DOMESTIC SOLAR HOT WATER SYSTEM

50% HOME POWER IS CONSUMED BY SOLAR HOT WATER SYSTEM.

AUSTRALIAN CONSUMPTION

29% ELECTRICITY & 13% GAS FOR HOT WATER.

QUEENSLAND

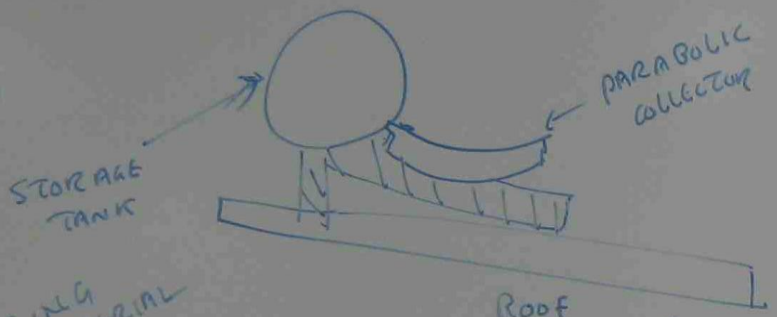
6% ⟶ SPACE HEATING / COOLING
38% ⟶ HOT WATER.

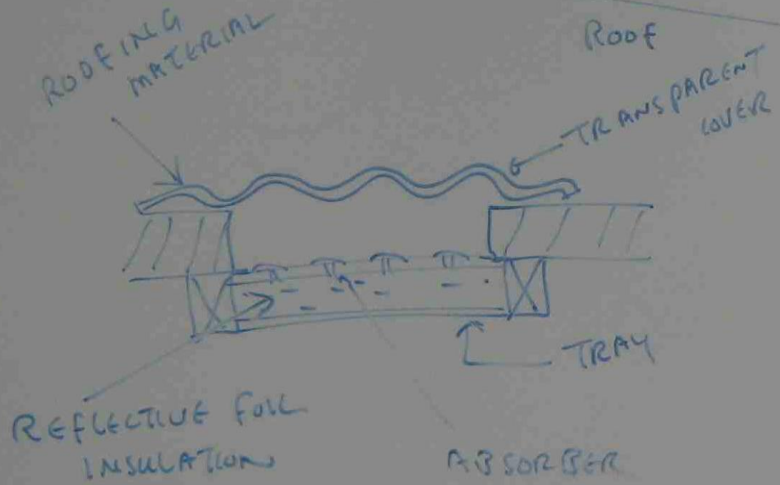
SOLAR HOT WATER SYSTEM

COLLECTOR - MOUNTED ON ROOF OF A HOUSE.
IT INCLUDES STORAGE TANK

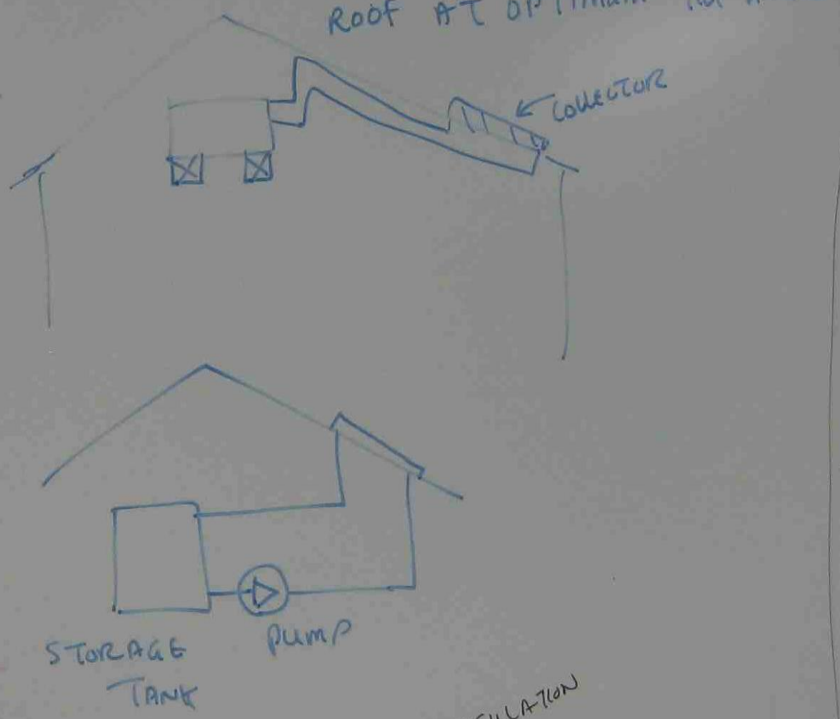
SOLAR RADIATOR - COLLECTOR WITH PARABOLIC SURFACE.
& ABSORBER TUBE.
ABSORB THE SOLAR ENERGY AND
CHANGE THE HEAT TO HEAT
TRANSFER LIQUID

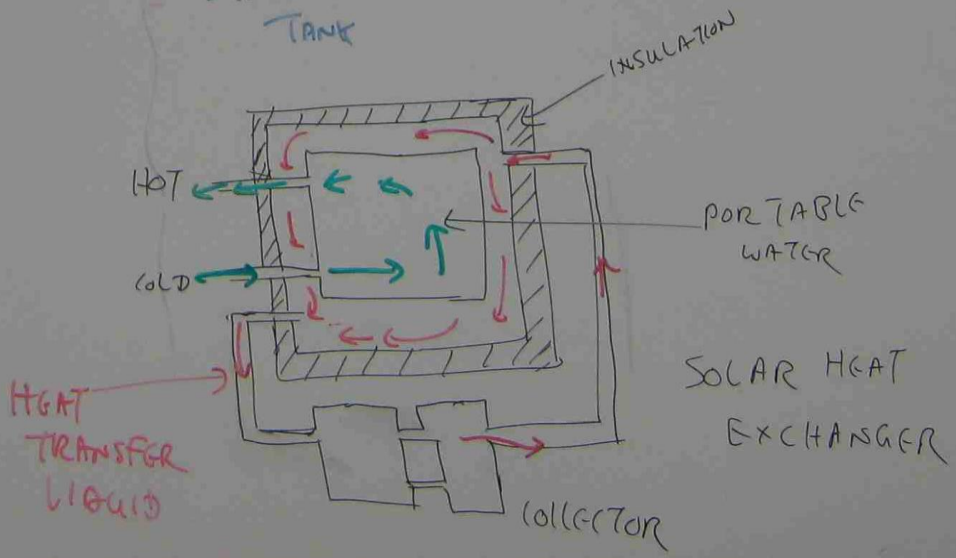
SYSTEM.





THE STRENGTH OF THE ROOF LIMITS THE WEIGHT OF THE WATER TANK.





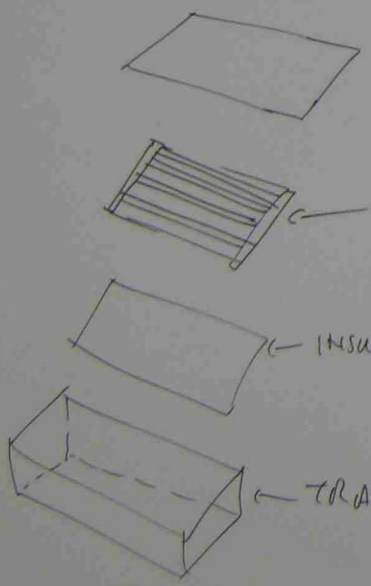
SOLAR HEAT EXCHANGER CONSISTS of SOLAR COLLECTOR, HEAT EXCHANGE CHAMBER AND WATER TANK.

THE SOLAR HEAT IS COLLECTED BY SOLAR COLLECTOR AND IT TRANSFERS THE HEAT TO HEAT TRANSFER LIQUID.

THE HEAT TRANSFER LIQUID HEATS UP WATER TANK.

THE COLD WATER ENTERS THE WATER TANK AND COMES OUT AS HOT WATER. IF AIR IS USED INSTEAD OF WATER, IT WILL BECOME SOLAR SPACE HEATING SYSTEM.

SOLAR ABSORBER CONSTRUCTION

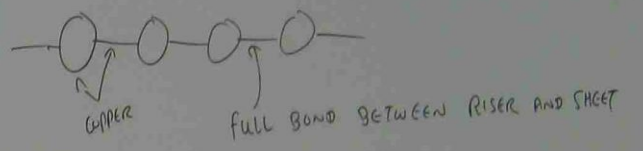


Types of TRANSPARENT MATERIALS

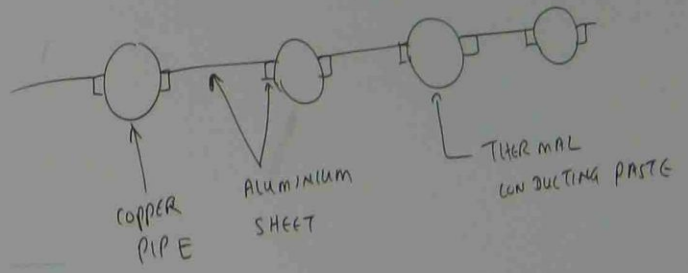
- WINDOW GLASS
- LOW IRON GLASS
- ACYLIC POLYCARBONATE
- POLYSTER
- PVF
- POLY CARBONATE FILM
- TEFLON FILM

CONSTRUCTION of ABSORBER PLATE

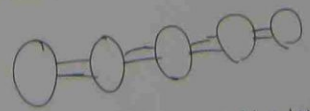
(1) COPPER SHEET, COPPER PIPE



(2) ALUMINIUM SHEET, COPPER PIPE



(3) SANDWICH CONSTRUCTION



Two SHEETS of ALUMINIUM STEEL, COPPER STAINLESS STEEL. BONDED TOGETHER

THEY ARE JOINED BY STEEL WHICH IS DURABLE WITHSTANDING TEMPERATURE UP TO 200°C.

10 → 20% of SUN IS ABSORBED TO PRODUCE ENERGY.

MATERIAL	CONDUCTIVITY $W\,cm^{-1}\,K^{-1}$
COPPER	3.35
ALUMINIUM ALLOY	1.47
MILD STEEL	0.67
STAINLESS STEEL	0.17

COLLECTOR SURFACE COATING

BLACK CHROME. COPPER OXIDE.
COLOURED STAINLESS STEEL.
BLACK PAINT. AMONIUM CHROMATE.

HEAT TRANSFER MEDIUM

HEAT TRANSFER MEDIUM ABSORBS THE HEAT GAINED BY THE COLLECTOR AND TRANSFERRED IT TO THE STORAGE TANK.

WHEN THE COLLECTOR MAY FREEZ. NON WATER LIQUID TO BE USED.

INSULATION

FIBRE GLASS WITH ORGANIC BINDER.
FIBRE GLASS WITH OUT BINDER.
ROCK WOOL.
POLYSTYRENE
UREA FORMALDAHYDE

CAPACITY OF STORAGE TANK

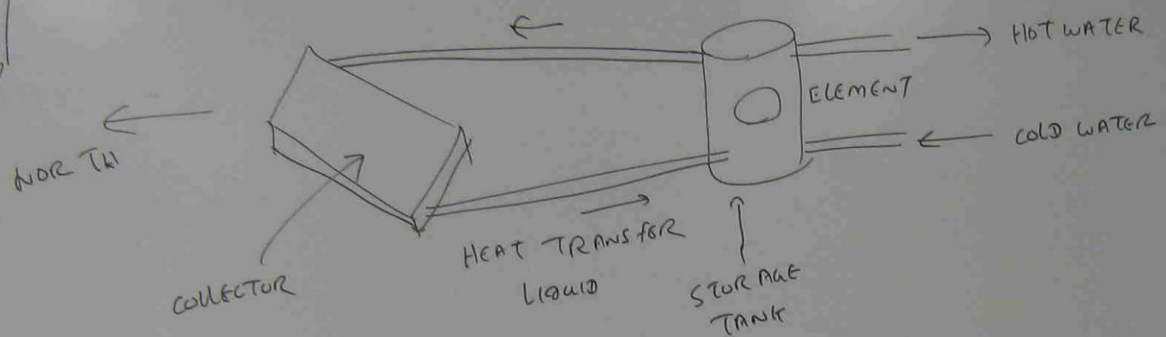
75 LITRE / 1 m^2 COLLECTOR

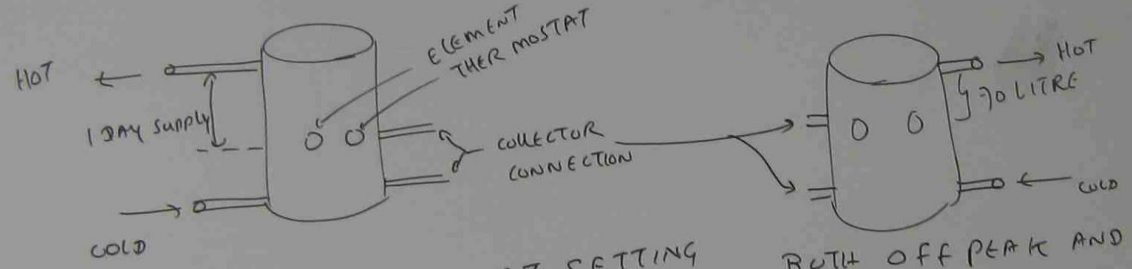
FOR 8 m^2 AREA OF THE COLLECTOR, IT NEEDS 600 LITRE STORAGE TANK

HOT WATER

35 → 45°C FOR BATHING
60°C FOR WASHING

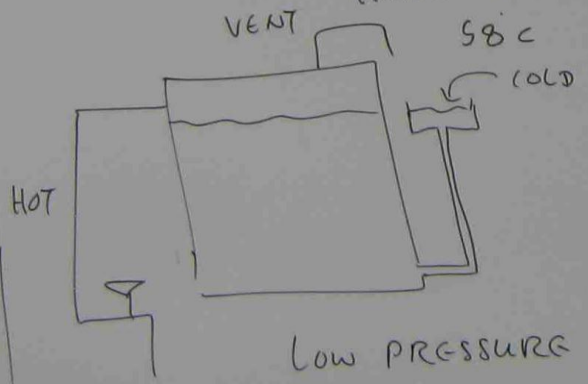
CONNECTION OF COLLECTOR AND STORAGE TANK





THERMOSTAT SETTING

BOTH OFF PEAK AND CONTINUOUS BOOSTING



LOW PRESSURE HEADER TANK SYSTEM.

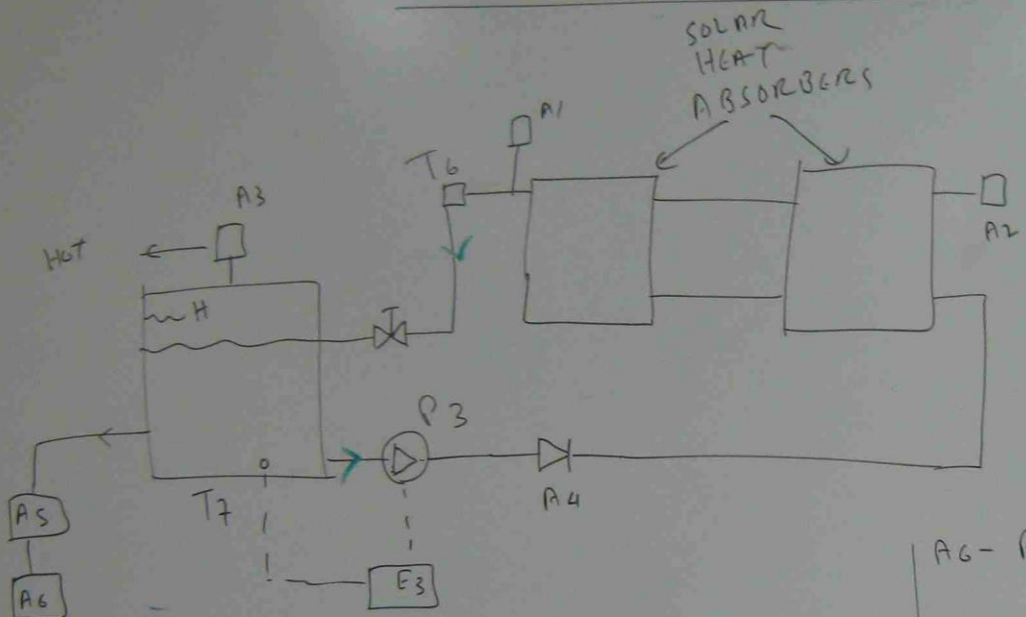
LOCATION OF STORAGE TANK

CLOSE COUPLED SYSTEM – TANK IS IMMEDIATELY ABOVE THE COLLECTOR

VERTICAL TANK – AT LEAST 300 mm ABOVE COLLECTOR

PUMP SYSTEM – ANY LOCATION.

HYDRAULIC CIRCUIT of SOLAR WATER HEATING SYSTEM



T_6 - WATER INLET TEMPERATURE

T_7 - WATER OUTLET TEMPERATURE

A_1 - AUTOMATIC AIR VENT

A_2 - TEMPERATURE

A_3 - PRESSURE RELEASE VALVE

A_4 - NON RETURN VALVE

A_5 | A_6 - COMBINATION of STRAINER STOP COCK.

A_6 - PRESSURE REDUCING VALVE

E_3 - ELECTRIC PUMP CONTROLLER

H - AUXILIARY HEATER

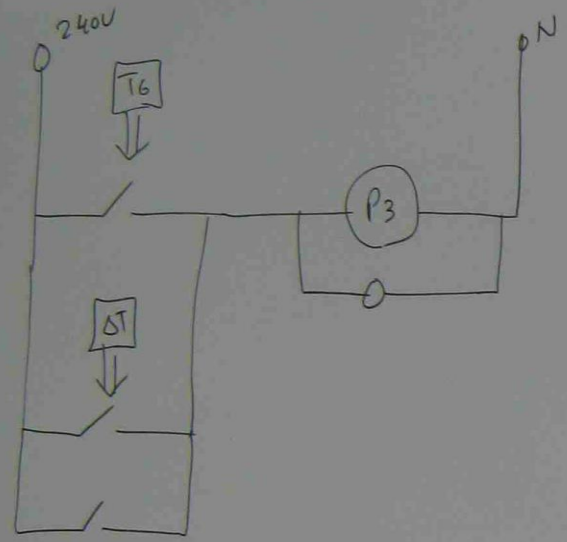
P_3 - COLLECTOR CIRCUIT PUMP

$T_6 < 3^{\circ}c \rightarrow P_3$ ON

$3^{\circ}c < T_6 < T_7 + 3^{\circ}c \rightarrow P_3$ OFF

$T_6 > T_7 + 3^{\circ}c \rightarrow P_3$ ON

ELECTRICAL CIRCUIT



MANUAL SWITCH

T6 ⇓ CONTROL ON T_6 COLLECTOR TEMPERATURE

IF $T_6 < 3^{\circ}C$ CIRCUIT CLOSED

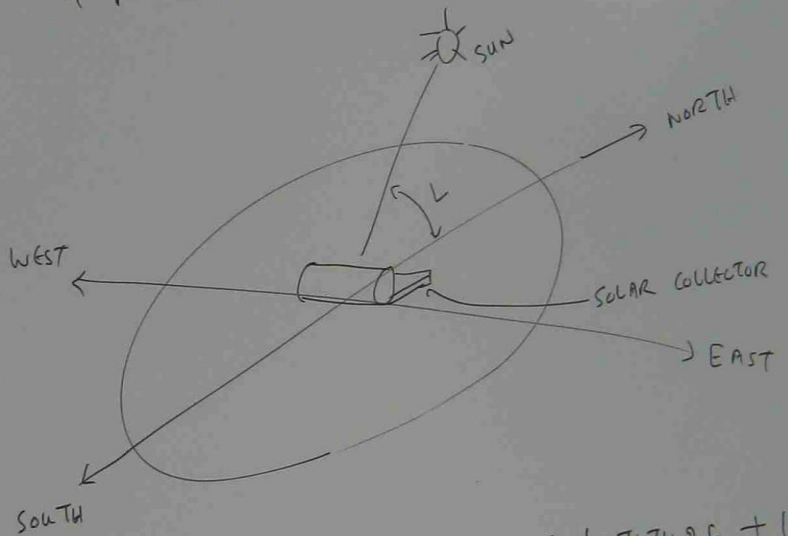
⟨FROST PROTECTION⟩

$T_6 > T_7 + 3^{\circ}C$ CIRCUIT CLOSED

ff

SIZING

4 PERSONS FAMILY NEEDS 180 LITRE DAILY



L = TILT ANGLE OF LATITUDE + 15 SHOULD BE USED.

VARIATION BETWEEN TRUE NORTH AND MAGNETIC NORTH

$4^{\circ} \longrightarrow 12^{\circ}$

ROOF PITCH $15^{\circ} \longrightarrow 22^{\circ}$

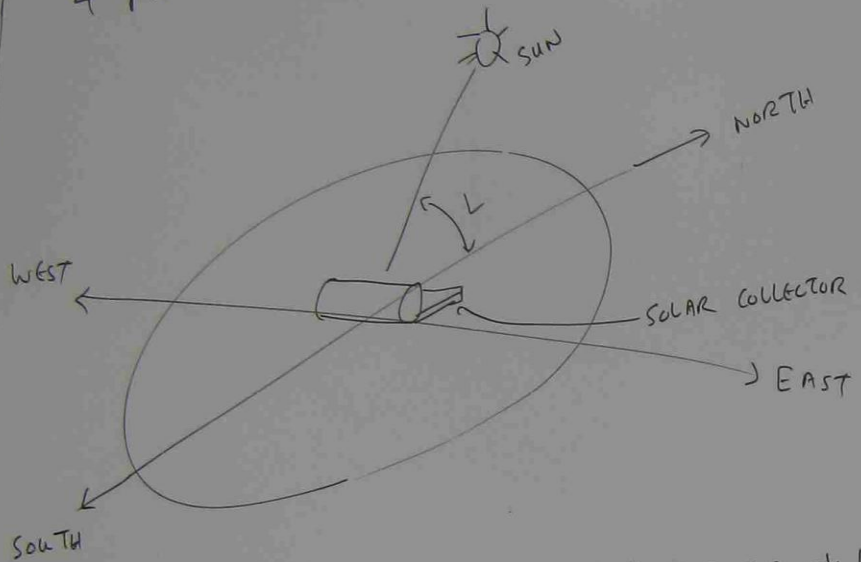
FOR ORIENTATION IS GREATER THAN 60° FROM TRUE NORTH

TILT ANGLE OF NO MORE THAN L − 20 AND NEVER

MORE THAN 20° SHOULD BE USED.

SIZING

4 PERSONS FAMILY NEEDS 180 LITRE DAILY



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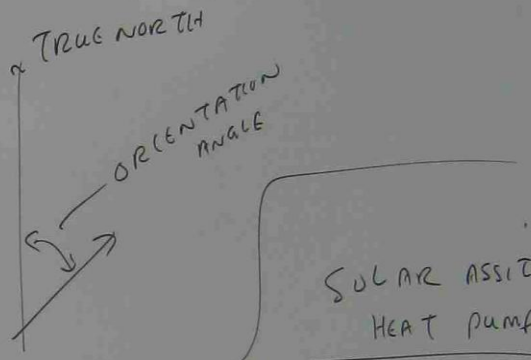
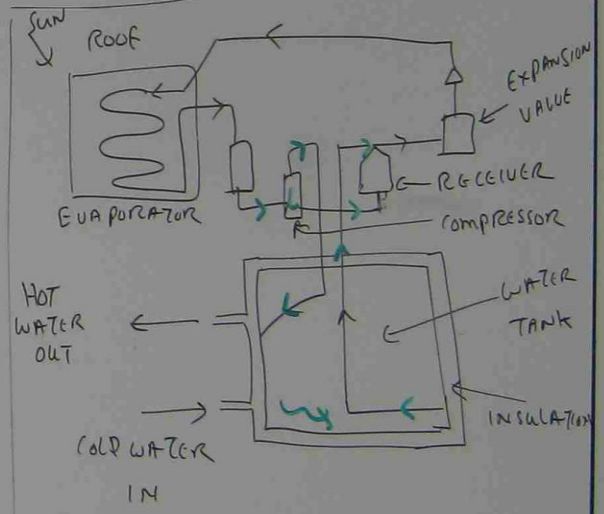


SOLAR ASSITED HEAT PUMP



LIST OF AUSTRALIAN STANDARDS FOR SOLAR WATER HEATING SYSTEM

AS 1056	STORAGE WATER HEATER
AS 3500.4	PLUMBING / DRIANGE
AS 2712	SOLAR WATER HEATER
AS 2535	SOLAR COLLECTOR
AS 2813	SOLAR WATER HEATER TEST FOR THERMAL PERFORMANCE
AS 2984 -	SOLAR WATER HEATER OUT DOOR TEST

LIGHTING MANAGEMENT FOR COMMERCIAL BUILDING

ALL LIGHTING INSTALLATIONS MUST BE DESIGNED PRIMARILY FOR THE OCCUPANTS' COMFORT AND TASK EFFICIENCY.

THE ENERGY CONSERVATION IS TO BE PROVIDED.

HUMAN EYE

LEAST SENSITIVE TO YELLOW / GREEN

MOST SENSITIVE TO RED / VIOLET

GLARE CONTROL

BADLY DESIGNED LIGHTING INSTALLATION CAN CAUSE DISCOMFORT TO OCCUPANTS.

THE SOURCES OF DISCOMFORT

- DIRECT GLARE
- REFLECTIVE GLARE
- VEILING REFLECTION