

nZEB OFFICE RETROFIT PROJECT

Final Design Submission

LIBERTY HALL OFFICE, DUBLIN 1

DRG-165/11

Desmond Rea O'Kelly Drawing

Archiseek.com
From Archiseek.com

Building-of-Liberty-Hall From The National Photographic Library

Hugh Doran 1965

Broadsheets.ie

TYPICAL SECTION THROUGH THE EXISTING FABRIC - SCALE 1:20

LINEAR THERMAL BRIDGE WITH TEMPERATURES INDICATED

BER RATING USING SBEM

EXISTING OFFICE PLAN - DESIGNBUILDER

EXISTING OFFICE EXTERIOR - DESIGNBUILDER

TEMPERATURE CURVES - WINTER TEMPERATURES

TEMPERATURE CURVES - SUMMER TEMPERATURES

HEATING BREAKDOWN SHOWING HIGH LEVELS OF SENSIBLE HEATING

LARGE HEAT LOSS THROUGH GLAZING, WALLS AND INFILTRATION

FUEL LOADING

SIMULATION

SITE PLAN - SITE OUTLINED IN RED

TYPICAL OFFICE FLOOR PLAN - SCALE 1:100

PV PANELS ON SOUTH, EAST AND WEST FACING ROOF SURFACES AND ON VERTICAL SHADING PROVIDE 8200KWH OF PRIMARY ENERGY

ANALYSIS

VERTICAL AND HORIZONTAL SHADING AT WINDOW HEAD LEVEL CONTROLLING OVER HEATING - SUSPENDED MECHANICAL AND ELECTRICAL SERVICES - OFFICE LAYOUT

MECHANICAL VENTILATION & LIGHTING LAYOUT - SCALE 1:100

EAST FACADE

HVAC, LIGHTING, DATA AND ELECTRICAL SUPPLY SUSPENDED FROM EXPOSED CEILING JOIST STRUCTURE FOR THERMAL MASS

MECHANICAL SYSTEM DIAGRAM - VARIABLE AIR VOLUME WITH HEAT RECOVERY, OUTSIDE AIR RESET AND MIXED MODE

DESIGNBUILDER MODEL FOR DYNAMIC SIMULATION OF THE BUILDING LAYOUT AND FACADE

THERMAL BRIDGE MODEL TO ASSESS R_{th} VALUES A VALUE ABOVE 0.71 IS REQUIRED FOR BUILDING REGULATION COMPLIANCE

CORNER JUNCTION TO NORTH WALL

CORNER JUNCTION TO EAST, SOUTH AND WEST WALLS

WALL AND FLOOR AT JUNCTION TO NORTH WALL

WALL AND FLOOR AT JUNCTION TO EAST, SOUTH AND WEST WALLS

FACTOR MODELS FOR BUILDING CALCULATIONS AND Y FACTOR Y FACTOR IS REDUCED TO 0.7 WITH EXTERNAL INSULATION

FABRIC HEAT LOSS SHOWING REDUCED LEVELS WITH TRIPLE GLAZING AND INSULATED WALLS

HEAT GAINS REDUCED FROM EQUIPMENT AND LIGHTING

COOLING THROUGH VENTILATION SHOWING LEVELS OF VENT PURGING OVER NIGHT - REDUCED INFILTRATION

EFFECTS OF THERMAL MASS THROUGH EXPOSED CONCRETE FLOOR AND WALLS

SMOOTH INTERNAL TEMPERATURE CURVES - 4 DEGREES EXTERNAL TEMP

SMOOTH INTERNAL TEMPERATURE CURVES - 24 DEGREES EXTERNAL TEMP

HEATING BREAKDOWN SHOWING REDUCED SENSIBLE HEATING AND NEW HEAT RECOVERY

COOLING BREAKDOWN

FUEL LOADING

SYSTEM LOADS

NO OVER HEATING NO COLD PERIODS

CO2 EMISSIONS

RETROFIT

SOUTH FACADE WITH SOLAR SHADING INCLUDING VERTICAL PHOTO VOLTAINIC PANELS TO SOUTH EAST & WEST CORNER PANELS

SOUTH FACADE

BuildDesk U
DesignBuilder SOFTWARE
AUTODESK REVIT

F RETROFIT STRATEGY F.3 F.9

BUILDING LAYOUT UPGRADE WITH NEW STAIRS AND SANITARY INSTALLATION TO PROVIDE COMPLIANCE WITH BUILDING REGULATIONS TODAY AND TOMORROW.

BUILDING FABRIC RETROFIT OF DOWN EXTERNAL INSULATION APPLIED TO THE EXTERNAL FACE OF THE EXISTING CONSTRUCTION TO REDUCE HEAT LOSS AS WELL AS IMPROVE AIRTIGHTNESS TO INCREASE AIRTIGHTNESS TO 2.0 ACH30. AIRTIGHTNESS LEVELS RELATED TO UNLITTED CURTAIN WALL INSTALLATION WHICH TYPICALLY MEETS 2.0 ACH30.

GLAZING IS MAINTAINED TO PROVIDE A SUFFICIENT LEVEL OF DAYLIGHTING TO THE INTERIOR.

LIMITED CURTAIN WALLS WITH TRIPLE GLAZING IN THERMALLY BROKEN FRAMEWORKS. NEW CURTAIN WALLS TO BE INSTALLED WITH TRIPLE GLAZING. SYSTEM ALLOWS QUICK INSTALLATION TO THE BUILDING FACADE. THERE ARE OPENINGS AT THE BOTTOM OF THE CURTAIN WALLS FOR NATURAL VENTILATION. THE BUILDING MANAGEMENT SYSTEM IS CONTROLLED BY A BUILDING MANAGEMENT SYSTEM BASED ON OCCUPANCY AND WEATHER. THESE WINDOWS ARE USED FOR POSSIBLE NIGHT PURGE VENTILATION DURING THE DAYTIME.

SOLAR SHADING INTEGRATED WITH ANTI-CURTAIN WALL SYSTEM TO PROVIDE REDUCED SOLAR HEAT GAIN TO THE BUILDING INTERIOR.

NATURAL VENTILATION PRINCIPLES PROPOSED TO BE USED IN TANDER WITH A MECHANICAL HEATING AND COOLING SYSTEM. A VAV (VARIABLE AIR VOLUME) SYSTEM IS PROPOSED WITH HEAT RECOVERY, OUTSIDE AIR RECOVERY AND MIXED MODE.

SERVICES TO BE WITH RENEWABLE HEAT RECOVERY AND AIR TO WATER HEAT PUMPS WITH COP OF 4 FOR HEATING AND 3 FOR COOLING.

ALL SERVICES ARE PROPOSED TO BE SUSPENDED FROM THE EXPOSED CONCRETE CEILING. THE CEILING IS EXPOSED FOR THERMAL MASS TO REGULATE HEATING CONTROL. IN THE BUILDING ALL NEW CONSTRUCTION IS SOLID AND UNPERFORATED.

LIGHTING DESIGN IS LOW ENERGY LED LIGHTING WITH SPECIFIC CONTROL, INCLUDING BOTH AN AUTO DETECTOR AND LIGHTING STEPPED LIGHTING AND ADAPTIVE ACTINATION AND TRANSFORMATION.

OFFICE RETROFIT INCLUDES FOR A COMPLETE INSTALLATION OF ENERGY EFFICIENT OFFICE EQUIPMENT INCLUDING: COMPUTER PERIPHERALS, SERVICES, SYSTEM EQUIPMENT AND TONE TREATMENT. ALL OFFICE EQUIPMENT PROVIDED WILL BE CERTIFIED BY THE ENERGY STAR SCHEME. ALL DOMESTIC EQUIPMENT WILL BE A AUTO SENSITIVE.

RENEWABLE ENERGY IS PRODUCED ON SITE BY SOLAR PHOTO VOLTAIC PANELS POSITIONED VERTICALLY ON THE SOUTH, EAST AND WEST ELEVATIONS OF THE BUILDING ON THE ROOF AND INTEGRATED WITH PHOTOVOLTAIC PANELS ON THE BUILDING FACADE. PHOTOVOLTAIC PANELS ON THE SOUTH AND WEST FACADES WILL PROVIDE APPROXIMATELY 8200KWH OF PRIMARY ENERGY BASED ON THE GLENNES PROVIDED OF THE LOCAL WEATHER BY DATA.

SERVICE VOID

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DISTRIBUTED ENERGY USE

Category	Reduced kWh/ly	Primary kWh/ly	%
Office Equipment	2,822.24	1,766.728	66.3143%
Lighting	1,024.16	41,381.943	31,526.03%
System Pumps	38,624.32	38,624.32	100%
Heating	27.32	66,194.1	0.246829%
Cooling	25.12	10,483.8	0.254829%
Dom Water Heating	143.12	17,235.9	2.94951%
Total	40,646.12	26,887.928	

DISTRIBUTION OF ENERGY USE

Category	Existing kWh/ly	Retros kWh/ly
Office Equipment	2,822.24	1,766.728
Lighting	1,024.16	41,381.943
System Pumps	38,624.32	38,624.32
Heating	27.32	66,194.1
Cooling	25.12	10,483.8
Dom Water Heating	143.12	17,235.9

THE NEW ENERGY USE IS 23% OF THE EXISTING ENERGY USE

TOM DOWNES - PG Dip DEAR - LIBERTY HALL SUBMISSION 6