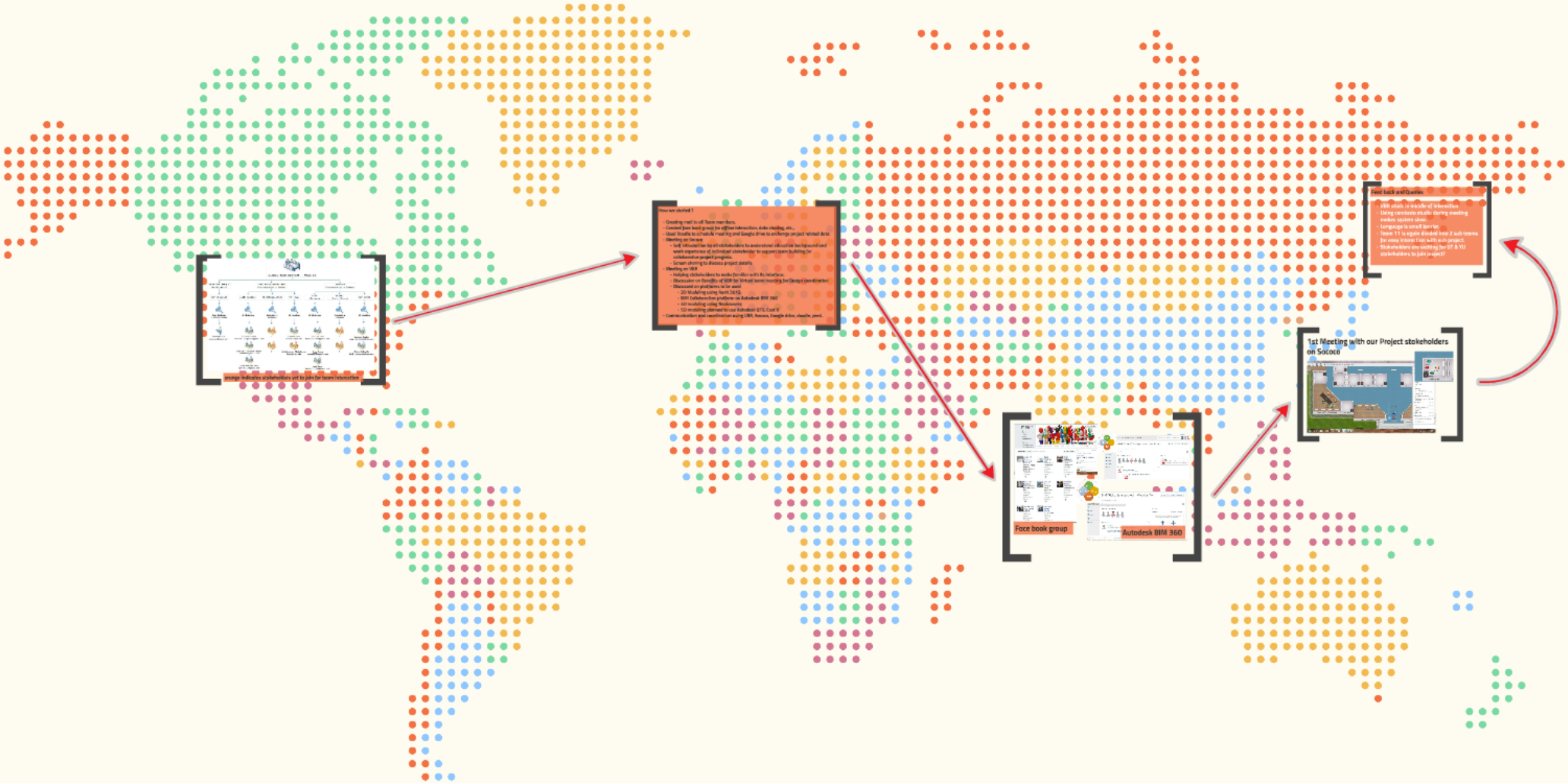
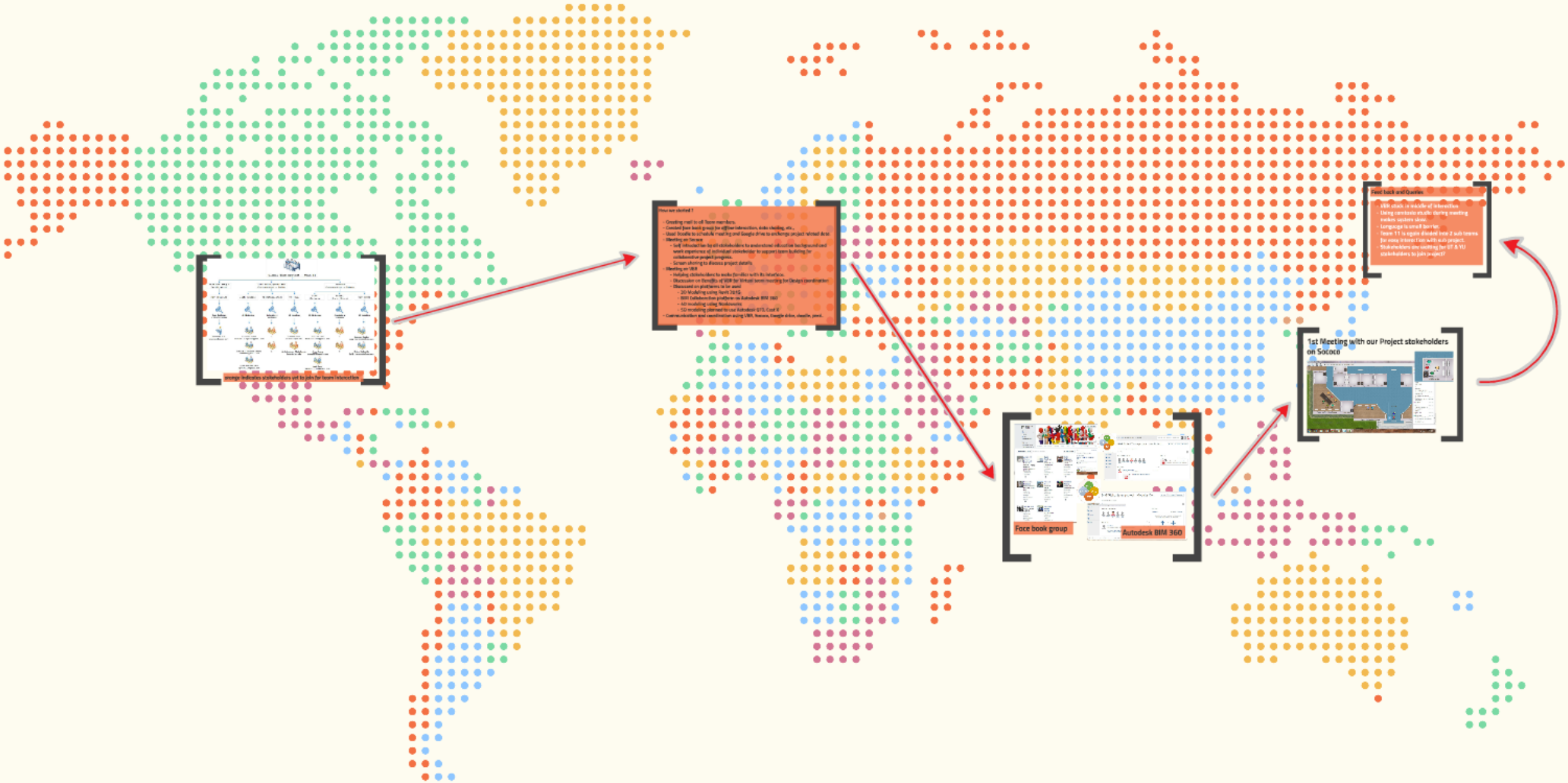


Global team 11

Meeting minutes

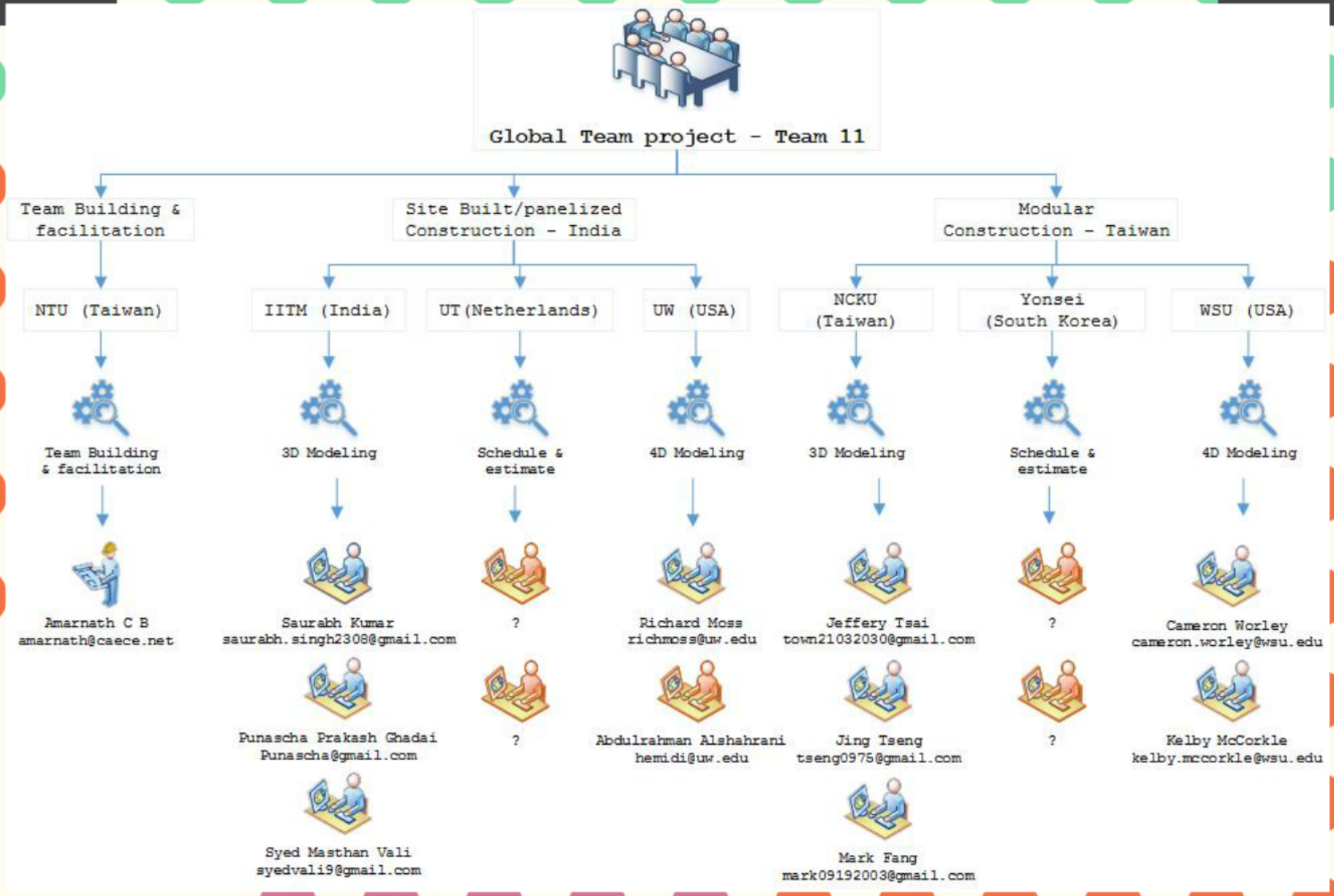
Prezi



Global team 11

Meeting minutes

Prezi



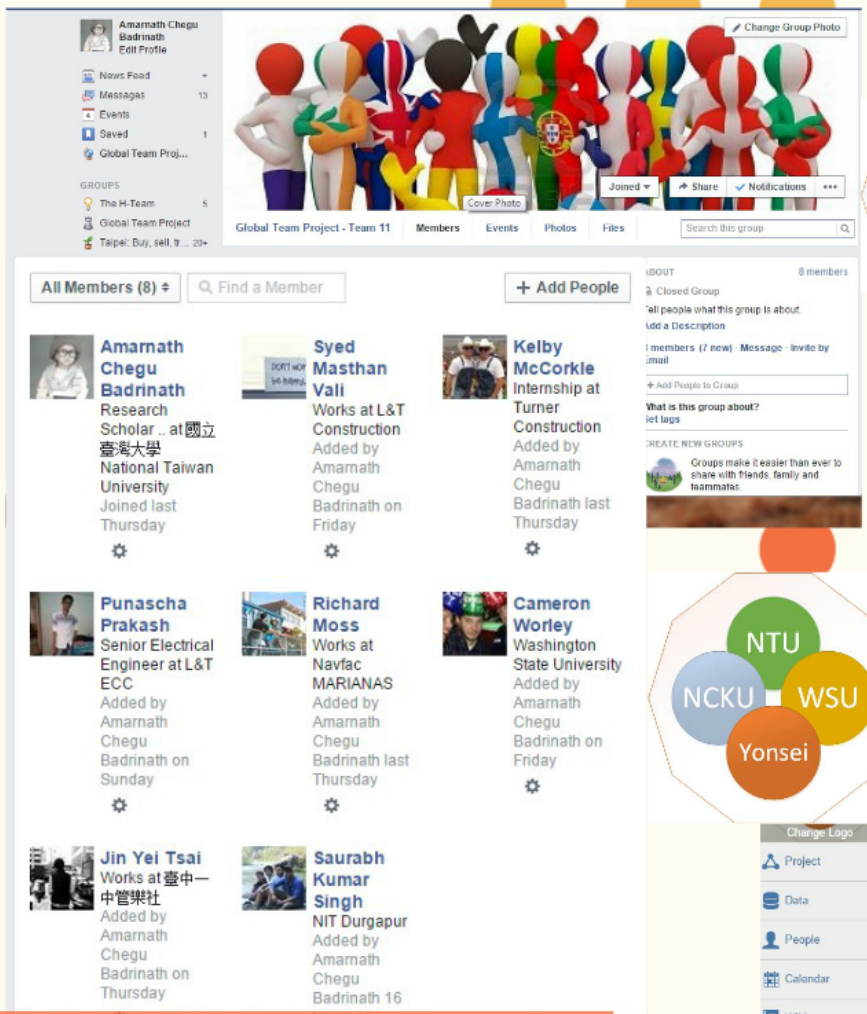
orange indicates stakeholders yet to join for team interaction

Prezi

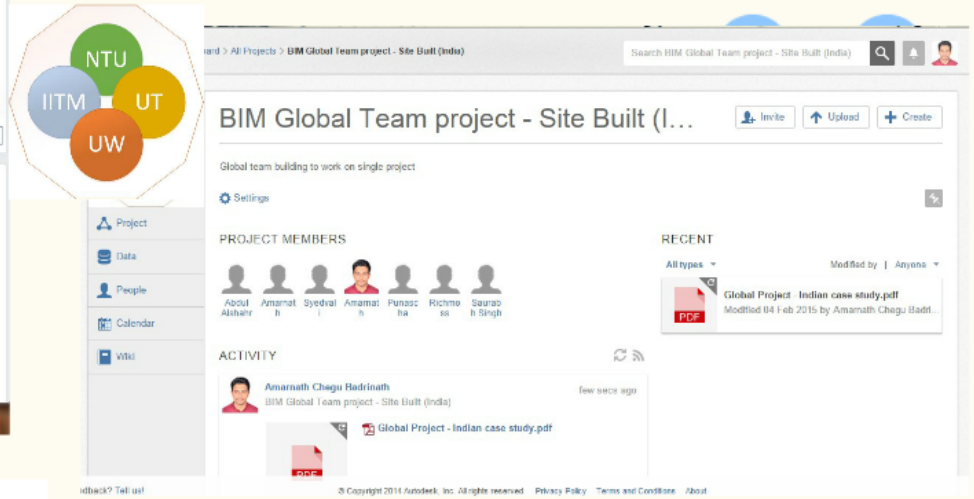
How we started ?

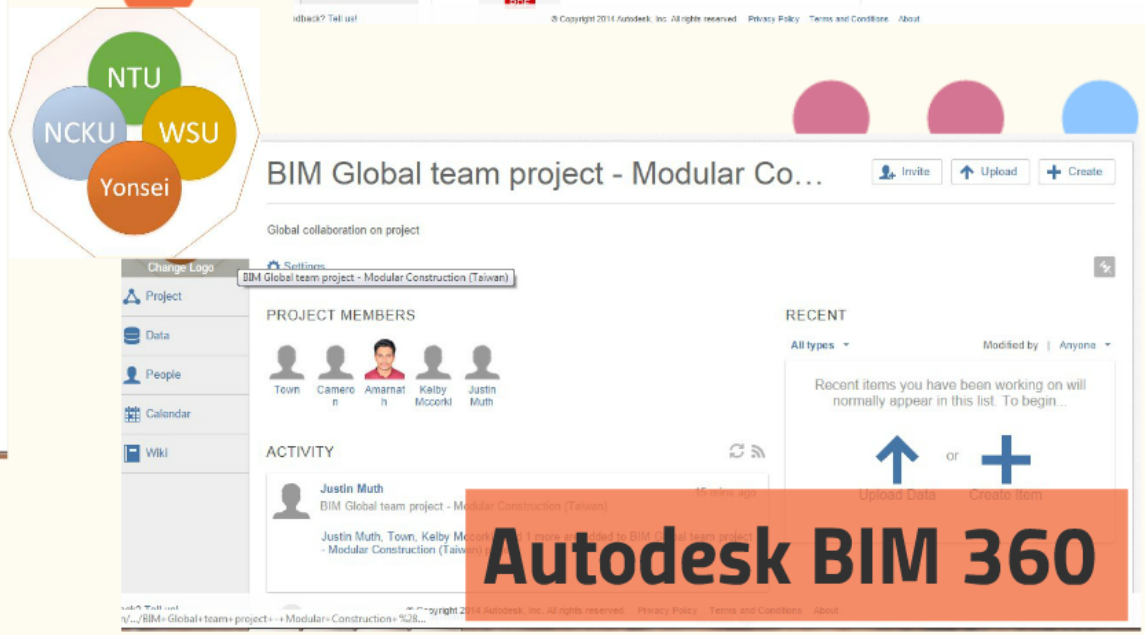
- Greeting mail to all Team members.
- Created face book group for offline interaction, data sharing, etc.,
- Used Doodle to schedule meeting and Google drive to exchange project related data.
- Meeting on Sococo
  - Self introduction by all stakeholders to understand education background and work experience of individual stakeholder to support team building for collaborative project progress.
  - Screen sharing to discuss project details
- Meeting on VBR
  - Helping stakeholders to make familiar with its interface.
  - Discussion on Benefits of VBR for Virtual team meeting for Design coordination
  - Discussed on platforms to be used
    - 3D Modeling using Revit 2015
    - BIM Collaboration platform as Autodesk BIM 360
    - 4D modeling using Navisworks
    - 5D modeling planned to use Autodesk QTO, Cost X
- Communication and coordination using VBR, Sococo, Google drive, doodle, prezi.

Prezi



Face book group

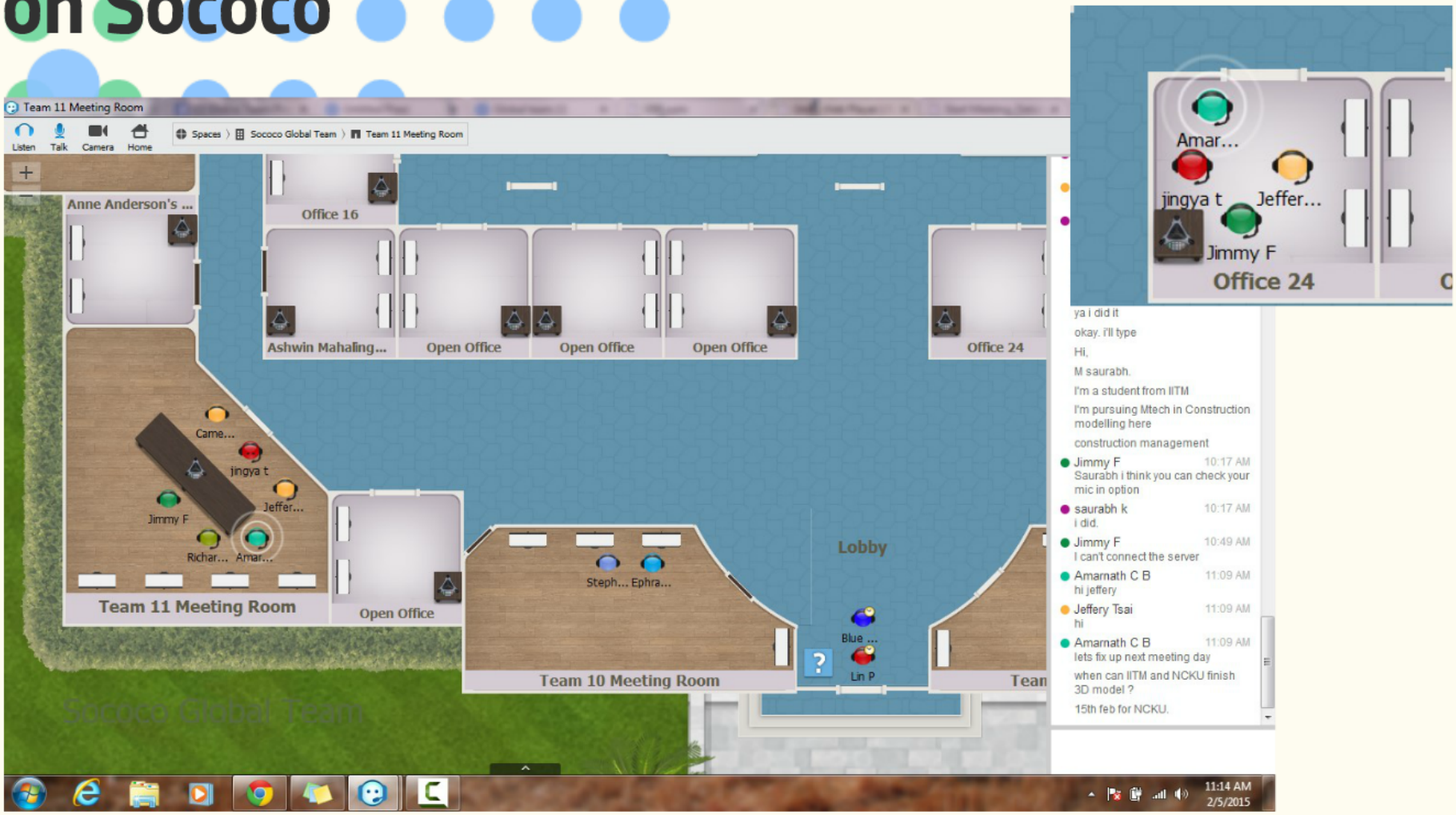




Autodesk BIM 360

Prezi

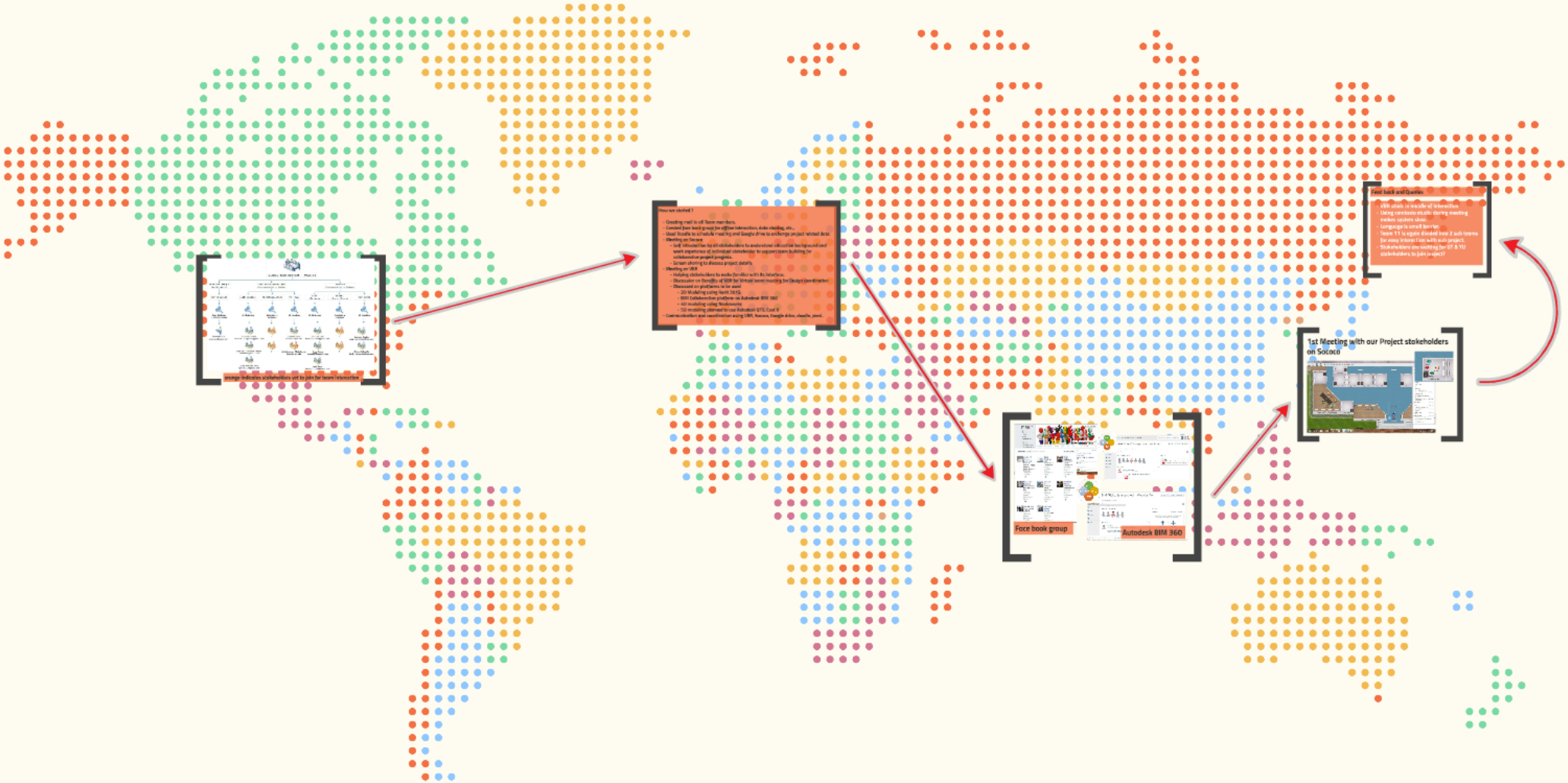
1st Meeting with our Project stakeholders on Sococo



Feed back and Queries

- VBR stuck in middle of interaction
- Using camtasia studio during meeting makes system slow.
- Language is small barrier.
- Team 11 is again divided into 2 sub teams for easy interaction with sub project.
- Stakeholders are waiting for UT & YU stakeholders to join project?

Prezi



Global team 11

Meeting minutes

Prezi

Start Meeting【Detailed Agenda】

Date: 5th feb 2015

Place: Sococo

(India)

(Taiwan)

(USA)

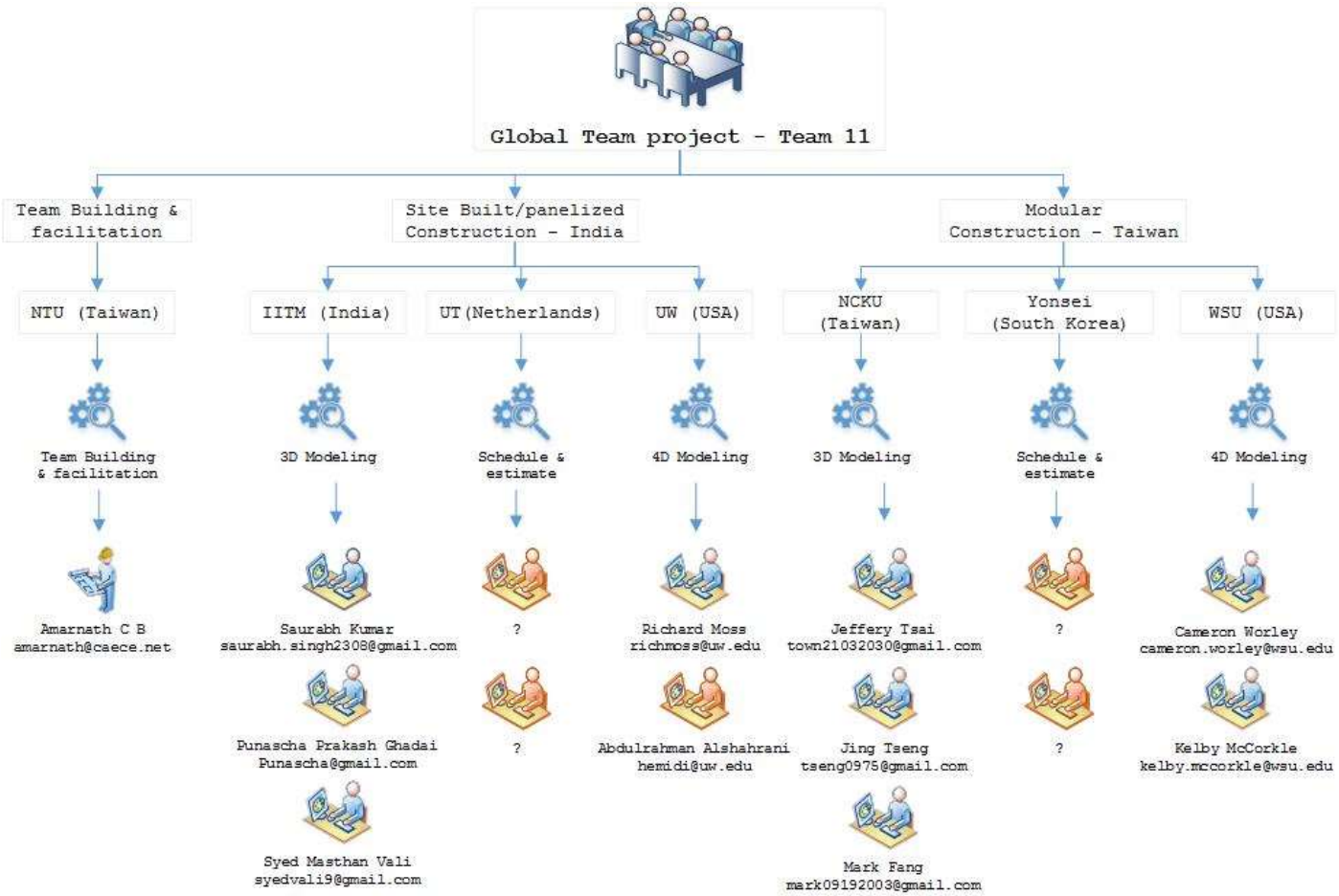
Chairman: Jeffery Tsai(NCKU)

Time controller: Amarnath C B (NTU)

1. **Introducing** 36min(12*3=36)
   a. 3 minutes for each people.
   b. I suggest **the introducing including your current situation like "I'm now in Tainan, and I also live in school now."** This word would help everyone be familiar with the situation.

2. **VBR Introducing** 15min
   a. Amarnath C B (NTU) will introduce VBR for us.
   b. We also can preview VBR. Below is the link.
      http://homepage.ntu.edu.tw/~r03521607/NBiM_client/NBiM_client.html
      In FB , Amarnath Chegu Badrinath(NTU) also posted the VBR's introduction for us.

3. **Confirming our works** **15min**
   a. Foreword



In this picture, IITM designs the models for site built/penalized construction, and NCKU designs the models for modular construction. Now the fact is that **IITM and NCKU both design model for site built construction and modular construction.** After discussion in NCKU, NCKU in team 11 will design for site built. And we are very glad to know how IITM will do in the start meeting.

Based on it, we could construct the 4D model separately in IITM's design and NCKU's design. This will make our works more efficient.

b. After we understood the whole situation, we can confirm everyone's work clearly in Sococo.

4. Deciding Next Meeting **up to the two teams, basically 10min**

a. If we all know what to do, I think we can do the project in two different teams, IITM+UW+UT and NCKU+WSU+YU, after this meeting.

b. Therefore, next meetings are for two teams separately. We two teams can discuss time for next meeting now in sococo.

Finally, I want to share some tips for our meeting. That can make the meeting more efficient.

1. One conversation at a time.
2. No blocking.
3. Follow the time (red words).

Thank for spending time looking the agenda, hope we can have a great cooperation.

Reg,

Jeffery Tsai & Amarnath C B

GLOBAL PROJECT -

MASS HOUSING PROJECT IN THE CYCLONE AFFECTED AREAS OF ANDHRA PRADESH (INDIA)

GLOBAL TEAM NO - 11

Information & Guidelines for a Housing Project in Andhra Pradesh (India)

- *Introduction to Andhra Pradesh :-*

Andhra Pradesh is a state in *INDIA* which is mostly affected by Cyclones, Storm surges & Floods. Since 1975 the state had faced more than 60 cyclones. The deadliest cyclone in the past 40 years that struck in November 1977 killing more than 10,000 peoples & damaging one Million houses with 1.35 million hectares of crops. The reason behind all may be due to the Geographical conditions of this state, Where the *Bay of Bengal* ocean is situated in the east exposed to around 44% of the state.

The cyclone develop in the pre-monsoon i.e *April to May* & Post-monsoon seasons *October to December*, But most of the time they tend to form in the Month of *November*. For getting some ideas for our Design & Building Criteria's let us see some of the deadliest cyclones data's as mentioned,

Time of Cyclone	*Event*	*Human Death*	*Houses Damaged*	*Max. Wind Speed*
Nov-77	Severe Cyclonic Storm	10000	1014800	205 Km/Hr
May-79	Heavy Rains /Floods Severe Cyclonic Storm with core of hurricane winds	706	748000	160Km/Hr
May-90	Severe Cyclonic Storm with core of hurricane winds	817	1439659	235Km/Hr
Nov-96	Severe Cyclonic Storm with core of hurricane winds	1077	616553	220Km/Hr

Objective :- (1). To design a settlement of 50 houses, of roughly 500sq. ft each. (2). To design 2 sets of designs - one for Pre-cast construction & one for cast in site construction with comparison.

Description: - Based on the History & Frequency of cyclone we will be designing the Housing projects & Compare the cost estimation for both Pre-cast & cast in site construction practice for which we will collect the cost for Raw materials, Equipment Hiring Charges, transportation Charges etc as required. During construction we also need to take care the culture of People in AP (Andhra Pradesh) & the way they want to construct their house. We will be collecting the data's regarding the same & consider the same in our design. Here are some points that requires explanation for design Purpose.

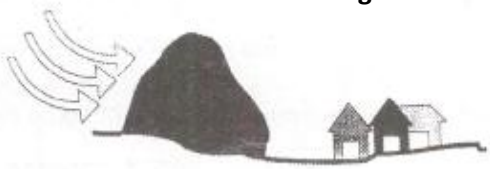
Design Aspects:-

- The Location of Construction.
- Weather condition & duration of project completion.
- Types of Damage during Cyclone.
- Plan forms & Orientations.
- Design wind Speed & Pressure
- Design Procedure for wind Resistance Building.
- Roof Architecture.
- Wall Opening.
- Foundation Design.
- Glass Panes.

1. *Location of Construction:-*

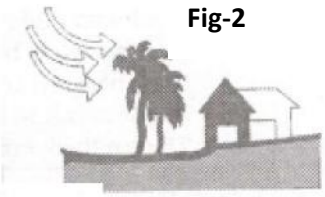
- As mentioned earlier the construction of the Project will be happen in the Cyclone Affected areas like Vizianagaram, Vishakhapatnam, Srikakulam, Kakinada or Machilipatanam. Though cyclonic storms always approach from the direction of the sea towards the coast, the wind velocity and direction relative to a building remain random due to the rotating motion of the high velocity winds. In non-cyclonic region where the predominant strong wind direction is well established, the area behind a mountain or a hillock should be preferred to provide for natural shielding as shown in fig-1.

Fig-1

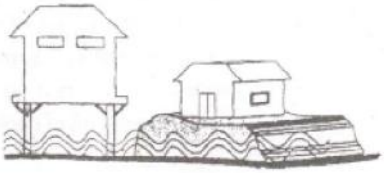


- Similarly a row of trees planted upwind will act as a shield provided that they should be at a safe distance from the row houses as shown in fig-2.
- In hilly regions, construction along the ridges should be avoided since they experience high wind velocity whereas valleys experience lower speeds in general.
- In cyclonic regions, close to the coast, a site above the likely inundation level should be chosen. In case of non availability of high level natural ground, construction should be done on stilts with no masonry or cross-bracings up to maximum surge level, or on raised earthen mounds as shown in Fig. 3 to avoid flooding/inundation but knee bracing may be used.

Fig-2



Construction at ground level-High Risk



House on Artificially raised earth mounds

2. ***Weather Condition & Duration of Project Construction:-***

- Since the most of the Cyclone develop in Pre monsoon i.e April to May & Post monsoon i.e October to December including higher chance of occurrence in November we need to plan the construction Schedule from January till the date of completion based on the Scope of work.

3. ***Types of damage during Cyclone:-***

- Before Constructing a Cyclone proof house we need to understand the damages it does during the cyclone to the different parts of our house. The wind pressures and suction effects on flat objects could be sufficient to lift them off and fly away from their place of rest unless they are tied down to substantial supports.

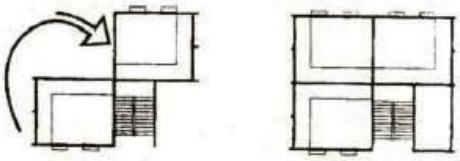
Wind Speed, m/sec.	*Typical Possible Movement*
30-35.1	Roof sheets fixed to battens fly
35-40	Small aircrafts take off speed
40-45	Roof tiles nailed to battens fly
45-50	Garden walls blow over
50-55	Unreinforced brick walls fail
55-60	Major damage from flying debris
60-65	75 mm thick concrete slabs fly

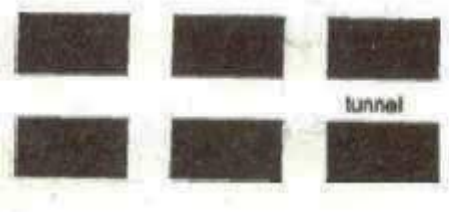
- ***Roof Sheeting*** is the commonest area of failure in cyclones. The causes are usually inadequate fastening devices, inadequate sheet thickness and insufficient frequencies of fasteners in the known areas of greater wind suction. Light weight Verandah in INDIAN houses are susceptible to damage due to high wing speed.
- ***Roof Tiles*** were thought to have low vulnerability in storms but past cyclones have exposed the problem of unsatisfactory installation practices.
- ***Windows and Doors*** are the components most frequently damaged in cyclones. Of course, glass would always be vulnerable to flying objects. The other area of vulnerability for windows and doors is the hardware latches, bolts and hinges.
- In Case of ***Walls*** it is not uncommon for un-reinforced masonry to fail in severe cyclones. Cantilevered parapets are most at risk. But so are walls braced by ring beams and columns have remained safe. Sometimes bad construction practices are also the reason for failure.
- Failure of large industrial buildings with ***light weight roof*** coverings and long/ tall walls due to combination of internal and external pressures.

4. ***Plan form & Orientation:-***

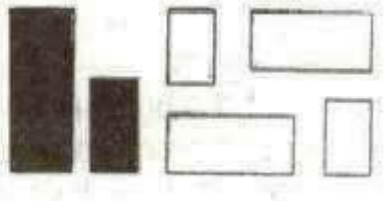
- For individual buildings, a circular or polygonal plan shape is preferred over rectangular or square plans, but from the viewpoint of functional efficiency, the rectangular plan is commonly used.

- A symmetrical building with a compact plan-form is more stable than an asymmetrical building with a zig-zag plan, having empty pockets, as the latter is more prone to wind/ cyclone related damage.
- In case of construction of group of buildings, a cluster arrangement (Fig-3) can be followed in preference to row type.





(Row Planning of Mass Housing project creates wind)



(Zig-Zag Planning of Mass Housing project avoids wind)

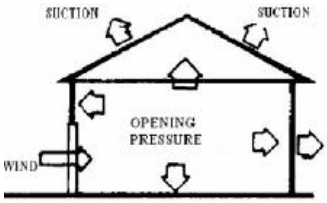
5. ***Design wind Speed & Pressure :-***

- The basic wind speed is reduced or enhanced for design of buildings and structures due to following factors. Since Costal belt areas are nearer to Bay Of Bengal Ocean there is chance of salt water coming with high velocity to destroy the building foundations.

  - The risk level of the structure measured in terms of adopted return period and life of structures.
  - Terrain roughness determined by the surrounding buildings or trees and, height with size of the structure.
  - Local topography like hills, valleys, cliffs, or ridges, etc.

The value of wind pressure actually to be considered on various elements depends on

  - Aerodynamics of flow around buildings.
  - The windward vertical faces being subjected to pressure
  - The sloping roofs getting pressures or suction effects depending on the slope. The projecting window shades, roof projections at eave levels are subjected to uplift pressures. These factors play an important role in determining the vulnerability of given building types in given wind speed zones.



- Wind generating opening on the windward side during a cyclone will increase the pressure on the internal surfaces. This pressure, in combination with the external suction, may be sufficient to cause the roof to blow off and the walls to explode.
- Another mode of failure occurs when the windward side of the house collapses under the pressure of the wind.
- If the building is not securely tried to its foundations, and the walls cannot resist push/pull forces the house tends to collapse starting the roof with the building leaning in the direction of the wind. ***(Fig-4)***

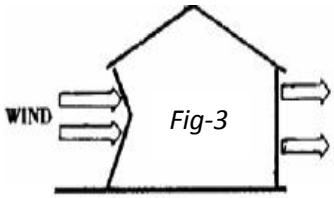


Fig-3

- Overturning is another problem for light structures. This occurs when the weight of the house is insufficient to resist the tendency the house to be blown over.

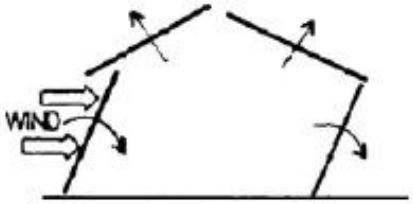


Fig-4

6. *Design Procedure for wind Resistance Building :-*

- We may follow the procedure to design a building that will be resistant to damage during the cyclone in area like ***Vishakhapatnam & Vizag***.

  - As per the IS: 857 Part 3-1987 the basic design wind speed in Vishakhapatnam & Vizag are considered as 50 m/sec (i.e. V_b = 50m/sec) for 10 meter height.
  - Then we have to choose the ***Risk co-efficient factor K_1*** = 1.08 i.e. for cyclone affected areas but for normal residential building it is 1.
  - Again choosing appropriate value for **K_2** ***(Terrain, Height & Structure Size Factor)*** corresponds to building height up to 10m is 1.05 where as it is 0.80 for built-up city areas.
  - ***K_3 (Topography)*** value varies with the height above ground level, at a maximum near the ground & reducing to 1.0 at higher levels. Here let us consider K_3 = 1.05 as it is very close to the sea level.
  - Then the design wind velocity can be calculated for our Project is :-

    $V_z = V_b*K_1*K_2*K_3$
    $= 50m/sec*1.08*1.05*1.05 = 59m/s$
  - Then Normal Design Pressure can be calculated as

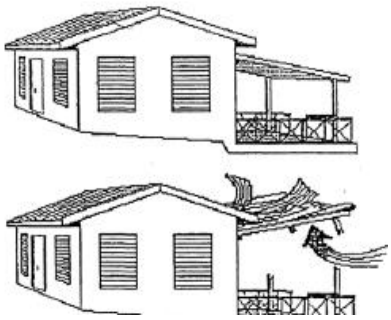
    $P_z = 0.0006*V_z^2$
    $= 0.0006*(59m/sec)^2 = 2.0886Kn/m^2$
  - From above calculations we can conclude that for our Mass Housing construction project in the cyclone affected areas of AP the design parameters that we will consider for the design purpose will be based on ***(i) V_z = 59m/s i.e the design wind velocity & (ii) P_z = 2.088Kn/m^2***.

- Load effects shall be determined considering all critical combinations of dead load, live load and wind load. In the design of elements, stress reversal under wind suctions should be given due consideration. Members or flanges which are usually in tension under dead and live loads may be subjected to compression under dead load and wind, requiring consideration of buckling resistance in their design.
- Even thin reinforced concrete slabs, say 75mm thick, may be subjected to uplift under wind speeds of 55 m/s and larger, requiring holding down by anchors at the edges, and reinforcement on top face! As a guide, there should be extra dead load (like insulation weathering course, etc) on such roofs to increase the effective weight.
- Resistance to corrosion is a definite requirement in cyclone prone sea coastal areas. Painting of steel structures by corrosion-resistant paints must be adopted. In reinforced concrete construction, a mix of ***M20 grade*** with increased cover to the reinforcement has to be adopted. Low water cement ratio with densification by means of vibratos will minimize corrosion.

7. ***Roof Architecture :-***

- Lightweight flat roofs are easily blown off in high winds. In order to lessen the effect of the uplifting forces on the roof, the roof Pitch should not be less than 22º. Hip roofs are best, they have been found to be more cyclone resistant than gable roofs.
- Since heavy rain occurs during Cyclone, for rain Protection a minimum roof projection of 500mm is desirable. Tying down the same will be very advantageous.
- Avoid openings which cannot be securely closed during a cyclone. Where openings are already in existence, cyclone shutters should be provided.
- Avoid large overhangs as high wind force build up under them. Overhangs should not be more than 18 inches at verges. Build ***verandah*** and patio roofs as separate structures rather than extensions of the main building. So that they may blow off without damaging the rest of the house. (Fig-6).
- As the corners and the roof edges are zones of higher local wind suctions and the connections of cladding/sheeting to the truss need to be designed for the increased forces. Failure at any one of these locations could lead progressively to complete roof failure.

Hip Roof



Verandah Design

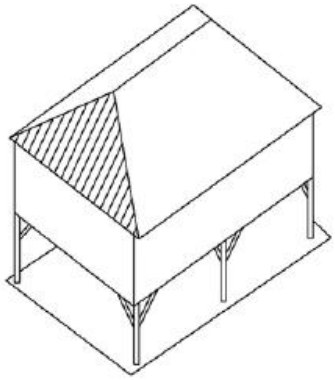
8. ***Wall opening :-***

- Openings in general are areas of weakness and stress concentration, but needed essentially for lighting and ventilation. The following norms are recommended in respect of openings.
- Openings in load bearing walls should not be within a distance of h/6 from inner corner for the purpose of providing lateral support to cross walls, v,/here 'h' is the story height up to eave level.
- Opening just below roof level be avoided except that two small vents without shutter should be provided in opposite walls to prevent suffocation incase room gets filled with water and people may try to climb up on lofts or pegs.
- Since the failure of any door or window on wind-ward side may lead to adverse uplift pressures under roof, the openings should have strong holdfasts as well as closing/locking arrangement.

9. ***Foundation Design :-***

- The foundation is the part of the house which transfers the weight of the building to the ground. It is essential to construct a suitable foundation for a house as the stability of a building depends primarily on its foundation. Buildings usually have shallow foundation on stiff sandy soil and deep foundations in liquefiable or expansive clayey soils. It is desirable that information about soil type be obtained and estimates of safe bearing capacity made from the available records of past constructions in the area or by proper soil investigation. In addition the following parameters need to be properly accounted in the design of foundation.

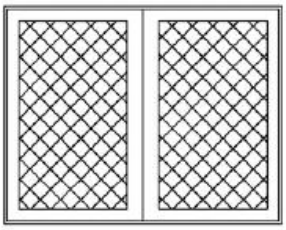
- ***Effect of surge or flooding:-*** Invariably a cyclonic storm is accompanied by torrential rain and tidal surge (in coastal areas) resulting into flooding of the low lying areas. The tidal surge effect diminishes as it travels on shore, which can extend even up to 10 to 15 km. Flooding causes saturation of soil and thus significantly affects the safe bearing capacity of the soil. In flood prone areas, the safe bearing capacity should be taken as half of that for the dry ground. Also the likelihood of any scour due to receding tidal surge needs to be taken into account while deciding on the depth of foundation and the protection works around a raised ground used for locating cyclone shelters or other buildings.



- ***Buildings on stilts:-*** Where a building is constructed on stilts it is necessary that stilts are properly braced in both the principal directions. This will provide stability to the complete building under lateral loads. Knee bracings will be preferable to full diagonal bracing so as not to obstruct the passage of floating debris during storm surge.

10. Glass Panes :-

- As in the modern construction days Glass has a very high importance but in cyclone it plays a negative role to damage the house. Glass windows and doors are, of course, very vulnerable to flying objects and there are many of these in cyclones. The way to reduce this problem is to provide well designed thicker glass panes. Further, recourse may be taken to reduce the panel size to smaller dimensions. Also glass panes can be strengthened by pasting thin film or paper strips. This will help in holding the debris of glass panes from flying in case of breakage. It will also introduce some damping in the glass panels and reduce their vibrations.



Glass protection by adhesive tapes

11. Masonry Walls :-

- All external walls or wall panels must be designed to resist the out of plane wind pressures adequately. The lateral load due to wind is finally resisted either by all walls lying parallel to the lateral force direction (by shear wall action) or by reinforcement concrete frames to which the panel walls must be fixed using appropriate reinforcement concrete at window sill and lintel level.
- For high winds in cyclone prone areas it is found necessary to reinforce the walls by means of reinforced concrete bands and vertical reinforcing bars as for earthquake resistance.