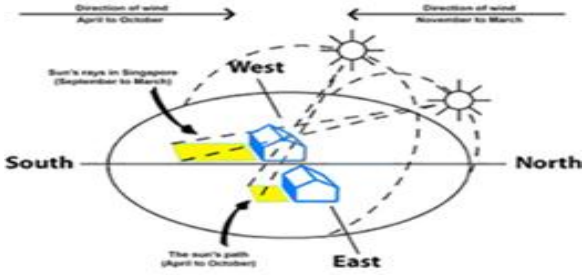
When the terrain is relatively flat, wineries are built as above-ground or semi underground structures. In the case that the terrain is in slope, and the plot is located on one of the hillsides, winery is designed as semi-underground and there is a tendency toward maximizing the use of the gravity in the production process and transport.

C. Form and orientation:

1.Sun orientation

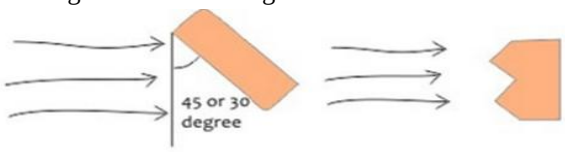
The south and north sides can easily be protected by an overhanging roof. Thus, the best orientation to

minimize solar exposure on vertical surfaces is the longer façades facing north and south.



2. Wind orientation

For utilizing the wind flow, buildings need to be oriented at an angle (usually ±45 degrees) to the prevailing wind direction. Where a predominant wind direction can clearly be identified, long-shaped buildings should be arranged across this direction.

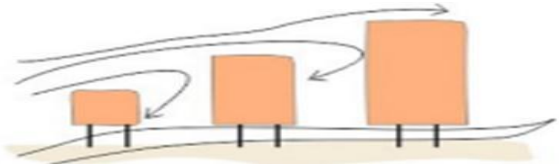


3.Form

The preference of typologies for multi-storey residential buildings in terms of reduced solar radiation exposure is

- Linear double-loaded corridor typology
- Linear typology
- Tower typology

Forms with large surface areas are preferred to compact buildings. In addition, the roof should extend far beyond the line of walls, with broad overhanging eaves and other means of shading. The height of the buildings should, in general, not exceed three-stories.



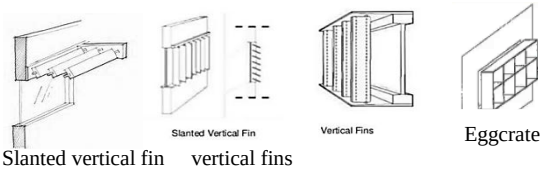
If a site has multiple buildings they should be arranged in ascending order of their heights and be built on stilts to allow penetration.

The intense diffuse solar radiation calls for buildings that have large overhanging roofs and wide shaded verandas.

Buildings elongated along the east-west axis provide the best shading of the critical east and west walls. These critical east and west walls are best protected if the building is covered with a hipped roof (a type of roof where all sides slope downwards to the walls, usually with a fairly gentle slope).


a) Overhanging roof b) hipped roof

a. *Overhang, horizontal louvers in the horizontalplane*: best orientation south, east, west; free air movement, small scale.
b. *Overhang, horizontal louvers in the vertical plane*: best orientation south, east, west; reduces the length of the overhang; view restricted; also available with miniature louvers.
c. *Overhang, vertical panel*: best orientation south, east, west; free air movement, view restricted.
d. *Vertical fin*: best orientation north, restricts view if used on east and west.
e. *Vertical fin slanted*: best orientation east, west; slant toward the north; restricts view significantly.
f. *Eggcrate*: Best orientation east, west; for very hot climates; view very restricted; traps hot air.
g. *Eggcrate with slanted fins*: best orientation east, west; slant toward the north; view very restricted; traps hot air.



Slanted vertical fin vertical fins Eggcrate

D. Movable External Shading Devices

External movable shading systems are installed on the windows and glass facade of buildings which dynamically control the solar heat ingress and the visual light transmission.

4. Shutters: The external movable shutters can be of various types and can be made of a variety of materials, such as treated wood, bamboo, and aluminum. They can be of sliding, top rolling, or a hinged configuration.

5.Solar screens: Woven fiberglass or perforated metal solar screens mounted on the exterior of the window can lower a clear window's solar heat gain coefficient by 30 to 70 percent. The open weave of the screen allows much of the heat from this absorbed radiation to be convicted away

Shutters solar screens roller blinds

before it interacts with the glazing. Solar screens diminish light and view to some extent but can be removed during the winter to allow in more sunlight and solar heat.

6.Roller Blinds: Best orientation east, west, southeast, southwest. Very flexible from completely open to completely closed. View is restricted when roller blinds are sued.

7.Awning: Best orientation south, east, west. It is fully adjustable for annual, daily or hourlyconditions, traps hot air, is good for a view, can be retracted during storms. Retractable awnings are best used either in the fully extended or fully retracted position, as partial shading of thewindow can cause thermal stress. Also, awnings should provide pathways for ventilation to prevent hot air from being captured underneath.

AwningFabric BlindsRotating horizontal louvers

8.Fabric Blinds

9. *Rotating horizontal louvers*: Bestorientation south, east, west, block some view and winter sun.

10.*Rotating vertical fins*: Best orientation east, west, much more effective than fixed fins. Less restricted view than slanted fixed fins.

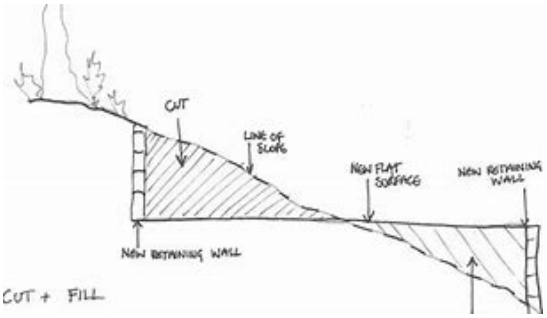
11.*Eggcrate rotating horizontal louvers*: Best orientation east, west. View very obstructed but less than fixed eggcrate. For very hot climates only.

Eggcrate rotating horizontal louvers, External frames with movable awnings, rotating vertical fins

12.*External frames with movable awnings*, bamboo chick or blinds. They are lightweight and lightly connected to the building structure: this means they do not store and re-radiate or conduct heat into the building.

E. *Foundation*

To avoid sloping foundation bed or excessive depth of excavation at the top end, stepped foundation is necessary to be provided in a considerably sloping ground. Foundations on Sloping Ground is achieved by cutting the portion of the foundation trench in steps.

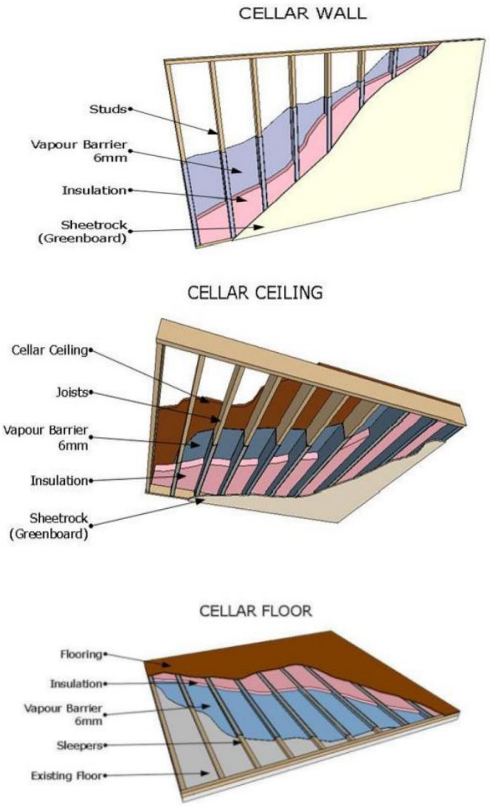


F. Winery Spaces

A. Wine cellar

1. Determining the Location of the Wine Cellar:
in general, look to position your wine cellar where there is:
a) Adequate ventilationb) Minimal direct exposure to sunlight or to heat; andc) Limited vibration
The easiest way to gain this benefit is to locate the cellar below grade, as in a basement, and insulating the space properly.
2. Framing the Room: Your wine cellar should be constructed to exact dimensions of the wine cabinetry or racking to go inside. The more precise, the more your wine cellar will appear custom made. All necessary electrical and plumbing rough-in work should be installed prior to insulation.
3. Vapor Barrier
A vapor barrier is critical to controlling the humidity inside your wine cellar.In humid climates, this prevents warm, moist air from entering the cellar, which can cause mold. In dry climates, this helps to maintain the humidity within the cellar in dry climates.Sprayed-in, closed-cell foam insulation can serve as both insulation and moisture barrier.
4. Insulation
Walls and ceilings must be insulated, using fiberglass, rigid foam (polystyrene), or blown-in

insulation (fill to min. 4" depth for R-28). In general, thicker insulation translates to better cooling.



5. Walls and Ceiling
6. Cooling System
1. System Types

The requirements of your wine cellar's cooling unit will depend on several factors, including cellar size, your ambient climate, your intended use, construction plans, etc.

- Self-contained, which are placed into one of the cellar walls, and blow cold air into the cellar and exhaust warm air out of the cellar and into the adjacent space. These systems are generally the most economical, but also have important disadvantages. They take up valuable space inside the cellar, they generally have more limited capacity, and they are the noisiest option.
- Split Systems allow the condensing unit to be located remotely outside the cellar (either inside or outside of the building) and are connected to an evaporator inside the cellar by a line set consisting of a liquid line and a suction line. These systems also require a drain line from the condenser unit and must be installed by a licensed plumber. Split systems can be quieter, longer lasting, more efficient and have greater cooling capacity than self-contained systems.
- Fully Ducted Systems operate in a manner similar to a home HVAC system, using a remotely located evaporator/condenser unit, and connecting to the cellar via ductwork for supply and return air. These systems offer the significant advantage of having no mechanical equipment inside the cellar, which saves space inside the cellar and are essentially silent within the cellar.

7. Flooring

Most common treatments are tile, slate, marble, and concrete or other "hard surfaces", but vinyl, cork and gravel is also acceptable.

III.CONCLUSION

climate decides a design consideration in any structure. winery is the climate sensitive project from location to materials it needed the climate study according to region. here we study the winery and climate and architectural needs.

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