solar · creek · community

a climate driven approach to creating sustainable communities

mthokozisi sibisi
vahin parmananda

multicomfort house
student contest edition 2018

location

- the uae has an immigrant population of over 80%

between tradition & innovation

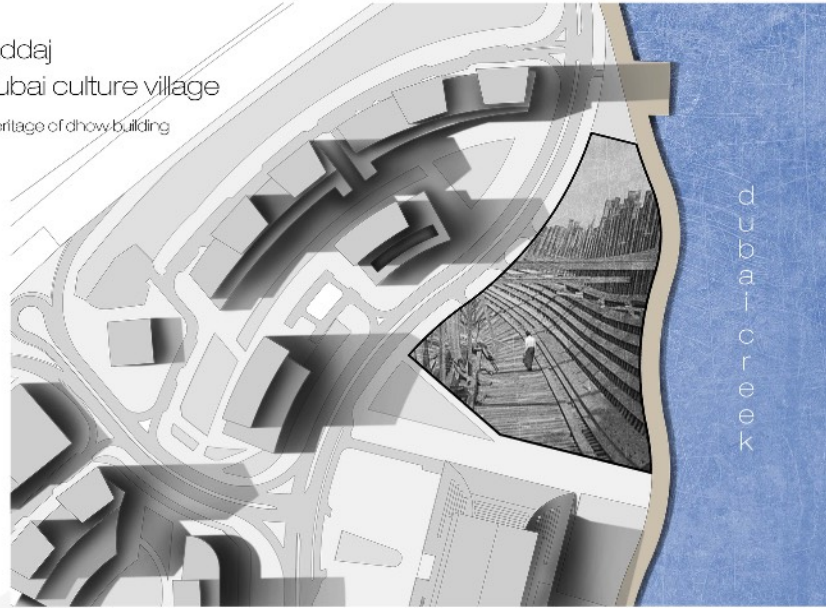
inclusivity

inclusivity through hybridity of form, space & culture

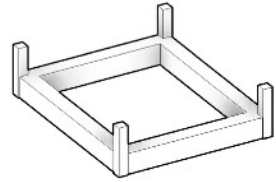
al jaddaj

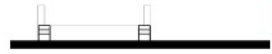
dubai culture village

site heritage of dhow building



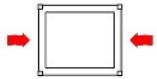
lessons from the vernacular

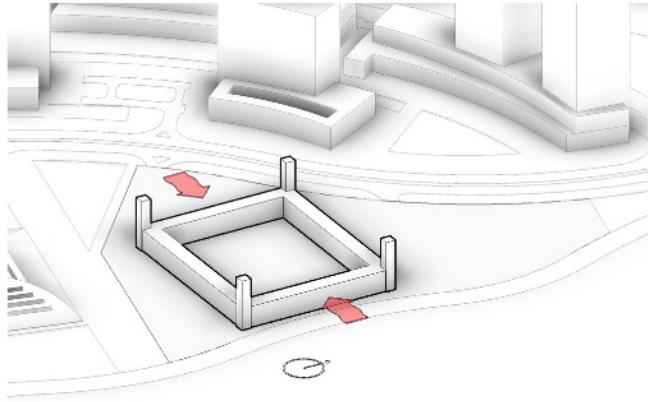




principles & elements | **vernacular**

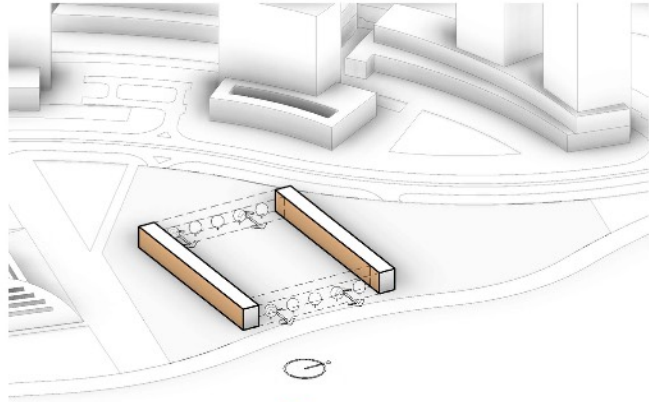
- built form of vernacular architecture
- coutyard spaces
- passive cooling chimneys **[thermal comfort]**
- narrow built form for ventilation & light **[thermal & visual comfort]**

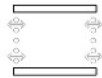




principles & elements | **contextual response**

- harsh light from the east & west axis

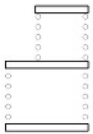


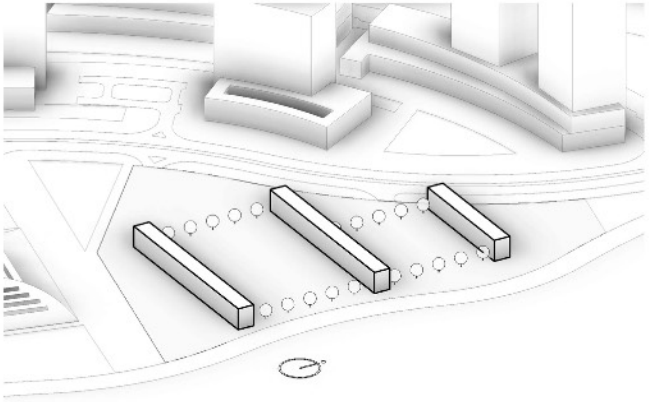


- east & west facing blocks removed & courtyard defined with vegetation
- south facing building maximising natural daylight **[visual comfort]**

principles & elements | **contextual response**

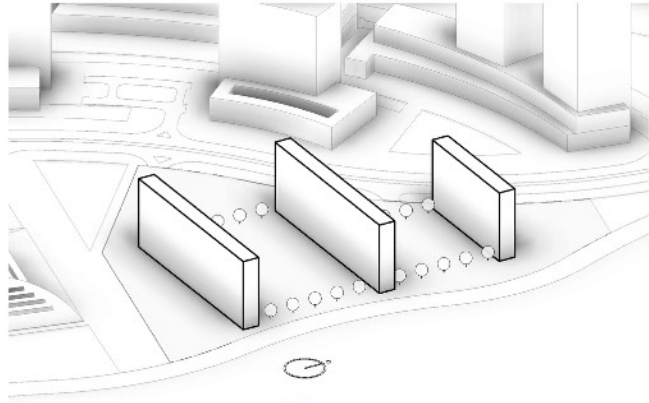
- tree-lined edge permeable **[inclusivity]**

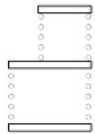




principles & elements | **adaptation for density**

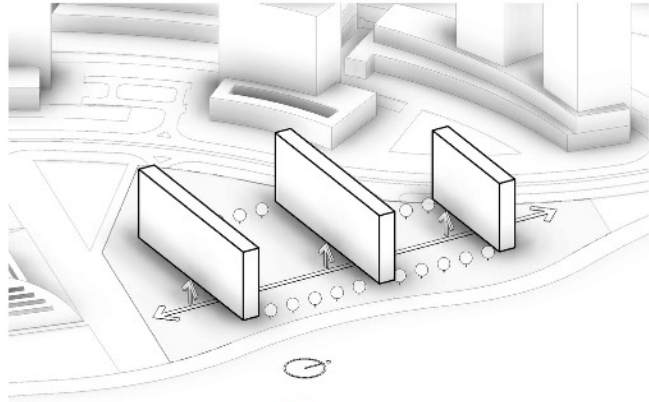
courtyard form adapted & repeated





- mid-rise forms
- 45m height cap respected

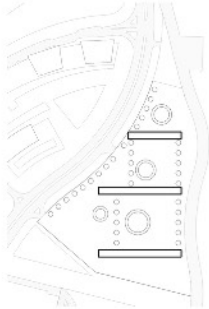
principles & elements | **adaptation for density**

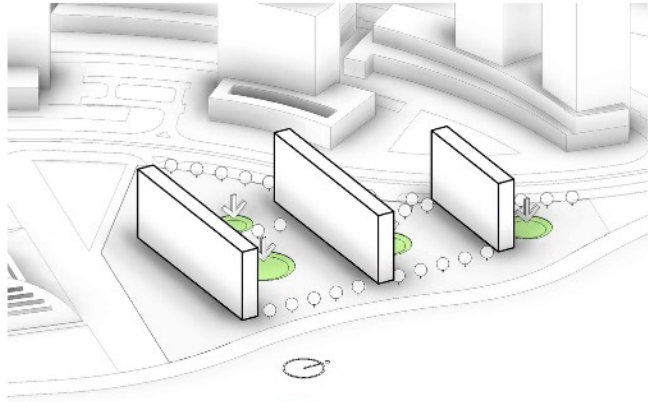


buildings raised to activate ground floor

45m height cap respected

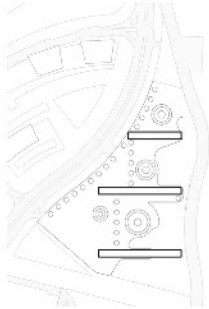
principles & elements | **adaptation for density**

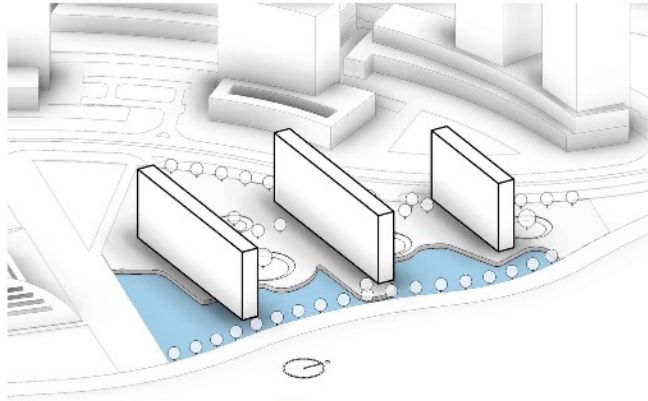




- social spaces encouraging interaction
- tree-lined road edge to act as acoustic barrier **[acoustic comfort]**

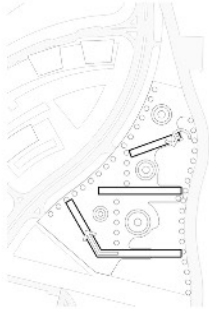
principles & elements | **community**

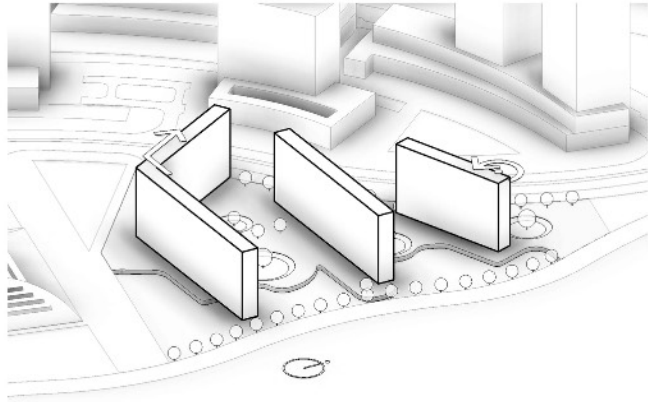




- water from the creek naturally floods into tidal pools on site as the tides rise
- mangrove lined promenade edge
- 2 stage water filtration process
  - naturally via mangroves
  - technologically via desalination plant

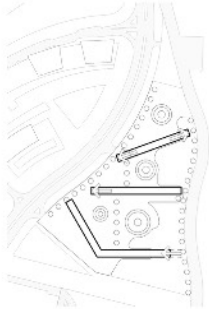
principles & elements | **symbiosis**

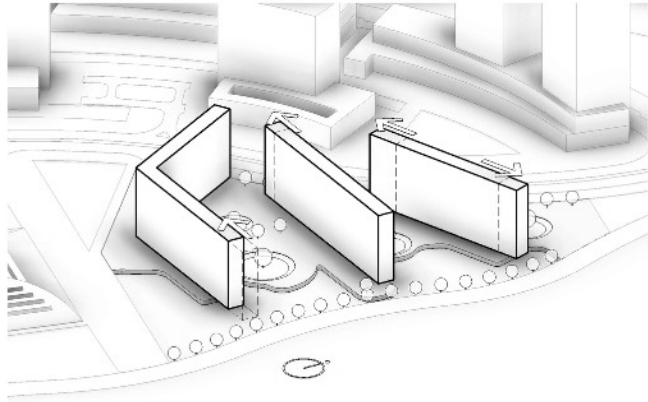


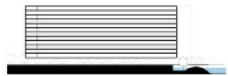


principles & elements | **contextual response**

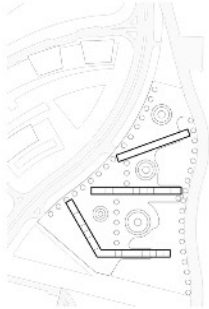
- buildings tilted & rotated for views **[visual comfort]**

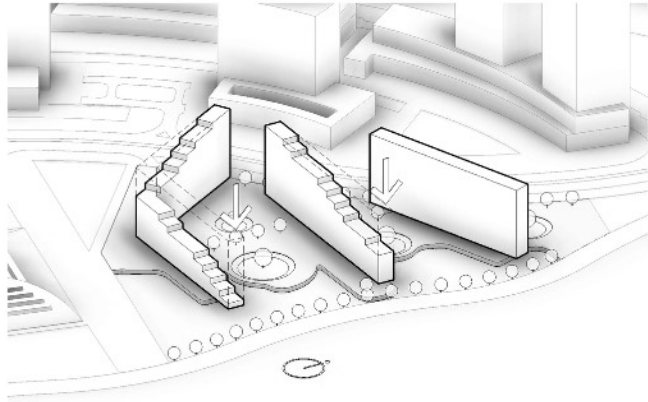


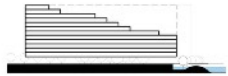


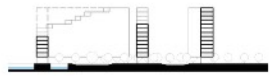


principles & elements | **adaptation for density**



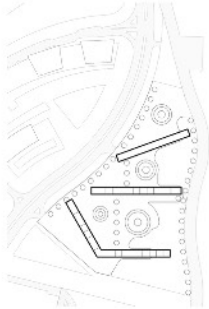


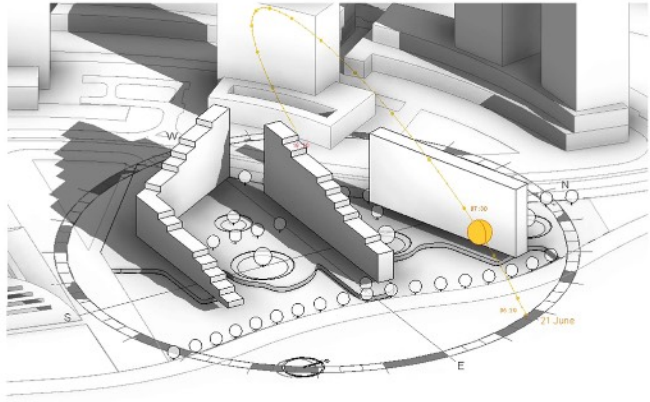


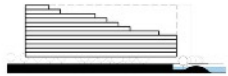


principles & elements | **contextual response**

- buildings stepped to maximize views **[visual comfort]**

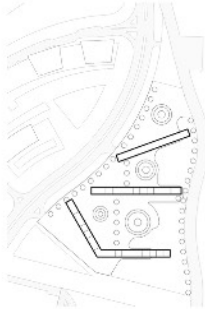


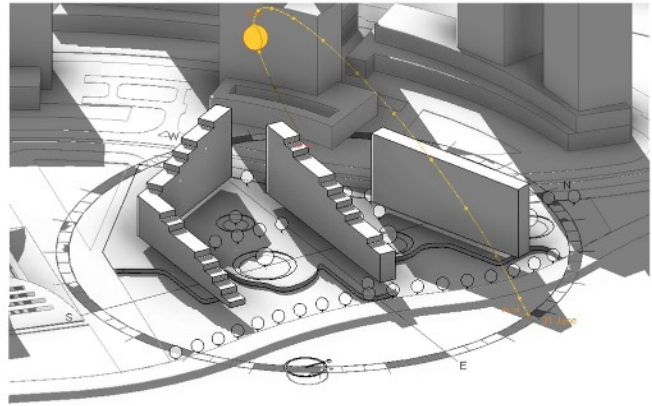


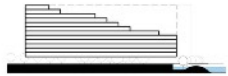


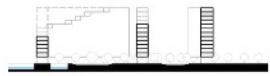
principles & elements | **climatic response**

shadow study **[thermal comfort]**



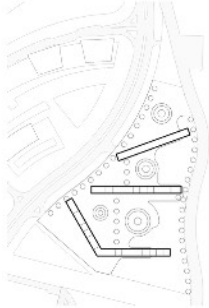


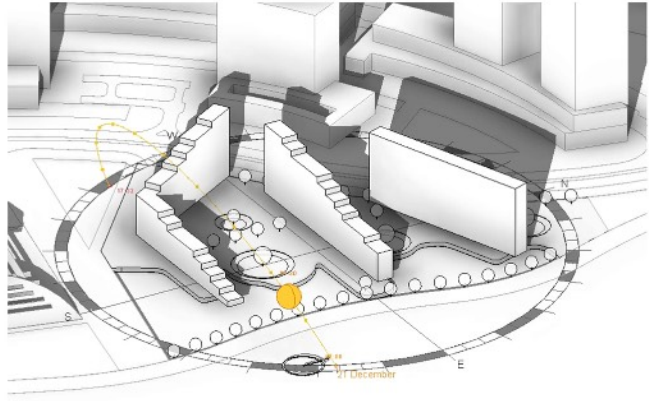


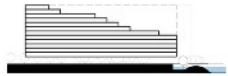


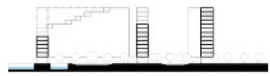
principles & elements | **climatic response**

shadow study **[thermal comfort]**



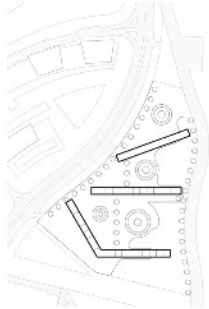


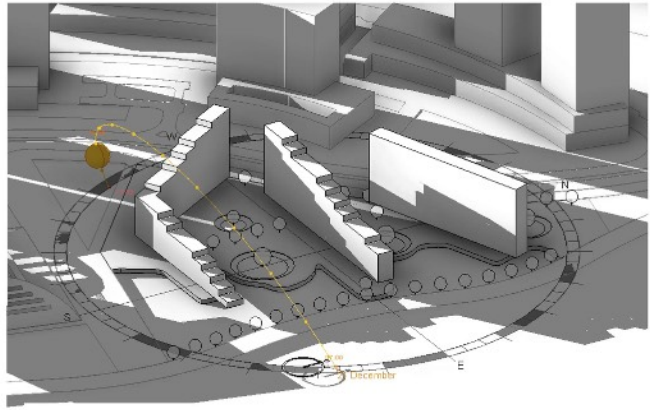


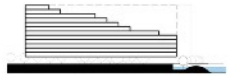


principles & elements | **climatic response**

shadow study **[thermal comfort]**

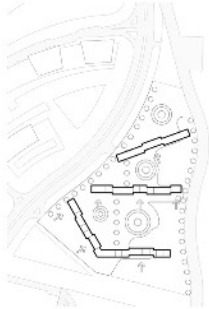


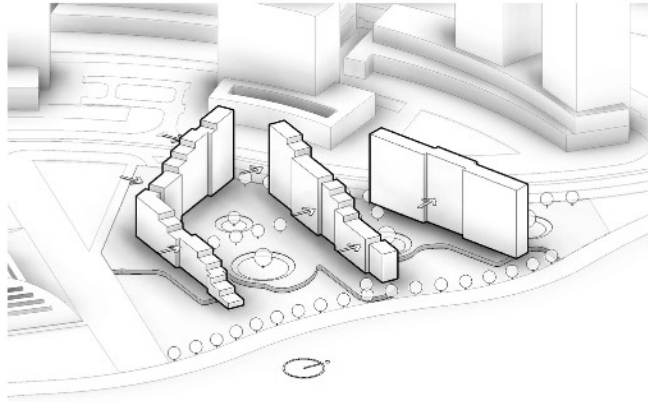


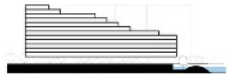


principles & elements | **climatic response**

shadow study **[thermal comfort]**

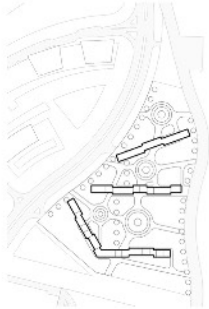


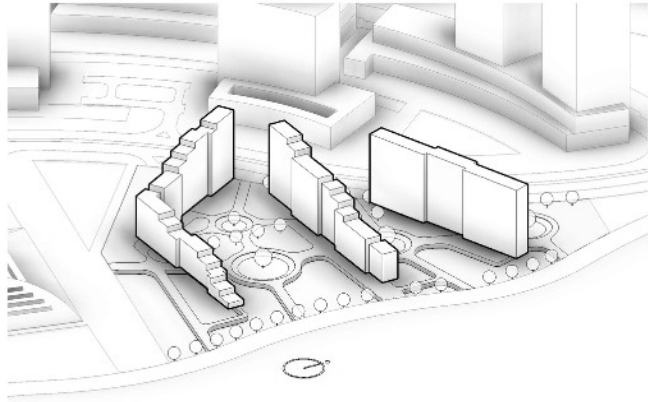


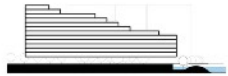


principles & elements | **community**

articulation of form to create space for interaction

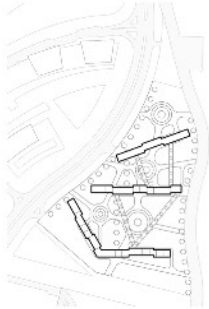


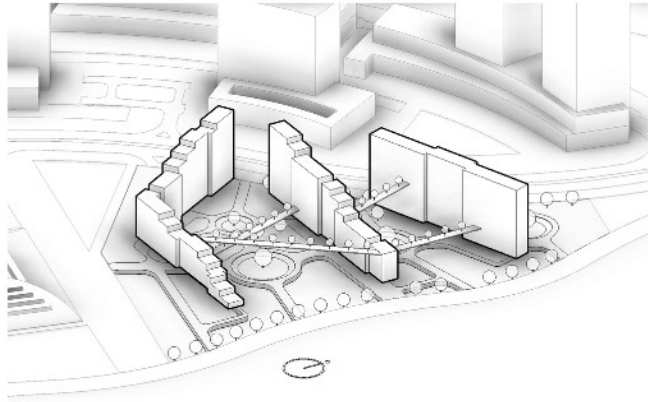


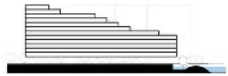


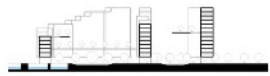
principles & elements | **connectivity**

- network of pathways creating linkages between points of interest / social spaces.



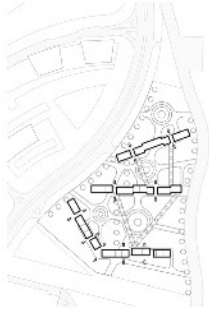


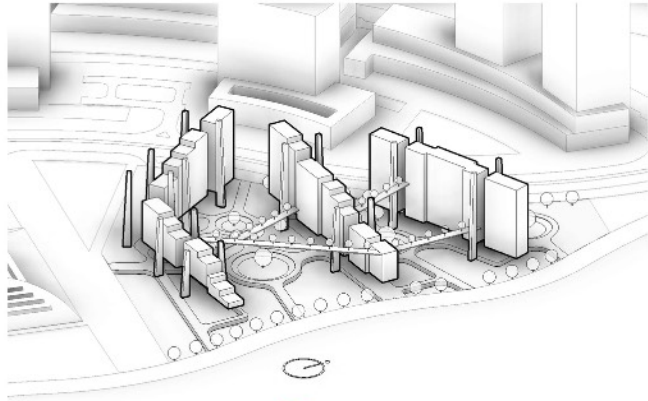


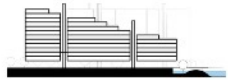


principles & elements | **connectivity**

bridges between buildings linking social spaces.

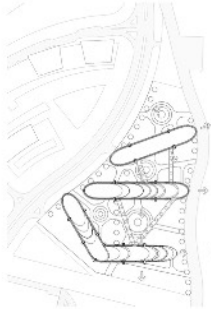


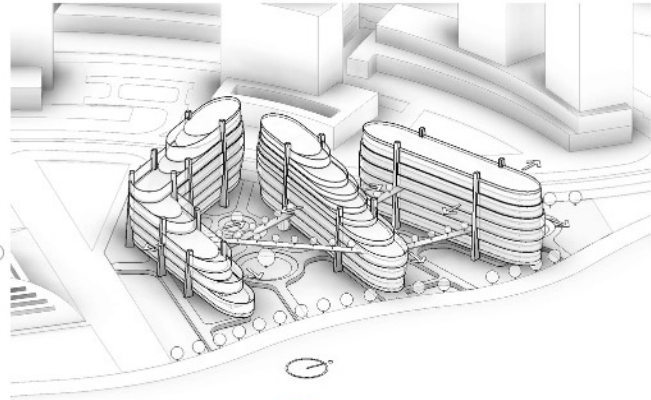


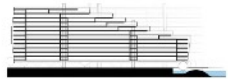


- solar chimney & wind catcher added to increase passive cooling efficacy
  [thermal comfort]
  [indoor air quality]
- spaces between units for connection & interaction

principles & elements | **cooling**







- large balconies define social spaces around residential units
- screens added for shade and create visual link to traditional mashrabiya
- screens articulated

principles & elements | **hybridity**

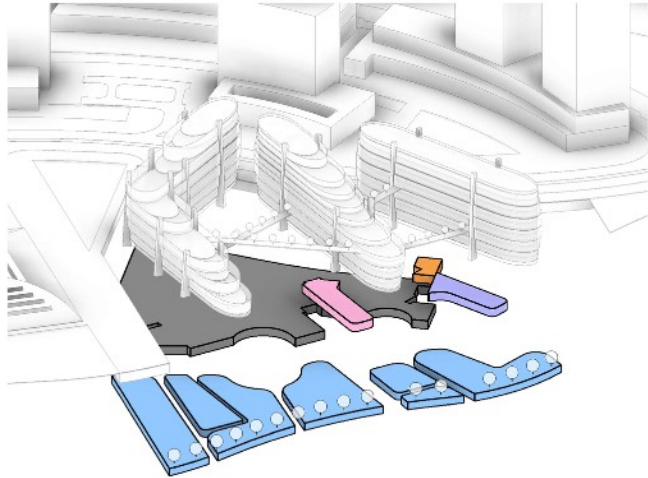
parking

desalination

greywater treatment

solar battery

tidal pools



accommodation | **below ground**

art studio | 192m²

convenience | 207m²

book exchange | 97m²

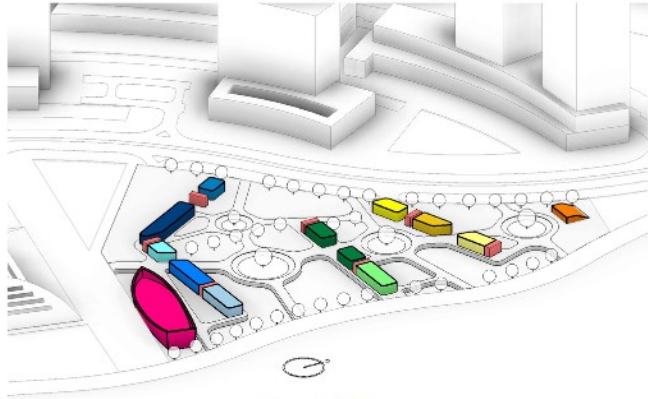
kindergarten | 304m²

gallery | 99m²

yoga studio | 191m²

restaurant | 252m²

dhow museum | 1384m²



132m² | cafe

bakery | 127m²

124m² | pharmacy

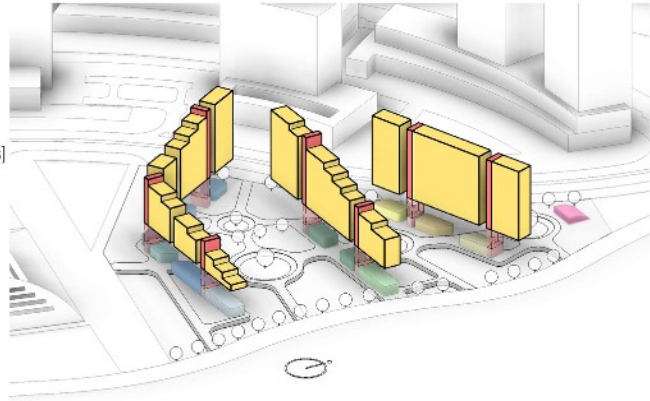
bike rental / juice bar | 97m²

accommodation | ground floor

total retail | 3196m² [12%]

residential [242 units]

vertical circulation



accommodation | **upper floors**

total residential | 23 591m² [88%]

cityscapes

greenscapes

waterscapes

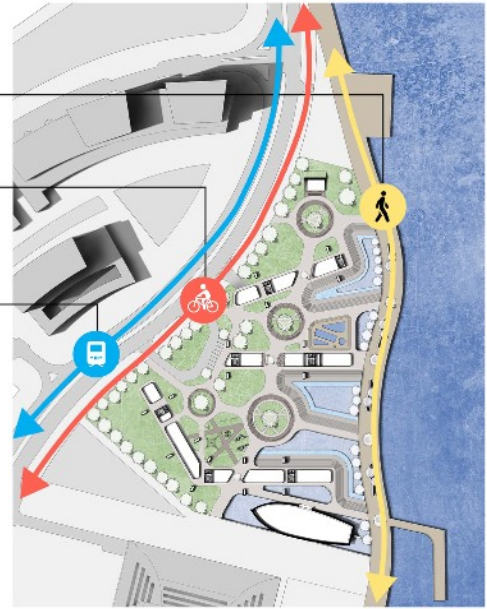
master plan

transitional space

pedestrian access via existing promenade

existing cycle route

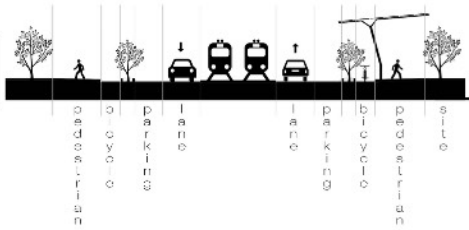
existing tram line



master plan

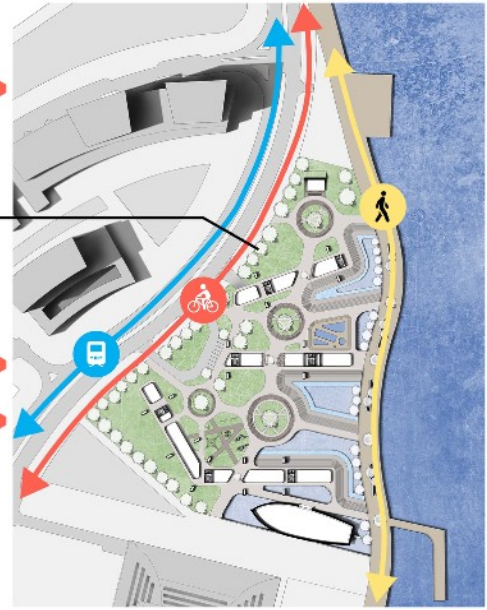
neighbouring traffic

solar panel incorporated shading devices



low emission asphalt to reduce the effect of heat islands from tar used in dubai

narrow road lane widths to promote pedestrianisation of road



master plan

road intervention

sheikh bin rashid library

courtyard gardens

bicycle rental station

master plan

central axis

dhow museum

dhow creek tour

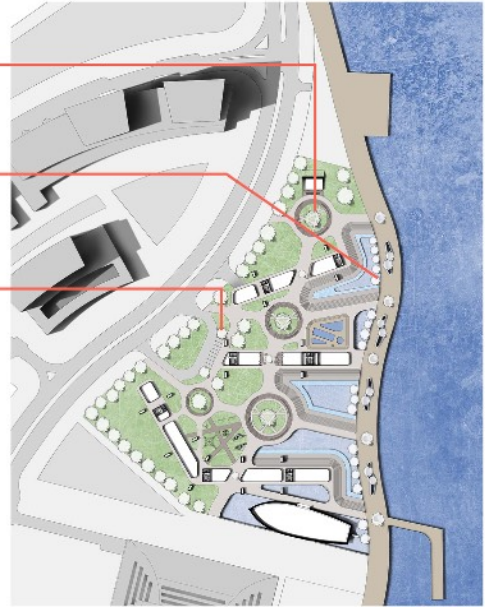
master plan

athle tree used in courtyards
-grows up to 10m
-indigenous
-provides shade

mangroves used in tidal pools
[avicennia marina]
-indigenous
-filters water from creek
-starting point of new ecosystem

palm trees used at entrance
-indigenous
-attracts consumption plant bodies per
cubai green building
regulations 302.01

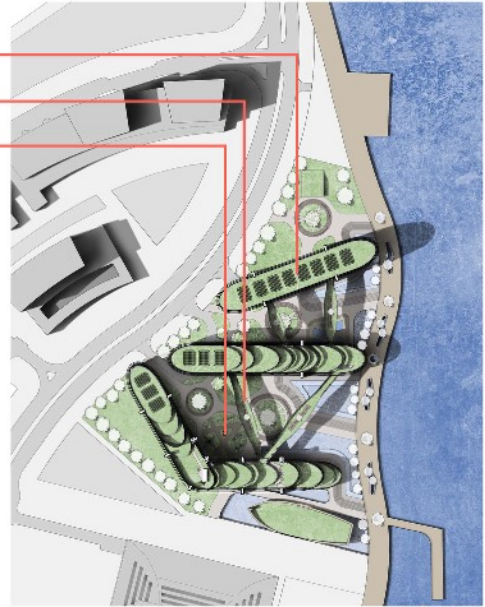
toothbrush tree used for
low-scale shrubbery
-indigenous
-evergreen



master plan

vegetation

- solar panels on roof spaces
- bridges linking social spaces on upper floors
- shaded courtyard spaces



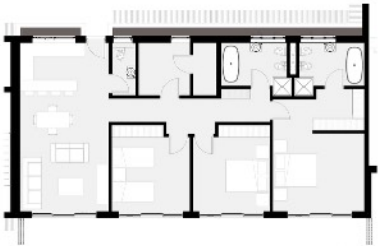
master plan

- roof plan

typical floor layout | **building b**

1 bed

2 bed



3 bed

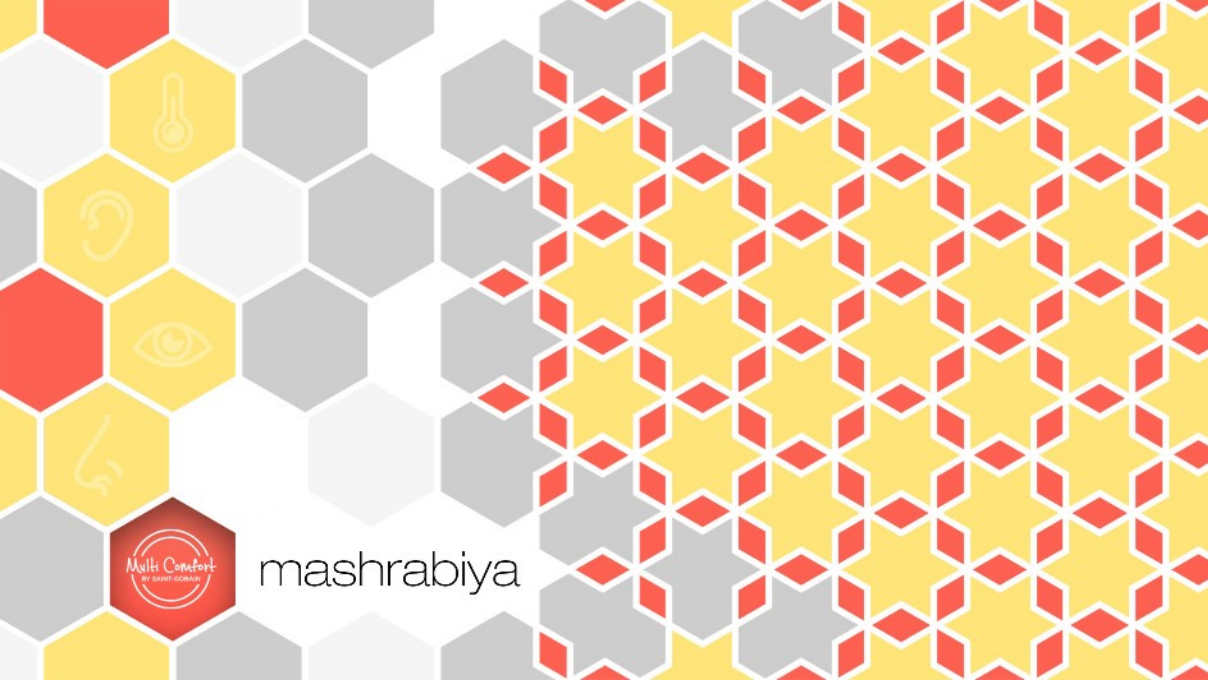
thermal comfort

acoustic comfort

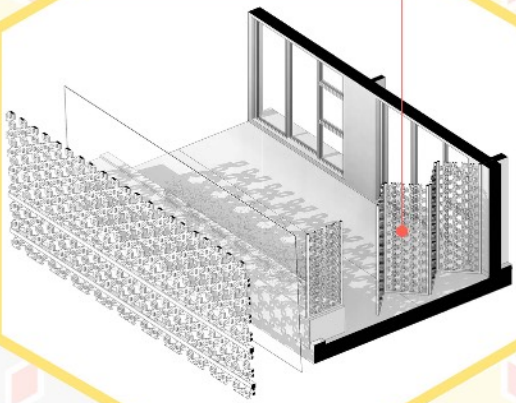
visual comfort

indoor air quality

elements of multicomfort


Multi Confort
BY SAINT-GOBAIN
mashrabiya

- visual link to traditional aesthetic
- shading to cool space and diffuse light
- adjustable screens for flexible space
- sustainably sourced, fast-growing softwood



Multi Confort
BY SAINT-GOBAIN

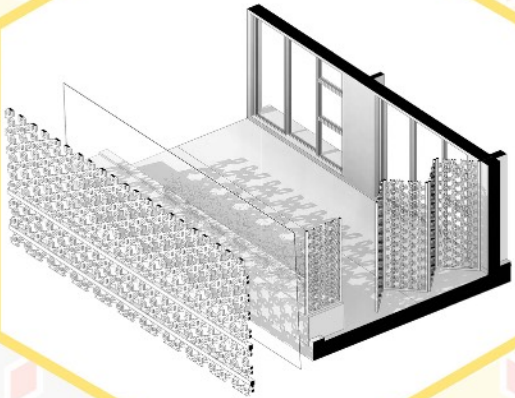
mashrabiya

facade timber to be fire retardant and pressure impregnated according to the UAE fire & life safety code of practice chapter 12 6.5.3

sustainably sourced timber for screens from cradle to cradle gold & platinum certified accoya®

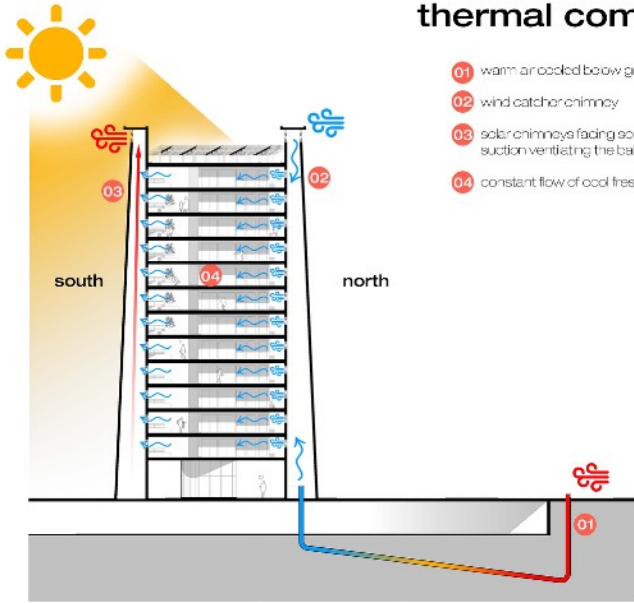
2nd layer of filtration via saint-gobain diamant 8mm glazing.

glazing selected via calumen live online tool



mashrabiya

thermal comfort strategy



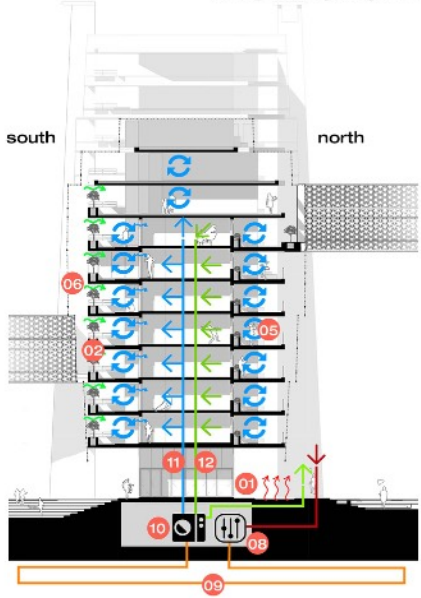
01 warm air cooled below ground

02 wind catcher chimney

03 solar chimneys facing south, air within is heated creating suction ventilating the balcony space

04 constant flow of cool fresh air in space around units

thermal & indoor air quality strategy



01 elimination of ground thermal transmittance by raising residential units above ground

02 shaded private balconies on south side & communal balconies on north

03 passive house certified details used to achieve 0.6V/h air-tightness

04 design temperature 20°C

05 microclimatic cool air pools around units created via solar chimney & wind catcher allow for comfortable natural ventilation tilted windows (33%) 2 hours

06 planted balconies naturally filters air

07 low VOC finishes applied to interior spaces

08 air filter

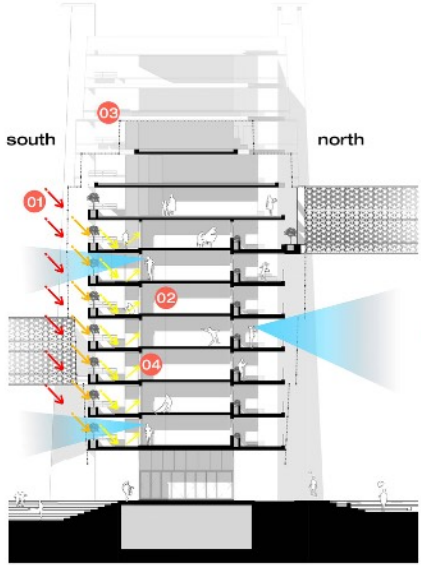
09 ground-coupled heat exchanger to cool air for interior supply

10 fresh air dehumidified & supplied via energy recovery ventilator (erv)

11 fresh air supply

12 exhaust air

visual comfort



01 layers of filtration diffuse harsh light:
- 1. mashrabiya screens
- 2. 8mm saint gobain 8mm glazing
- 3. planted balconies
- 4. hard surface in light cool hues

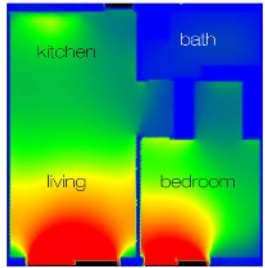
02 units designed to allow natural daylight & views to all living spaces

03 buildings stepped & positioned to all views to the creek for all units

04 sgg climatop triple glazing applied to fenestration:
- light transmittance (TL) 73%
- outdoor reflectance (RLe) 15%
- indoor reflectance (RLi) 15%

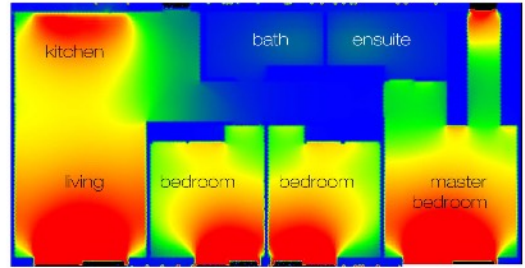
(selected via the saint-gobain calumen live online tool)

CalumenLive



1 bedroom apartment

2 bedroom apartment



3 bedroom apartment

VELUX

500
438
375
313
250
188
126
63

lux

Multi Comfort
BY SAINT-GOBAIN

visual comfort

water strategy

01 water from creek floods tidal pools [2m water level variance respected for tidal change]

02 naturally filtration via mangroves

03 water cooled below ground

04 cooling mist from tidal pools for courtyard thermal comfort

05 reverse osmosis desalination

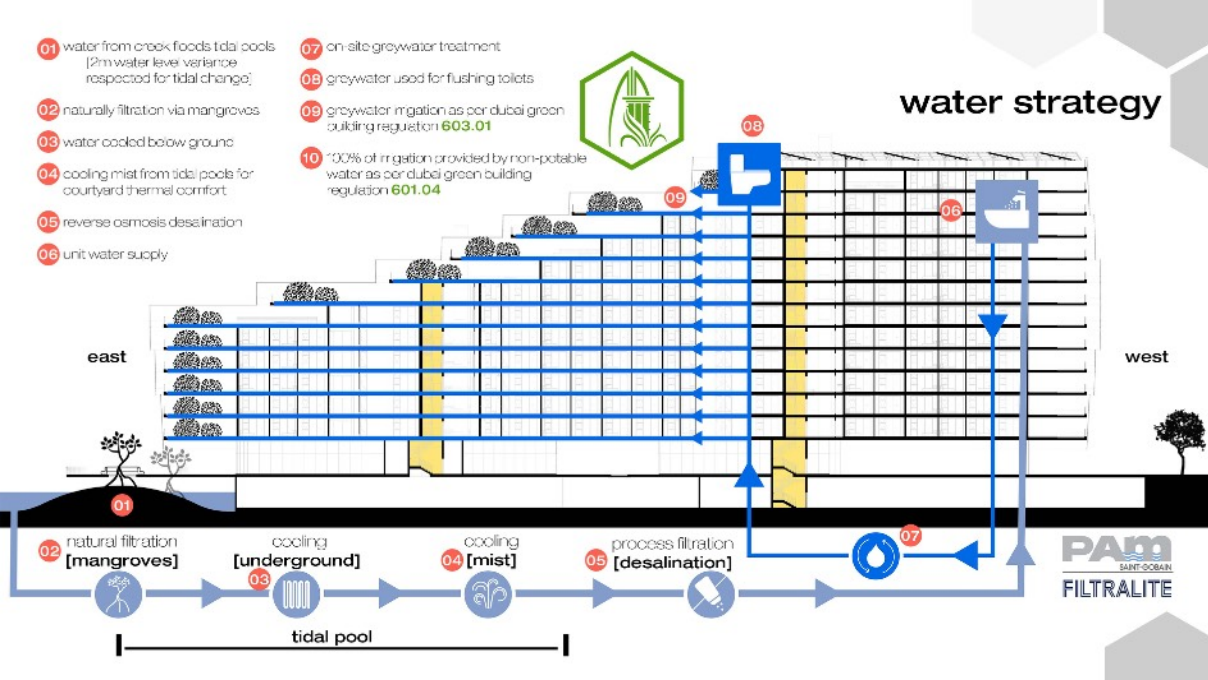
06 unit water supply

07 on-site greywater treatment

08 greywater used for flushing toilets

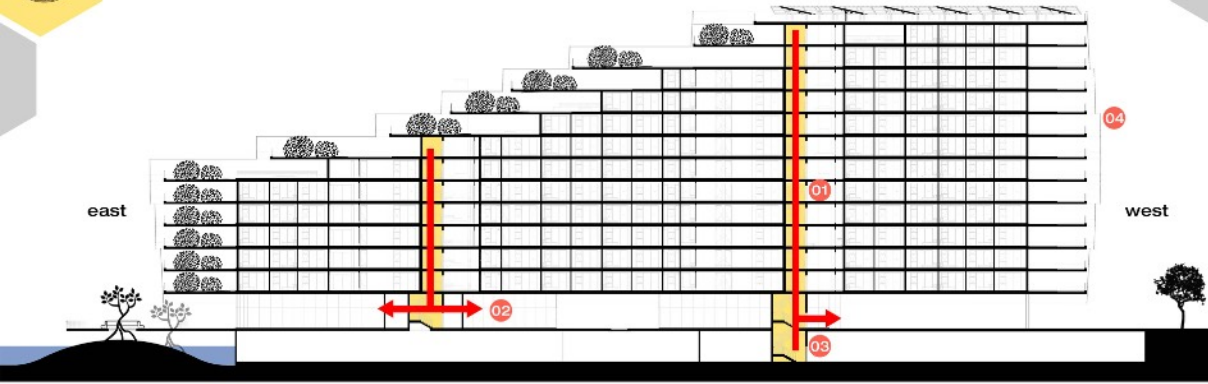
09 greywater irrigation as per dubai green building regulation **603.01**

10 100% of irrigation provided by non-potable water as per dubai green building regulation **601.04**



PAM SAINT-GOBAIN FILTRALITE

fire strategy



01 escape via pressurised smoke proof enclosure as per uae fire & life safety code - **chapter 3 - 5.2.18.2**

02 exits terminate on public courseways as per uae fire & life safety code - **chapter 3 - 6.2.2**

03 basement above floors discharge separated as per uae fire & life safety code - **chapter 3 - 6.5.2**

04 facade timber to be fire retardant and pressure impregnated as per uae fire & life safety code - **chapter 12 - 6.5.3**

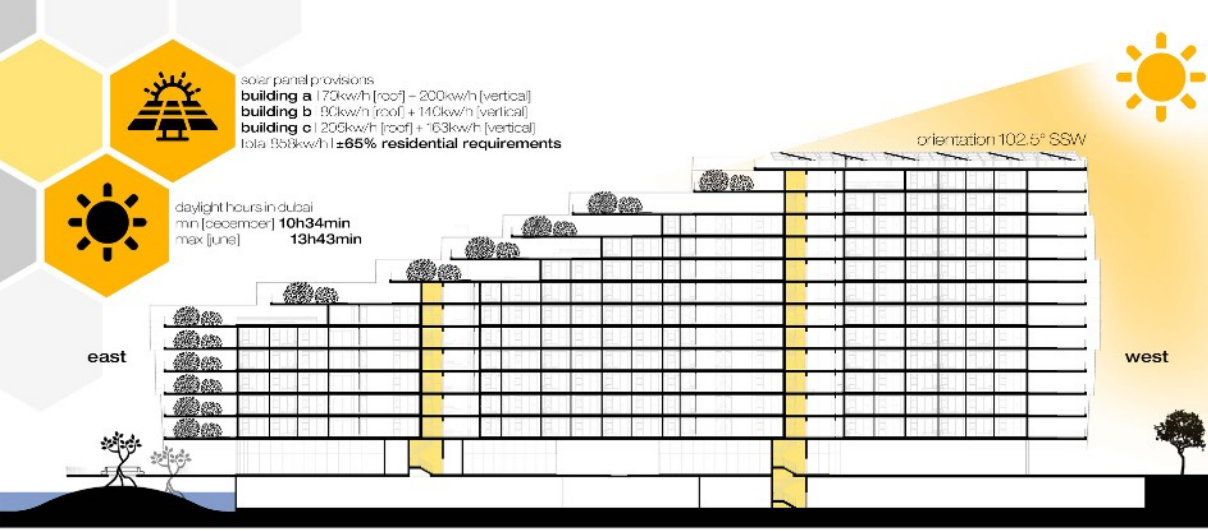
solar panel provisions
building a | 70kw/h [roof] – 200kw/h [vertical]
building b | 90kw/h [roof] + 140kw/h [vertical]
building c | 205kw/h [roof] + 163kw/h [vertical]
tota| 958kw/h | **±65% residential requirements**

daylight hours in dubai
min [decemcer] **10h34min**
max [june] **13h43min**

orientation 102.5° SSW

east

west



solar energy strategy

acoustic strategy

01 between unit airborne sound insulation of **[≥63dB]**
isover mineral wool

02 between unit impact sound insulation of **[≤40dB]**
isover akustik

03 within unit airborne sound insulation of **[≥48dB]**
isover mineral wool

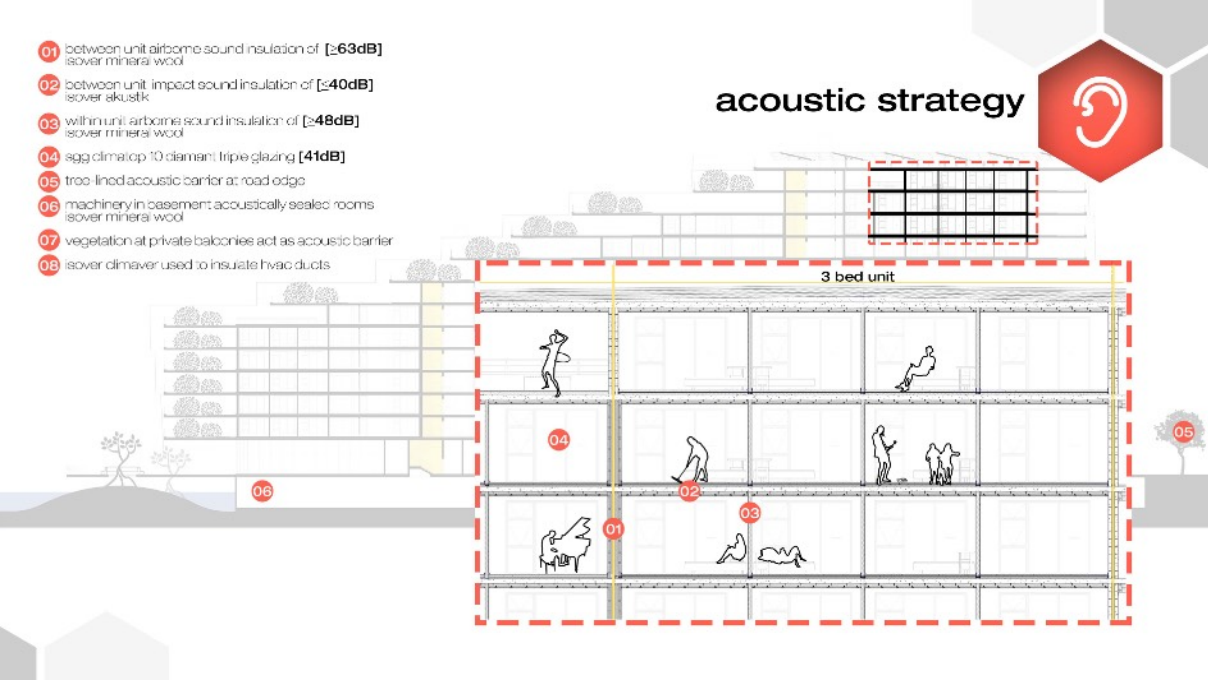
04 sgg climatop 10 diamant triple glazing **[41dB]**

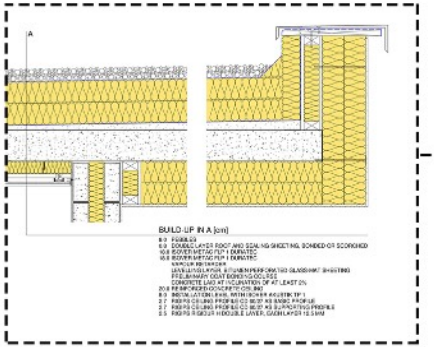
05 tree-lined acoustic carrier at road edge

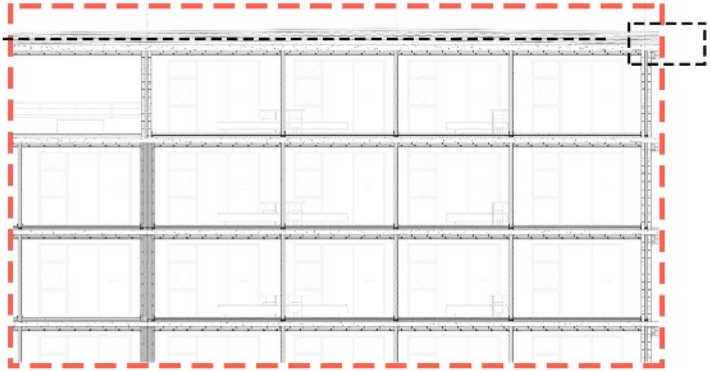
06 machinery in basement acoustically sealed rooms
isover mineral wool

07 vegetation at private balconies act as acoustic barrier

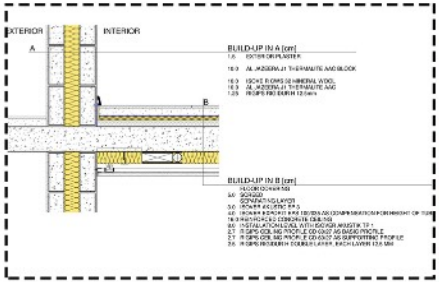
08 isover climavent used to insulate hvac ducts



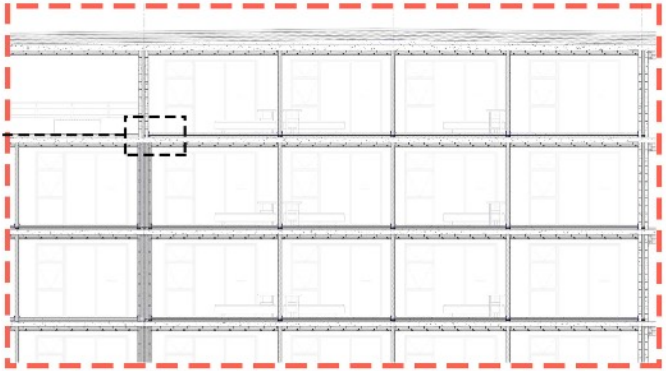

A
BUILD-UP IN A (cm)



technical solutions

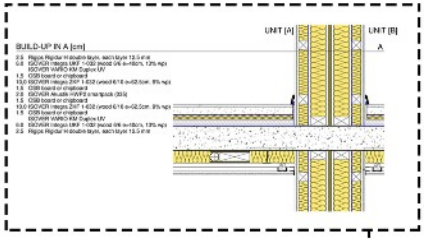


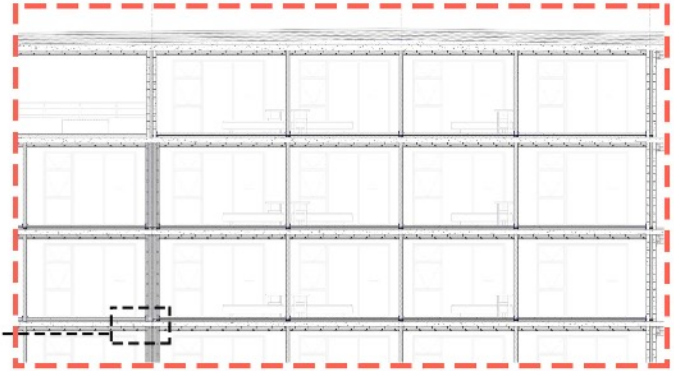
dubai green building regulations
701.06 recycled content
701.07 regional content



ISOVER SAINT-GOBAIN

Rigips SAINT-GOBAIN





ISOVER SAINT-GOBAIN

Rigips SAINT-GOBAIN

a. project data

object:	building b
climate zone:	dubai
construction:	new building
building type:	residential
usage:	for living
design temperature:	20°

b. area input

sum of living area:	125.09m²
sum of heated space volume:	300.22m²
a/v ratio:	0.42
sum of thermal envelope:	701.19m²

c. opaque elements (mean u-values)

roof flat:	0.41
wall against air:	0.2
wall against neighbour:	n/a
slab against unheated cellar:	0.17

d. windows/doors (mean u-values)

windows:	0.55
doors:	0.70

e. quality

air tightness:	0.60
thermal bridge free:	yes

f. shading (standard + summer shading)

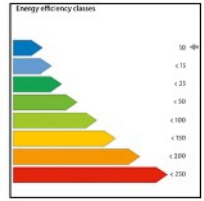
180°:	0.37
270°:	1.00
0°:	1.00
90°:	1.00
horizontal°:	1.00

h. summer ventilation strategy

summer air exchange rate:	0.20
with heat recovery system:	yes
night ventilation:	tilted windows + (33% 2h)
day ventilation:	none

calculations

specific annual heat demand:	0.54
specific annual cooling demand:	13.10
frequency of overheating:	53.13



multicomfort designer