



PROJECT MANUAL

U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON 2011

AS BUILT
AUGUST 2011

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1 SUMMARY OF CHANGES

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Changes to the Project Manual are as follows:

New table included – calculations of service/feeder net computed load and neutral load (NCE220)

Energy Analysis results and discussions updated

Specification sections revised – minor changes only



2 RULES COMPLIANCE CHECKLIST

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RULE	RULE DESCRIPTION	LOCATION DESCRIPTION	LOCATION
Rule 4-2	Construction Equipment	Drawing(s) showing the assembly and disassembly sequences and the movement of heavy machinery on the competition site	O-101, O-102, O-103, O-104, O-105, O-106, O-107, O-108, O-109, O-110
Rule 4-2	Construction Equipment	Specifications for heavy machinery	41 22 13
Rule 4-3	Ground Penetration	Drawing(s) showing the locations and depths of all ground penetrations on the competition site	C-103
Rule 4-4	Impact on the Turf	Drawing(s) showing the location, contact area, and soil-bearing pressure of every component resting directly on the turf	C-103
Rule 4-5	Generators	Specifications for generators	41 65 16
Rule 4-6	Spill Containment	Drawing(s) showing the locations of all equipment, containers, and pipes that will contain liquids at any point during the event	H-101, P-101, P-102, P-103, P-105, P-106, P-300, P-301, P-400, P-901, P-902
Rule 4-6	Spill Containment	Specifications for liquid-containing equipment	11 31 00, 22 41 00,
		Specifications for liquid-containing containers	22 12 00, 22 13 63, 22 33 30
		Specifications for liquid-containing pipes	21 10 00, 22 11 16, 22 13 16, 22 14 13,
Rule 4-7	Lot Conditions	Calculations showing that the structural design remains compliant even if 18 in. (45.7 cm) of vertical elevation change exists	Engineers Site Report 07 (PM Appendix 1)
Rule 4-7	Lot Conditions	Drawing(s) showing shimming methods and materials to be used if 18 in. (45.7 cm) of vertical elevation change exists on the lot	Engineers Site Report 07 (PM Appendix 1)
Rule 5-2	Solar Envelope Dimensions	Drawing(s) showing the location of all house and site components relative to the solar envelope	G-201, G-202
Rule 5-2	Solar Envelope Dimensions	List of solar envelope exemption requests accompanied by justifications and drawing	N/A

		references	
Rule 6-1	Structural Design Approval	List of, or marking on, all drawing and project manual sheets that have been or will be stamped by the qualified, licensed design professional in the stamped structural submission; the stamped submission shall consist entirely of sheets that also appear in the drawings and project manual	PM Page 5
Rule 6-2	Finished Square Footage	Drawing(s) showing all information needed by the rules officials to measure the finished square footage electronically	G-101
Rule 6-2	Finished Square Footage	Drawing(s) showing all movable components that may increase the finished square footage if operated during contest week	N/A
Rule 6-3	Entrance and Exit Routes	Drawing(s) showing the accessible public tour route and the ground surface area that will be covered by organizer-provided walkway material	G-102, G-103
Rule 7-1	Placement	Drawing(s) showing the location of all vegetation and, if applicable, the movement of vegetation designed as part of an integrated mobile system	L-101, L-104
Rule 7-2	Watering Restrictions	Drawing(s) showing the layout and operation of greywater irrigation systems	N/A
Rule 8-1	PV Technology Limitations	Specifications for photovoltaic components	26 31 00, 26 31 01
Rule 8-3	Batteries	Drawing(s) showing the location(s) and quantity of all primary and secondary batteries and stand-alone, PV-powered devices	N/A
Rule 8-3	Batteries	Specifications for all primary and secondary batteries and stand-alone, PV-powered devices	N/A
Rule 8-4	Desiccant Systems	Drawing(s) describing the operation of the desiccant system	N/A
Rule 8-4	Desiccant Systems	Specifications for desiccant system components	N/A
Rule 8-5	Village Grid	Completed interconnection application form.	PM Page 12
Rule 8-5	Village Grid	Drawing(s) showing the locations of the photovoltaics, inverter(s), terminal box, meter housing, service equipment, and grounding means	E-101, E-111, E-112, E-113, E-201, E-205, E-214
Rule 8-5	Village Grid	Specifications for photovoltaics	26 31 00, 26 31 01

		Specifications for inverter(s)	48 19 16
		Specifications for meter housing	26 27 13
		Specifications for service equipment	26 27 13
		Specifications for grounding means	33 79 83
Rule 8-5	Village Grid	One-line electrical diagram	E-601
Rule 8-5	Village Grid	Calculation of service/feeder net computed load per NEC 220	E-602
Rule 8-5	Village Grid	Site plan showing the house, decks, ramps, tour paths, and terminal box	E-101
Rule 8-5	Village Grid	Elevations(s) showing the meter housing, main utility disconnect, and other service equipment	E-205, E-214
Rule 9-1	Container Locations	Drawing(s) showing the location of all liquid containers relative to the finished square footage	P-101
Rule 9-1	Container Locations	Drawing(s) demonstrating that the primary supply water tank(s) is fully shaded from direct solar radiation between 9 a.m. and 5 p.m. EDT or between 8 a.m. and 4 p.m. solar time on October 1	G-601, P-101
Rule 9-2	Team-Provided Liquids	Quantity, specifications, and delivery date(s) of all team-provided liquids for irrigation, thermal mass, hydronic system pressure testing, and thermodynamic system operation	N/A
Rule 9-3	Greywater Reuse	Drawing(s) showing the layout and operation of greywater reuse systems	N/A
Rule 9-4	Rainwater Collection	Drawing(s) showing the layout and operation of rainwater collection systems	N/A
Rule 9-6	Thermal Mass	Drawing(s) showing the locations of liquid-based thermal mass systems	N/A
Rule 9-6	Thermal Mass	Specifications for components of liquid-based thermal mass systems	N/A

Table 1: Rules compliance checklist



3 STRUCTURAL CALCULATIONS

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For structural calculations and engineers specification refer to Construction Specification.

For engineers sketches refer to drawing set – S series.

Refer for the list below for engineer's drawings and calculations which have been stamped by a licensed engineer as per rule 6-1.

Calculations

A1	Introduction
B1 – B4	Case Loadings
C1 – C10	Roof Design
D1 – D5	Canopy Roof Design
E1 – E17	Floor Design
F1 – F25	Bracing Design

Specification

DOM	Domestic Specification
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Sketches

SK01	Foundation & Floor Plan
SK02	Wall Bracing Plan
SK03	Roof Plan
SK04	Canopy Roof Plan
SK10 - 21	Details



4 DETAILED WATER BUDGET

4 DETAILED WATER BUDGET

This budget is based on the maximum capacity of the supply tank , at 250mm / 9.84 inches high, of 2745 L / 725.1 Gal. The waste tank maximum capacity, based on a tank height of 210mm / 8.27 inches) is 1613 L / 426.1 Gal.

It is also assumed that the waste tanks will be emptied twice during the water removal period.

	Gallons / Task	Tasks / Day	Wastage etc	Total	Cumlt. Total
Day 8					
Dishwasher	2.5	1	0%	2.5	2.5
Cooking	0.6	1	10%	0.7	3.2
Clothes Washer	15.9	1	0%	15.9	19.0
Hot Water	15.0	2	10%	33.0	52.0
Day 10					
Clothes Washer	15.9	1	0%	15.9	67.9
Hot Water	15.0	2	10%	33.0	100.9
Day 11					
Dishwasher	2.5	1	0%	2.5	103.4
Cooking	0.6	1	10%	0.7	104.0
Hot Water	15.0	2	10%	33.0	137.0
Day 12					
Clothes Washer	15.9	1	0%	15.9	152.9
Hot Water	15.0	2	10%	33.0	185.9
Day 13					
Hot Water	15.0	2	10%	33.0	218.9
Day 14					
Dishwasher	2.5	1	0%	2.5	221.4
Cooking	0.6	1	10%	0.7	222.1
Clothes Washer	15.9	2	0%	31.7	253.8
Hot Water	15.0	2	10%	33.0	286.8
Day 15					
Dishwasher	2.5	1	0%	2.5	289.3
Clothes Washer	15.9	1	0%	15.9	305.1
Hot Water	15.0	2	10%	33.0	338.1
Day 16					
Dishwasher	2.5	1	0%	2.5	340.6
Cooking	0.6	1	10%	0.7	341.3
Clothes Washer	15.9	2	0%	31.7	373.0
Hot Water	15.0	2	10%	33.0	406.0
TOTAL (gallons)					406.0

Table 2: Projected daily water usage by competition tasks

		GPM	Time		
Fire Protection					
Sprinkler Heads	2	15.0	5.00		150.0
TOTAL (gallons)					150.0

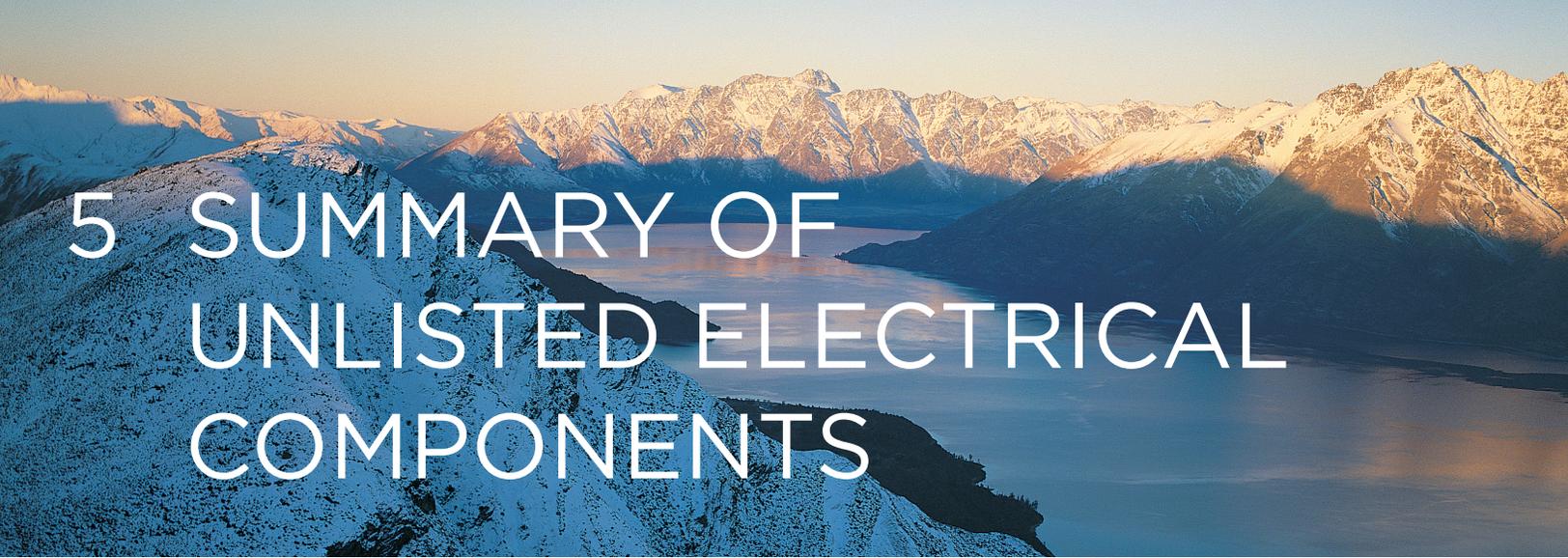
Table 3: Water allowance for fire protection

	Gallons / Task	Tasks / Day	Wastage etc	Total	Cumlt. Total
Day 8					
Irrigation	6.97	1	10%	7.7	7.7
Day 9					
Irrigation	6.97	1	10%	7.7	15.5
Day 10					
Irrigation	6.97	1	10%	7.7	23.2
Day 11					
Irrigation	6.97	1	10%	7.7	30.9
Day 12					
Irrigation	6.97	1	10%	7.7	38.7
Day 13					
Irrigation	6.97	1	10%	7.7	46.4
Day 14					
Irrigation	6.97	1	10%	7.7	54.2
Day 15					
Irrigation	6.97	1	10%	7.7	61.9
Day 16					
Irrigation	6.97	1	10%	7.7	69.7
TOTAL (gallons)					69.7

Table 4: Projected daily water use for landscape irrigation.

TOTAL	
Task Usage	406.0
Irrigation	69.7
System Volume	99.3
Fire Protection	150.0
TOTAL TO BE SUPPLIED (gallons)	
	725

Table 5: Detailed water budget summary

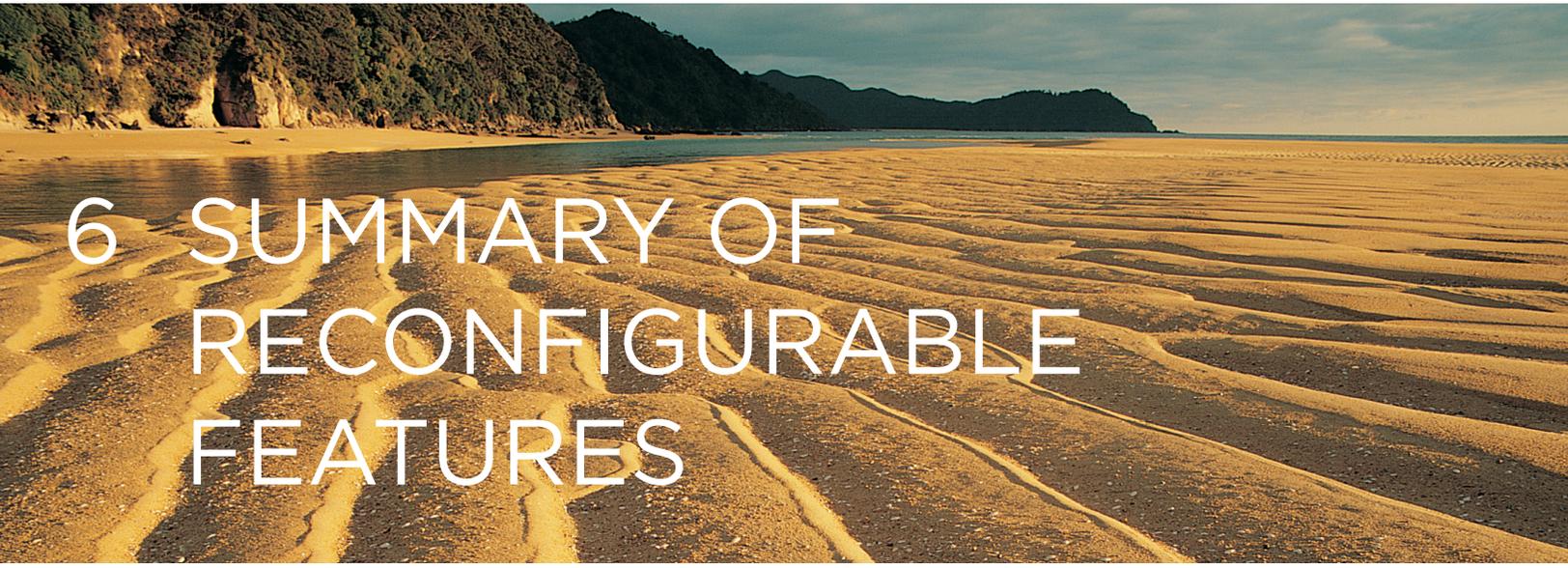


5 SUMMARY OF UNLISTED ELECTRICAL COMPONENTS

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5.1 Statement of Compliance

All components in the design of the First Light entry to the 2011 Solar Decathlon competition carry an approved testing agency's listing per Section 6-7 of the SD2011 Building Code.



6 SUMMARY OF RECONFIGURABLE FEATURES

6 SUMMARY OF RECONFIGURABLE FEATURES

A summary of all reconfigurable features affecting SD2011 Rules 602 and Appendix B-2 are outlined below.

6.1 Reconfigurable Features affecting ANSI Z765-2003

There are no reconfigurable features which alter the finished square footage of the First Light House. The minimum and maximum areas of the First Light house are within the requirements specified by the SD2011 Rules, demonstrating compliance.

6.2 Demonstration of Reconfigurable Features for Jury Tours

During the course of public and jury tours, team members will demonstrate multiple reconfigurable features of the First Light House. Each has been outlined below.

6.2.1 Workstation

The workstation provides the necessary desk space and storage for the study area, as well as providing screening and storage for the bedroom. As shown in below, the desk top folds down from the unit. The operation of this unit will be demonstrated by a decathlete during all public and jury tours. There is also a detachable section (shown removed in Fig1 part 3) which allows an accessible tour route into and out of the bedroom. This will remain in its detached position for the entirety of the public exhibit period, however the alternative configuration will be demonstrated to judges on the various contest panels. Refer to construction document drawings I-551 – I-555 for further details.



Figure 1: Indicative operation of reconfigurable workstation unit

6.2.2 Lounge unit

The lounge unit comprises of built-in seating and storage, and can also be reconfigured to provide two additional sleeping spaces for guests as shown in Figure below. The operation of this unit will be demonstrated by a decathlete during all public and jury tours. Refer to construction document drawings I-31 – I-43 for further details.



Figure 2: Indicative operation of reconfigurable lounge unit

6.2.3 Kitchen Table

In the centre of the house sits a large concrete table. This acts as an island bench top, extending the kitchen into the middle of the room and providing additional space in which to prepare food and store utensils. The height of the bench top is such that people can comfortably stand at it to talk, cook and eat. Bar stools seat four to six people around the southern end of the table, and if there is a need to accommodate a bigger event, the storage unit slides out from underneath the northern end to free up leg room for more guests, as seen in Figure 3 below. This also provides space for serving food and beverages. The operation of this unit will be demonstrated by a decathlete during all public and jury tours. Refer to construction document drawings I-441 to I-443 for further details.



Figure 2: Indicative operation of reconfigurable kitchen table

6.2.4 Internal Blind (Skylight)

In order to control heat loss from the house at night an internal thermal roller blind on the skylight is to be used. The operation of this blind will be demonstrated by a decathlete during all public and jury tours.



7 INTERCONNECTION APPLICATION FORM

7 INTERCONNECTION APPLICATION FORM

New Zealand, Lot 103

Team Name and Lot Number

7.1 PV Systems

Module Manufacturer	Short Description of Array	DC Rating of Array (sum of the DC ratings)
Mitsubishi Electric	14 Mitsubishi Electric Model PV-UJ225GA6 arranged in series	3.15kWp
Mitsubishi Electric	14 Mitsubishi Electric Model PV-UJ225GA6 arranged in series	3.15kWp

Total DC power of all arrays is 6.3 kW

7.2 Inverters

Inverter Manufacturer	Model Number	Voltage	Rating	Quantity
SMA	Sunny Boy 6000A	246-480 V	5.5kW	1

Total AC power of all inverters is 6 kW

The following information has been included as required:

- One-Line Electrical schematic. Refer to construction documents drawing E-601
- Calculations of service/feeder net computed load and neutral load (NCE 220) (See section 7.3)
- Plan view of the lot showing the house, decks, ramps, tour paths, the service point and the distribution panel or load centre. Refer to construction documents drawing E-101
- Contact details for the team's electrical engineer, Liam Fox, have been posted to the "Team Officer Contact Info" database on the Yahoo Group as required per Rule 3-2.

7.3 Calculations of service/feeder net computed load and neutral load (NCE 220)

Also refer drawing E-602 for calculations.

Circuit	Circuit Name	Qty	Volts	Amps	VA	Circuit Breaker Rating	Demand factors as per NEC 220 III	TOTAL VA
1	Exterior Lighting	3	230	0.1	5	10	100%	15
2	Interior Lights 1	35	230	5.2	33	10	100%	1185.773
3	Interior Lights 2	35	230	5.2	33	10	100%	1185.773
4	Study	1	230	0.8	180	20	100%	180
5	Entertainment	4	230	1.6	90	16	100%	360
6	Miscellaneous	20	230	7.8	90	20	100%	1800
7	Bathroom	1	230	0.8	180	10	100%	180
8	Kitchen	8	230	3.1	90	10	100%	1500
9	Oven	1	230	12.2	2800	16	80%	2240
10	Hob/Rangehood	1	230	15	3450	16	75%	2587.5
11	Dishwasher	1	230	5.0	1150	10	75%	862.5
12	Fridge	1	230	1.7	400	10	75%	300
13	Controls	1	230	0.8	180	10	100%	180
14	Shading Blinds	1	230	0.8	180	10	100%	180
15	Washing Machine	1	230	6.5	1500	10	75%	1125
16	Hydronic Dryer	1	230	0.8	180	10	100%	180
17	Hot Water		230	8.6	1980	10	100%	1980
		1	230	7.8	1800			

		1	230	0.8	180			
18	Ventilation	1	230	0.8	180	10	100%	180
19	Heat Pump	1	230	20.7	2870	32	100%	2870
		1	230	1.7	390			
		1	230	19.0	2480			
20	Shed Outlet	4	230	1.6	90	20	100%	360
21	Fire	1	230	6.5	1500	16	100%	1500
				97.6				20951.55

Feeder and service load calculations		
Sum of Loads	21	kVA
Total Amperage	91.1	A
Select 100A breaker		



8 ENERGY ANALYSIS RESULTS AND DISCUSSIONS

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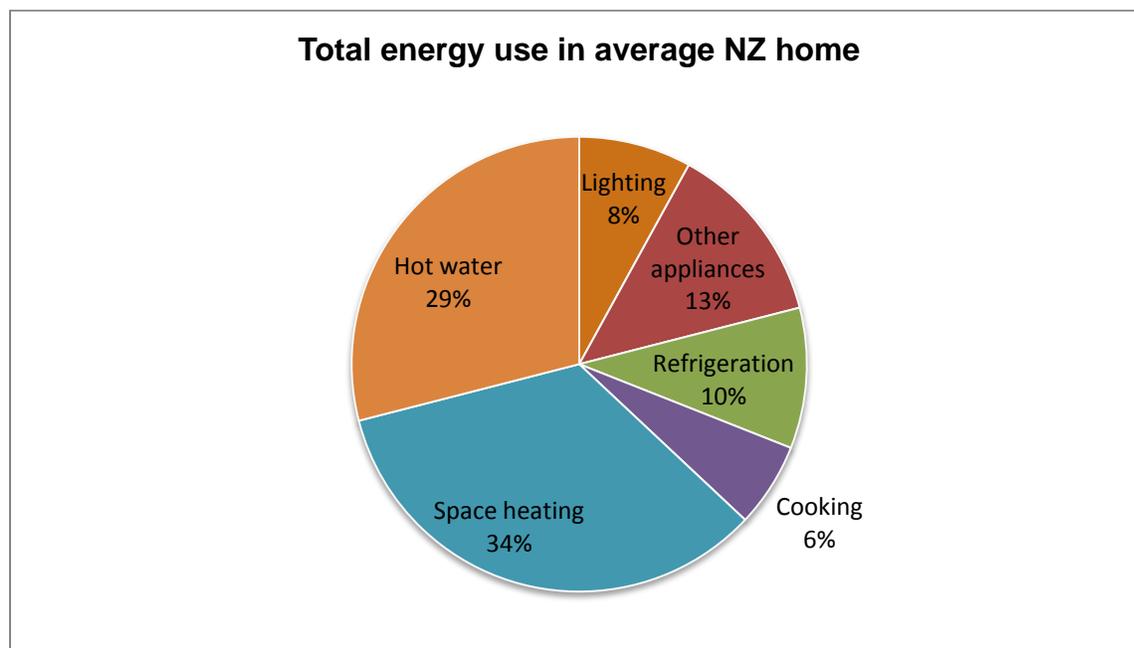
8.1 Point of departure

This project has grown out of a desire to improve the current state of New Zealand housing. Many homes in New Zealand waste energy. They are badly designed and constructed, have inadequate insulation, and use a lot of energy to heat and run. A typical New Zealand home has very low indoor air temperatures throughout the year which recently has been associated with poor health, a variety of social and economic problems for residents as well as contributing to mould and dampness in homes. The First Light house is a chance to showcase an improved quality of housing that is warm, dry and healthy using considerably less energy than the current type of housing in New Zealand

What is the current state of housing in New Zealand?

There are currently 1.6 million existing homes in New Zealand, many of which are underperforming, waste energy and are cold. Many are badly designed and constructed, and have inadequate insulation, consuming a lot of energy to heat and run. 750,000 homes throughout New Zealand have insufficient ceiling and under floor insulation, most of these have problems with dampness and are all very cold.

A recent study called the Household Energy End-use study (HEEP) performed by the building research authority in new Zealand quantified how, where and why energy was used in new Zealand homes, based on monitoring of energy and end uses in a national sample of 400 homes. The study found that the average total energy use per household was 11,410 kWh/yr



Interestingly New Zealand households use relatively little energy compared to other developed nations. On a climate corrected basis NZ had the lowest residential sector energy use per capita in comparison

with Australia, Canada, France, Germany, Japan, Netherlands, Denmark, USA and the UK. (Schipper et al.2000) One of the reasons for this was the very small amount of energy used for space heating. Despite this, space heating is still an important energy user in NZ dwellings, on average using 3,820kWh/yr.

New Zealand is a temperate country but has a diversity of climates thus has quite a variation in outdoor temperatures. But what remains consistent across the country is that our homes are very cold. Based on the data from the study it was found the mean indoor and ambient winter temperature of the houses studied were well below the World health organisation (WHO) healthy indoor temperature range.

August-September mean temperatures	Northern North Island	Southern North Island	Christchurch	Southern South Island
Living room	16.5	16.1	16.1	14.7
External temperature	11.9	9.3	10.3	7.3

Table 6: Mean indoor & ambient winter temperatures by region

	Morning	Day	Evening	Night
	7-9am	9am-5pm	5-11pm	11pm-7am
Living room	13.5	15.8	17.8	14.8
Bedroom	12.6	14.2	15	13.6
Ambient	7.8	12	9.4	7.6

Table 7: Mean indoor & ambient winter temperatures across a day

Looking at four different periods throughout the day it was only during the evening that the temperature came close to a healthy indoor temperature of between 18-24°.

This study paints a very stark but realistic picture of the state of housing in New Zealand. Despite still consuming a large amount of energy on space heating we are still living in cold, damp and unhealthy environments.

Why are our NZ homes so cold?

The study concluded that there were three critical factors that contributes to the low indoor temperatures of our homes; these were

- The thermal properties of the home
 - o High heat loss in homes due to low levels of insulation
 - o Single glazing
 - o Poor air tightness and lack of adequate ventilation
 - o Large floor areas
 - o Poor orientation and design
- Heating sources and appliances
 - o Fuel sources and heating types
 - o Heating capacity and sizing
 - o Cost and availability
- Heating practices
 - o Heating seasons and patterns
 - o Levels of comfort

More here...

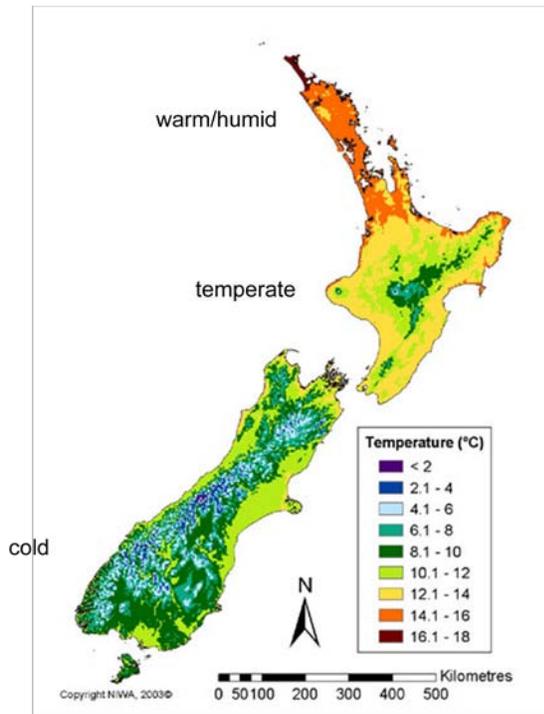
How can we improve the housing situation in NZ?

Our point of departure for this project is to design a home that not only meets the requirements of the competition but begin to tackle some of the issues currently associated with housing in New Zealand. Our aim is to design a house that maintains the essence of a New Zealand home while dramatically improving both the health and the efficiency of our homes. The First light house focuses on passive design features that create an improved thermal envelope that will maintain a comfortable living environment with minimal space heating. Windows, walls, and floors are made to collect, store, and distribute solar energy in the form of heat in the winter and reject solar heat in the summer reducing the houses reliance on mechanical forms of heating throughout the year. Energy efficient appliances, LED lighting, solar generated hot water, and a unique drying room all combine to reduce the houses reliance on energy. In fact the house will consume less than a third of the annual energy used by a traditional NZ home throughout the year and will generate all of this energy with rooftop photovoltaic's.

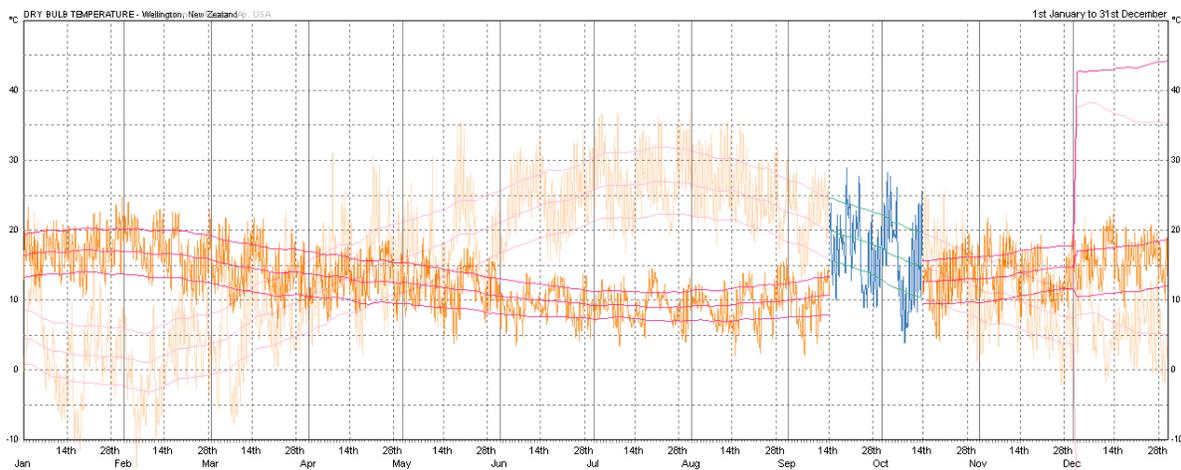
The following energy analysis report and discussion documents the process from design and simulation through to final construction and testing of the house. The report aims to give an overview of the energy analysis and thermal simulation that was performed to help optimize the design, a description of the systems within the house that help reduce its energy use and brief analysis of real life data taken from the First Light house when it was set up and tested for the first time here in NZ.

8.2 Climate

New Zealand has a wide range of climatic conditions and topography from the top to the bottom of the country.



Temperature comparison throughout year in Washington DC and New Zealand



NZ's Climate vs Washington DC Climate??

8.3 Baseline Simulation

8.3.1 Introduction

In order to gain a better understanding of how to better optimize the building's thermal performance throughout a year in NZ and in Washington DC during the competition week we have modeled the building in Energy plus simulation software. Testing the thermal performance of various aspects of the design and the building envelope has helped fine tune the house to the desired level of performance that fits both NZ and US climates.

8.3.2 Assumptions

Computer simulation is always an abstraction of reality, it therefore requires the modeler to make several assumptions with regards to the building's construction and the way it is likely to be used once built. The main assumptions are described in the following subsections.

8.3.2.1 Construction

When Energy Plus modeling commenced there was reasonably adequate construction information available to allow a high level of accuracy in the simulation model. The baseline building has been modeled as per the original design. Each building element used in the thermal model is presented in Table 8 below. Please note that these construction details are those that were in use at the time that simulation was commenced, refer to the construction documentation drawings for current construction details.

<i>ELEMENT</i>	<i>DESCRIPTION</i>	<i>R-VALUE</i>
Walls	SIPS Panels	R-6.4
Floor	SIPS Panels, Timber Lining	R-6.4
Roof	SIPS Panels	R-6.4
Glazing - Windows	6mm Standard Clear Glass, Air Filled, Double Glazing, Aluminum Frames	R-0.26
Glazing - Skylight	6mm Standard Clear Glass, Air Filled, Double Glazing, Aluminum Frames	R-0.26
Shading Canopy	Timber	-

Table 8: Construction R-Values used for baseline simulation

8.3.2.2 Heating and Internal Gains

At this stage the only heat gains to the building are those from solar gains through the windows. Natural ventilation from has been modeled (discussed in Section 8.3.2.3). External shading from surrounding buildings and landscape has been modeled; however incidental shading from foliage has been ignored. Overhangs, balconies and other areas where the building provides shade for itself have been taken into account.

Internal gains due to occupants, appliances and lighting loads have been added after the initial round of testing according to the competition schedule to ensure greater accuracy.

8.3.2.3 Ventilation and Infiltration

Infiltration was modeled at a rate of 0.1 Air Changes per Hour (ACH), this is if all the air in the room were replaced every ten hours through the infiltration of outside air through cracks in the building envelope, around doors, windows and the like. Ventilation has been modeled as 4 ACH.

8.3.2.4 Weather Information

Weather files for thermal simulations have been sourced from the US DOE Energy Plus Weather File Database. The files are based on data compiled by the New Zealand National Institute of Water and Atmospheric Research (NIWA) for simulations based in Wellington, and the US National Renewable Energy Laboratory (NREL) for Washington DC. The weather files are based on data gathered from Wellington International Airport, Wellington, and Ronald Reagan Airport, Arlington, VA, for the New Zealand and United States simulations respectively.

The NIWA files consist of hourly records for an artificial year created from twelve representative months, and the NREL files are from the Typical Meteorological Year 3 (TMY3) data set, which is made up of hourly values of solar radiation and meteorological elements for a 1-year period.

Their intended use is for computer simulations of solar energy conversion systems and building systems to facilitate performance comparisons of different system types, configurations, and locations in the United States. Because they represent typical rather than extreme conditions, they are not suited for designing systems to meet the worst-case conditions occurring at a location (design day data has been used for this purpose).

8.3.3 Modeling Variations

The simulations concentrated on reducing heating and cooling loads while maintaining thermal comfort. The thermal comfort that we have used here is the temperature/humidity requirements set for the competition. Several variations were made to the building fabric to optimize the thermal envelope. Initial simulations focused on:

- Glazing types
- Window to wall ratio
- Envelope insulation levels
- High or low mass flooring
- Window & skylight shading
- Canopy Size
- Natural ventilation rates

The results from these simulations are presented and discussed in Section 8.3.4 – 8.3.6.4.1. Following this first stage of testing the best performing options were compiled, and used for all following simulations. From this point further testing was performed on the skylight glazing as outlined in section 8.3.6.4.2.

These simulations are all 'standalone' variations i.e. they differ from the base model only in the regard expressly mentioned; the changes are not cumulative. Each set of results is discussed in a separate subsection of the report.

8.3.4 Results - Thermal Envelope

8.3.4.1 Mass

A large amount of the temperature gains within the building are due to direct solar gain through the skylight and the windows. Thermal mass has been investigated as an option in order to capture some of the heat available during the day, and utilize it during the night when the ambient temperature is lower. This will also have the effect of smoothing out peaks in the internal temperature that are experienced due to the lightweight structures rapid response to ambient temperature variations and solar insolation levels.

The concrete is only added on either side of the central core, as the timber floor is a crucial architectural element in this space. The floor has been modeled as solid poured concrete, without any floor coverings, and with the underside insulated with 240mm (9.4") expanded polystyrene, as is utilized in the Structurally Insulated Panels (SIPs).

Chart 1 shows the effect that the addition of varying thicknesses of concrete to the floor will have on the internal temperature. As can be seen, even a small addition of mass will have positive effects on the extreme high and low temperatures. The average temperature does not change.

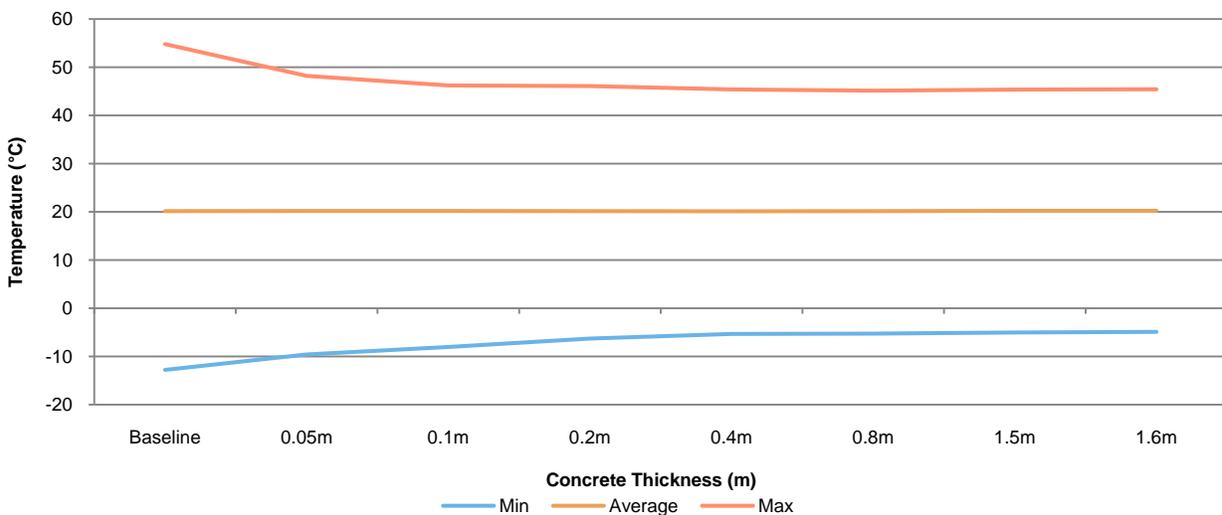


Chart 1: Variation in minimum, mean and maximum annual internal temperature with the addition of concrete topping to floor

Chart 2 shows a comparison of the heating and cooling loads required annually for the house with 100mm (3.9") of concrete, compared with the baseline. The HVAC was set to keep the internal temperature between 21.7°C -24.4°C (71°F - 76°F). 100mm (3.9") has been modeled as this is likely the largest amount possible within the current design, for structural and space reasons.

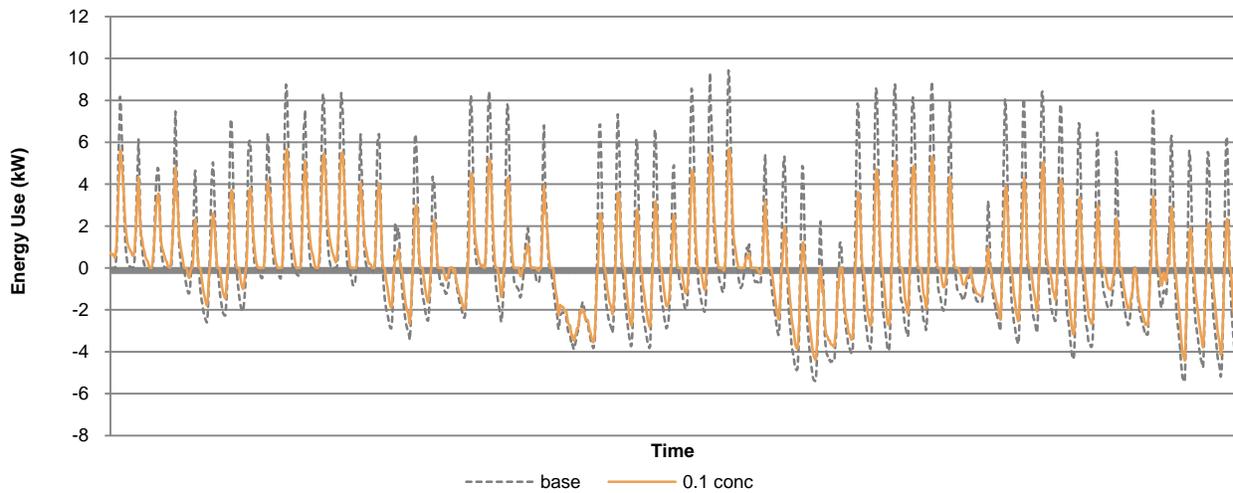


Chart 2: Variations in HVAC energy use with 100mm concrete slab compared with baseline for the period from September 15 – October 15

Chart 3 shows the internal temperatures with varying thickness of concrete, compared with the base line clearly showing a smoothing out of the peaks in internal temperature and HVAC Loads through the addition of a small amount of mass. The mass passively regulates the temperature and aids in meeting the strict requirements laid out in contest 6. The use of thermal mass also reduces energy consumption and results in a more comfortable internal environment even when in use outside of the competition.

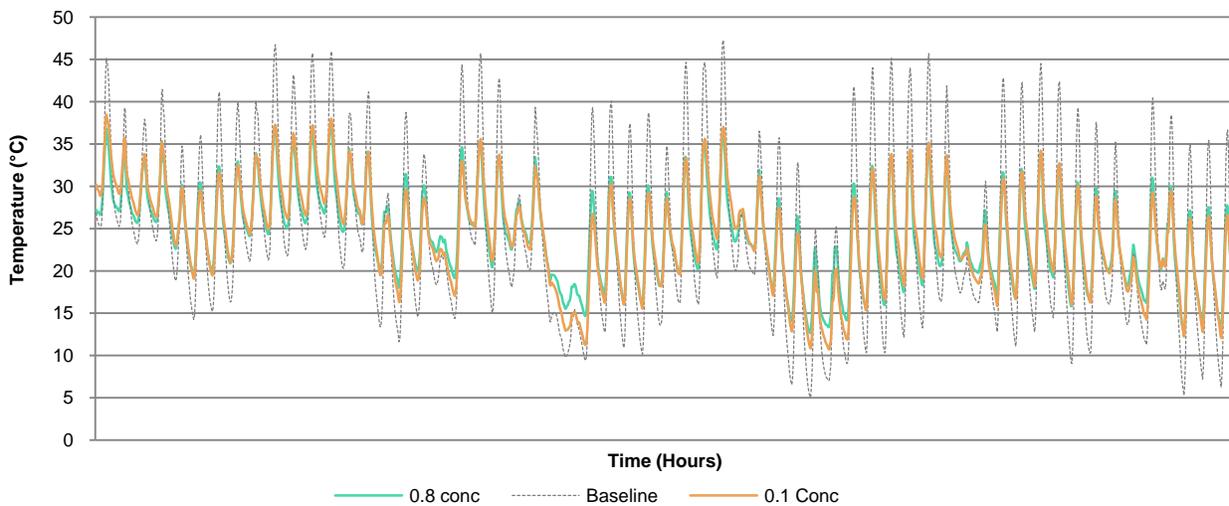
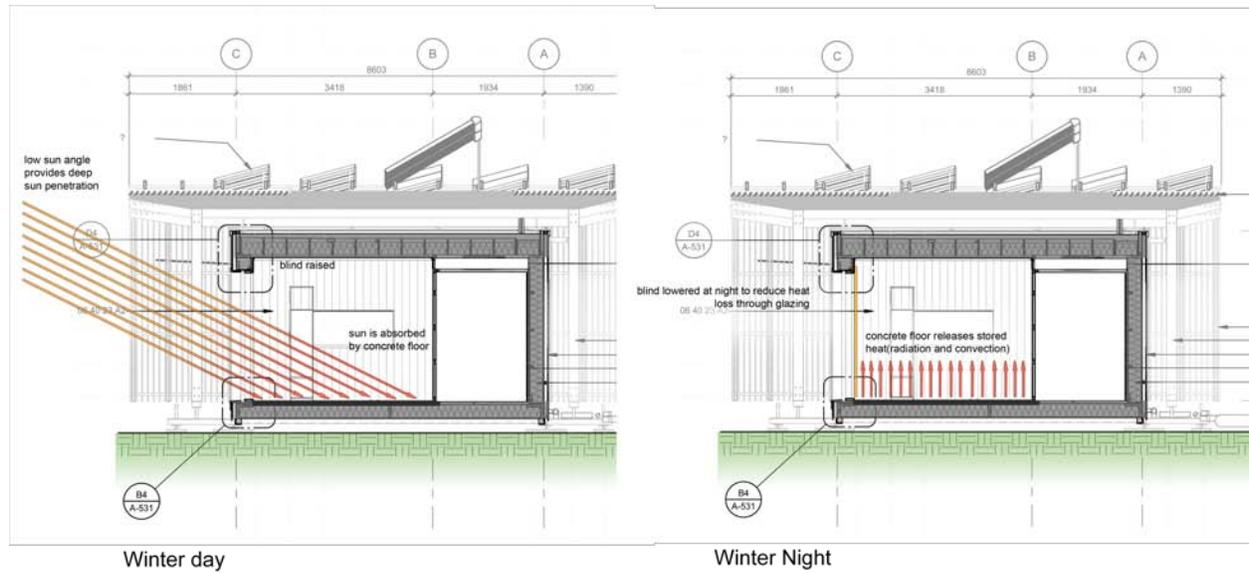


Chart 3: Variations in hourly internal temperature with 100mm & 800mm (9.3” & 31.5”) concrete slab compared with baseline for the period from September 15 – October 15



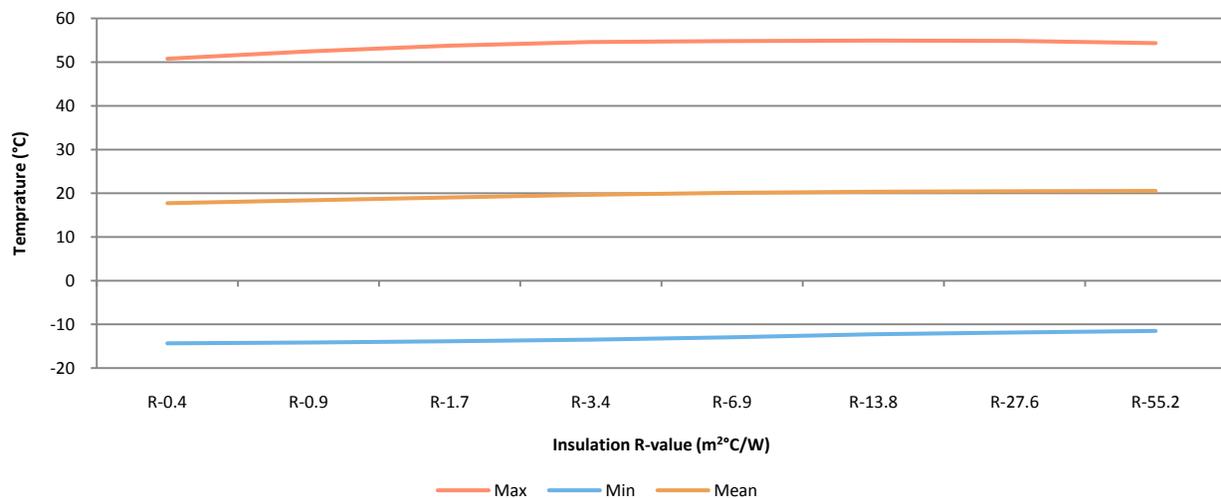
8.3.4.2 Insulation

Effective insulation is crucial to successful solar design, ensuring that the heat gained from solar radiation is retained in the space, rather than lost through the envelope. In order to determine the optimization point, at which adding more insulation would have little to no effect, the expanded polystyrene insulation thickness in all walls, floors and ceilings was increased from 12.5mm to 1600mm (0.5” – 63”) doubling the thickness each time. The corresponding R-values are shown in Table 9.

Polystyrene Thickness (mm)	R-Value (m ² °C/W)
12.5	0.4
25	0.9
50	1.7
100	3.4
200	6.9
400	13.8
800	27.6
1600	55.2

Table 9: Thickness of polystyrene and the corresponding R-Value ($m^2\text{C}/W$)

As can be seen in Chart 4 the increase in insulation by a magnitude of up to 64 times results in relatively small changes in the maximum, mean, and minimum temperature over the course of an entire year. Chart 4 shows the optimization point at around 400mm (157.5") or R-13.8 (R-78) for the maximum temperature. The mean and minimum temperatures continue to rise past an insulation level of R-55 (R-312.3), the mean temperature is beginning to level off at this stage, while the minimum temperature continues to rise relatively sharply. The difference of 0.1°C (32.2°F) between R-6.9 and R-13.8 (R-39 & R-78) was considered negligible for the additional space requirement and cost of doubling the insulation thickness. It should also be noted that for the maximum temperature the difference between R-3.4 and R-6.9 (R-19.3 & R-39) is also relatively minor, although the difference is greater for the mean and minimum temperature.

**Chart 4:** Comparison of variation in annual maximum, mean and minimum internal temperatures ($^\circ\text{C}$) due to increase in insulation R-value ($m^2\text{C}/W$)

8.3.5 Results - Shading

8.3.5.1 Blinds/Louvers

Due to the large area of glazing, especially in the skylight, there are periods where there are excessive solar gains which lead to large chiller loads. Due to the time of year, and therefore the angle of the sun, the canopy provides minimal shading. One option is to apply tints and films to the glazing, although due to their permanence they are best used in combination with adjustable shading. Shading, in the form of blinds and louvers can be adjusted at different times of the day and year allowing effective control over the solar gains. The louvers have been modeled as 300mm (11.8") external and internal shading devices and at three different settings, 60° open, 30° open and fully closed.

Chart 5 shows the maximum, mean and minimum temperatures with the different louver variations. As can be seen in this graph the minimum internal temperature varies greatly, staying below -12°C (10.4°F) on the coldest winter day. As to be expected the shading has no effect during cold winter days. The most

prominent change is the drop in maximum temperature, the best performing option, external skylight louvers closed, results in the internal temperature dropping to 39.6°C (103°F) from the baseline temperature of 54.8°C (129°F). This clearly demonstrates the significant impact the skylight has on the internal temperature and the importance of reducing the solar gain during certain periods.

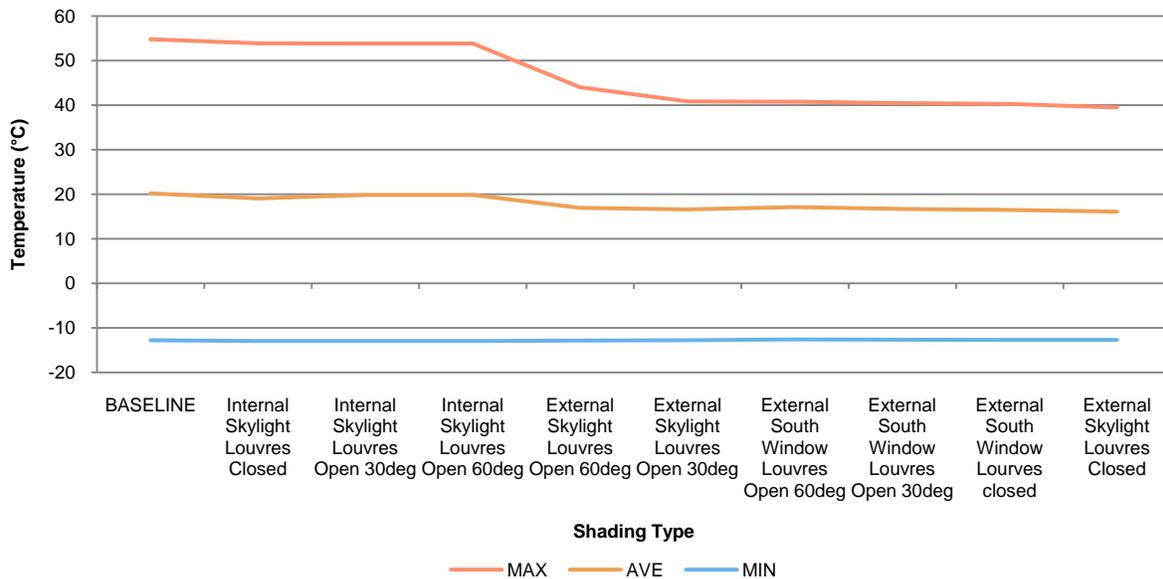


Chart 5: Comparison of annual maximum, mean and minimum internal temperatures (°C) with various shading devices

8.3.5.2 Canopy

The canopy provides shading to the house underneath, acting as a shading canopy that reduces the amount of direct solar radiation hitting the house. This canopy is also a mounting platform for the photovoltaic array, intended to allow air flow around the photovoltaic modules, passively cooling them and allowing them to operate at maximum efficiency.

In an attempt to reduce the solar gains through the skylight the canopy has been modeled with 700mm, 1000mm and 1500mm (27.6”, 39.4” & 59.1”) extensions to both the east and west side of the roof over the skylight. Similarly to reduce the gains through the southern windows the canopy has also been modeled with 700mm and 1000mm (27.6” & 39.4”) extensions to the south side.

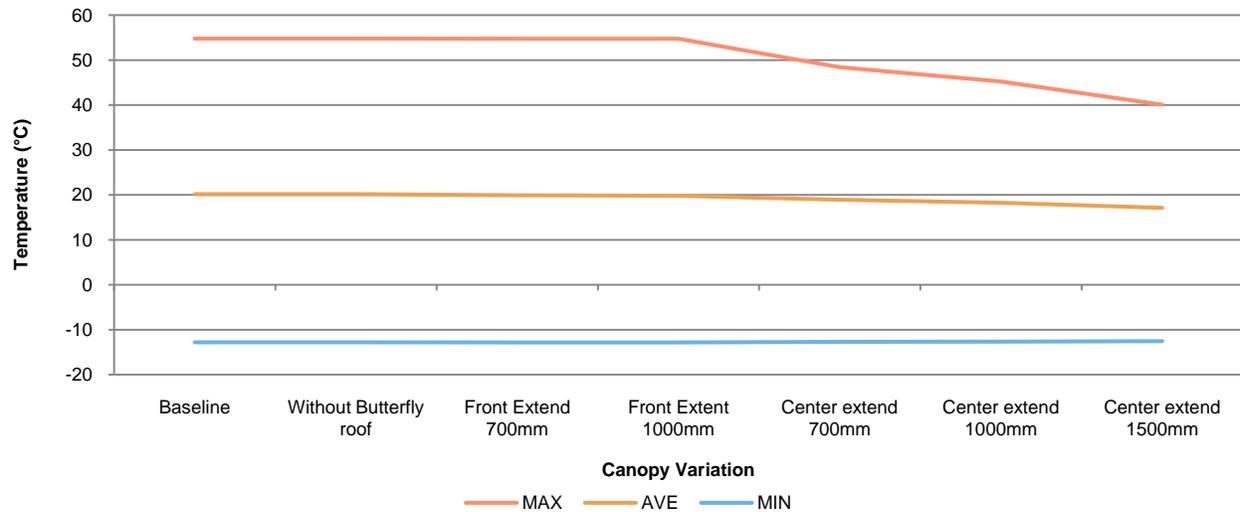


Chart 6: Annual maximum, mean and minimum internal temperature (°C) with canopy variations

Chart 6, shows the maximum, average and minimum temperatures with each different design option. As can be seen from Chart 6 the minimum internal temperature does not change. The biggest effect comes from completely shading the skylight, the temperature drops from 54°C to 40°C (129°F – 104°F). The average temperature drops slightly with the increase of shading over the skylight while the minimum temperature remains constant, and well below the level required by contest 6.

8.3.6 Results - Glazing

8.3.6.1 Window to wall ratio

8.3.6.2 All Glazing

In order to determine the optimum glazing area for the First Light House in Washington, simulations were performed with varying glazing areas. The ratios are based on the existing area of glazing i.e. 100% representing the existing area, 0% no glazing and 200% twice the glazing area. Window to wall ratio was investigated using the baseline standard clear double Insulated Glazing Units (IGU).

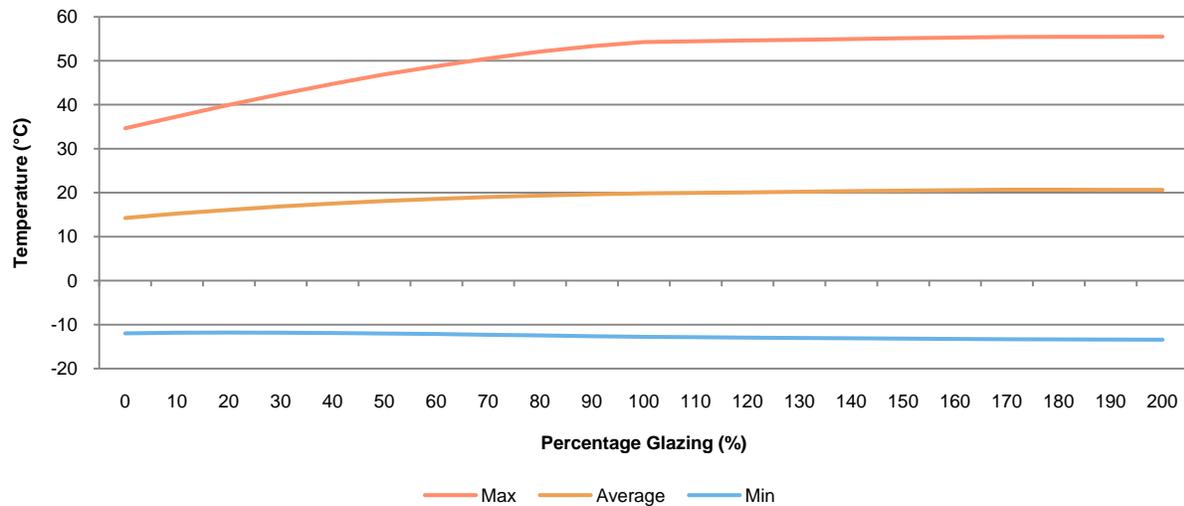


Chart 7: Annual maximum, mean and minimum internal temperature (°C) with glazing area between 0% and 200% of baseline area

This was compared utilizing the maximum, average and minimum temperatures across a full year period. Note the skylight was restricted by the effective roof area at 100%, as increasing the area beyond this point had no effect due to complete shading by the canopy evident in Chart 7 by the change in gradient at 100%. From these results a clear correlation can be seen between the glazing area and the internal temperature, where by the reduction in glazing results in a significant improvement in efficiency. The skylight is an integral aspect of the architecture, creating the desired spatial experience in the central area, therefore its removal would be a last resort.

The effect of the skylight on the maximum internal temperature can clearly be seen in Chart 7. The temperature levels level out when the area increases past 100%, this is due to the shading of the skylight by the canopy, as previously mentioned. This highlighted the considerable impact of the skylight on the internal temperature.

Furthermore from Chart 7 it can be concluded that reducing the glazing area results in a decrease in the range of internal temperature (i.e. the difference between the maximum and minimum temperature), with the decrease in the maximum temperature the most pronounced.

8.3.6.3 Skylight

As mentioned in the previous section the skylight has been identified as an area of the glazing design requiring further attention. Its area has been varied independently of the other glazing in order to determine the potential performance increases. Chart 8 and Chart 9 illustrates this through the display of the interior temperature across September and October in Washington for a glazing area of between 0% and 100% and 0%-400% respectively. As with the above results the area is expressed as a percentage of the existing glazed area, although focusing only on the skylight. The canopy was removed for these simulations in order to gain a clear indication of the correlation between the area of skylight glazing and the internal temperatures.

From Chart 8 & Chart 9, it can also be seen that there is a clear relationship between the area of the skylight and the internal temperature, where by the smaller the skylight area the lower the hourly interior temperature. This indicates that to perform optimally the skylight should be of the lowest area possible. The skylight is an integral aspect of the architecture, creating the desired spatial experience in the central area, therefore its removal would be a last resort.

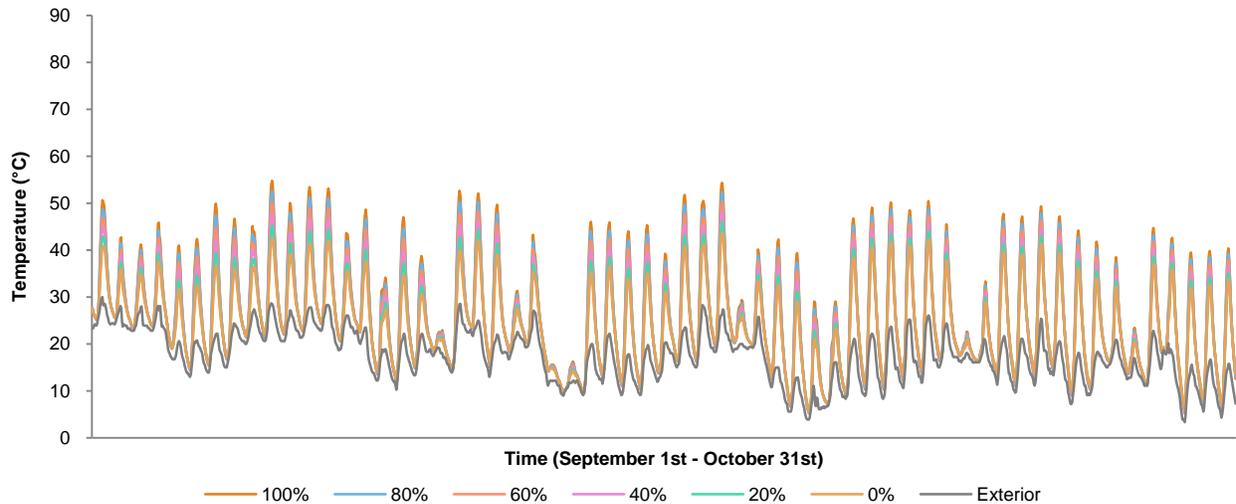


Chart 8: Variations in hourly internal temperature with glazing area between 0% and 100% of baseline area concrete slab compared with exterior for the period from September 15 – October 15.

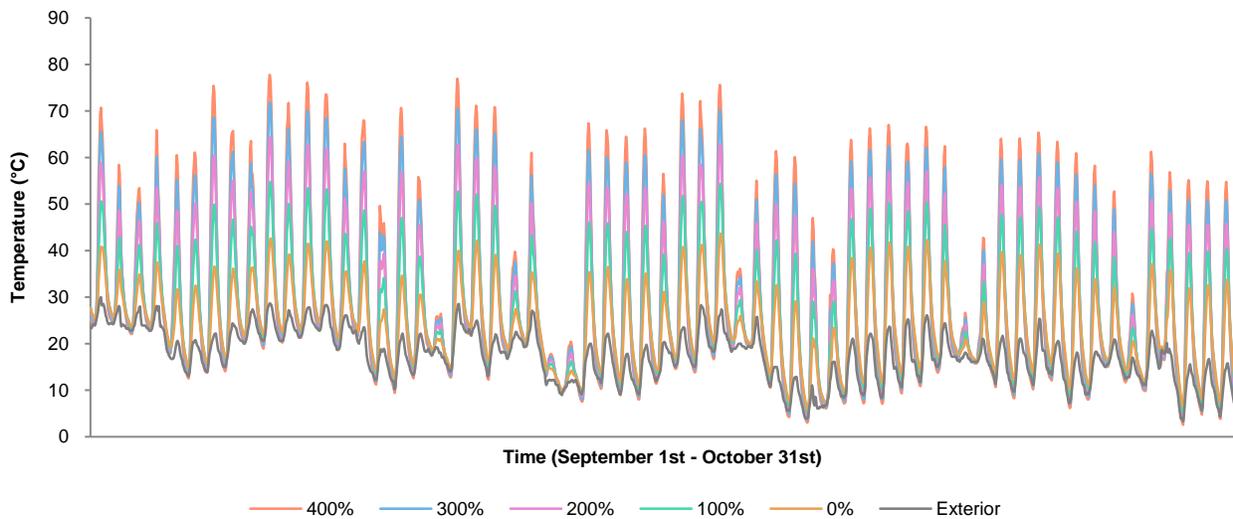


Chart 9: Variations in hourly internal temperature with glazing area between 0% and 400% of baseline area concrete slab compared with exterior for the period from September 15 – October 15.

The current design has reduced the skylight to approximately two thirds of the original size, along with significantly improving the glazing construction as detailed in Section 8.3.6.4.2. This has resulted in significant performance improvements, which enables the justification of the skylight in the design.

8.3.6.4 Glazing type

8.3.6.4.1 Windows

In addition to varying the area of glazing, there are significant performance improvements to be made by altering the construction of the glazing units, whether it be by changing the glass type, the number of layers or the gas fill.

Initial tests on the glazing were performed on all windows as well as the skylight. The baseline is a standard 6mm clear double Insulated Glazing Unit (IGU) with air fill. For comparative purposes five high performance glasses were chosen from the LBNL Window 5 database as detailed below in Table 10. Each glass was tested in a double and quad IGU, with both air and argon fill for each, giving 20 variations in total. The constructions of the IGUs are detailed below in **Error! Reference source not found.**

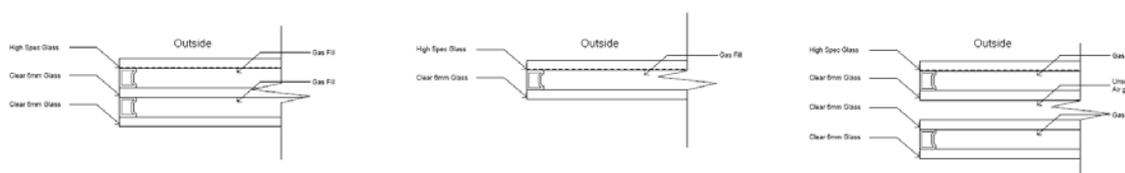


Figure 1: Glazing IGU Construction Details (a) Double, (b) Triple, (c) Quad

Glazing Type	W5 ID #	Thick (mm)	Tsol	Rsol		Tvis	Rvis		Emis		K (W/m.K)
				Front	Back		Front	Back	Front	Back	
Standard Clear	9804	6.0	0.77	0.07	0.07	0.88	0.08	0.08	0.84	0.84	1.0
Low-e + Tint	5374	7.9	0.10	0.09	0.56	0.27	0.05	0.04	0.84	0.02	1.0
Low-e	5440	7.9	0.28	0.49	0.56	0.77	0.07	0.06	0.84	0.02	1.0
Low Trans.	5832	5.8	0.10	0.08	0.33	0.11	0.07	0.30	0.84	0.63	1.0
Reflective + Tint	2751	5.6	0.12	0.63	0.44	0.17	0.6	0.56	0.84	0.84	1.0
Reflective	11049	6	0.27	0.60	0.46	0.47	0.40	0.42	0.84	0.84	1.0

Legend:

W5 ID #	Window 5 ID number	Tvis	Visible Transmittance at Normal Incidence
Thick	Thickness	Rvis	Visible Reflectance at Normal Incidence
Tsol	Solar Transmittance at Normal Incidence	Emis	Infrared Hemispherical Emissivity
Rsol	Solar Reflectance at Normal Incidence	K	Conductivity at Normal Incidence (W/m.K)

Table 10: Thermal and optical specifications for various glazing types (source: Window 5)

The main performance factors that were considered were the heat transfer through the glazing (loss and gain) and the internal temperature. The values in Chart 10 were taken from hourly data over the entire year. With regards to heat gain through the windows, all of the selected high performance glasses offer a significant improvement over the standard clear glass used in the base model. This is clearly shown in Chart 10 where even with another air fill double IGU (with reflective & tint glass) the maximum heat gain is reduced from 12.5kW to 3.1kW. Using the same glass with an argon filled quad IGU this can be reduced

further to 2.3kW. This shows that the choice of glass has a much more significant impact on reducing the solar gain than the gas type or number of layers of glass / gas. In saying this, the difference between quad and double is greater than the difference between air and argon. The glass offering the greatest reduction in heat gain is the tinted reflective glass mentioned above, followed by the tinted low-e glass.

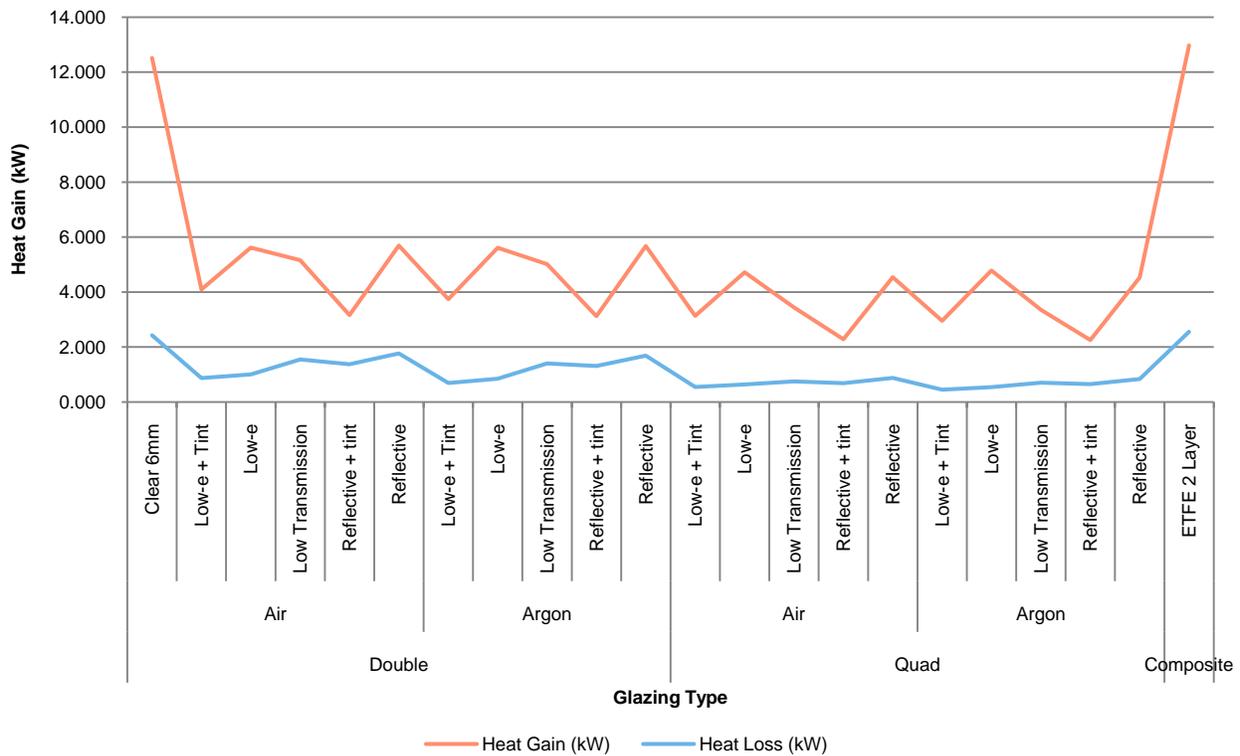


Chart 10: Maximum heat gain & loss through the glazing over entire year

As seen in Chart 10 the heat loss through the glazing is much lower than the heat gain, in the 1 – 2kW range it is still worth consideration. Here the benefits of adding more layers of glass and changing the gas fill are much more pronounced than with the heat gain, although the glass type still has a significant impact especially in the double IGUs. The tinted reflective glass which performed the best in preventing heat gain through the windows has the worst performance with reducing heat loss. The best glass for reducing heat loss through the windows is the tinted low-e glass, with the air filled IGU. It reduces the heat loss to 0.9kW compared to 2.5kW for the baseline and 1.5kW for the tinted reflective. This is reduced further to 0.45kW when the tinted low-e is used in an argon filled quad IGU.

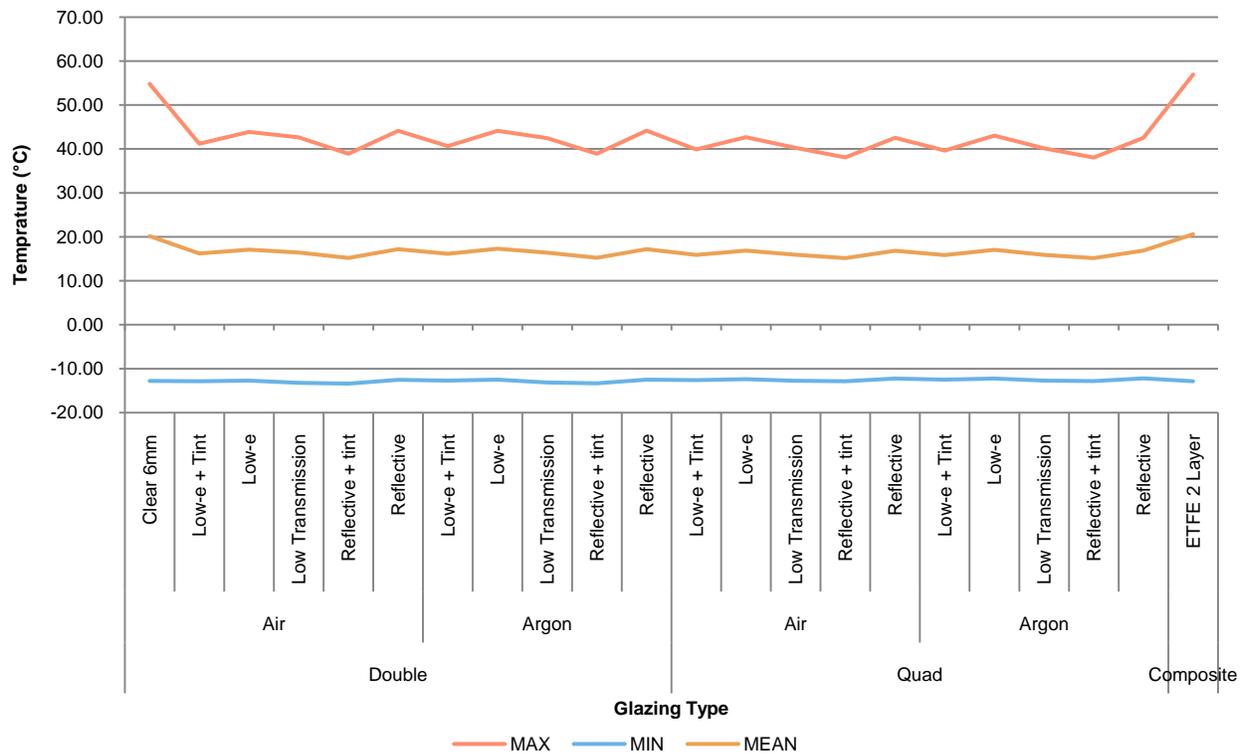


Chart 11: Annual maximum, mean and minimum internal temperature (°C) with variations in glazing type.

8.3.6.4.2 Skylight

The skylight has been identified as a major source of heat gain and loss, and was simulated separately from the windows in the following tests. Argon filled double IGUs was used in all windows and only the skylight glazing was varied. Three of the five glasses used in the initial glazing testing were used here (Low-e + Tint, Low-e, Reflective + Tint), in double, triple and quad units, each with argon and air fill giving a total of 18 variations. In addition to traditional glazing three alternative high performance overhead glazing materials have been used; Danpalon Polycarbonate, Pilkington Profilit glass channel with nanogel, and Ethyltetrafluoroethylene (ETFE) pillows. For comparison the simulations have also been performed where the skylight was replaced with a Structural Insulated Panel (SIP) of varying R-values of 2,4,6,8 and 10. Refer to Figure 2 for construction details and Table 11 for thermal and optical specifications.

All simulations have been run for the period from September 1st to October 31st unless otherwise specified (i.e. design days).

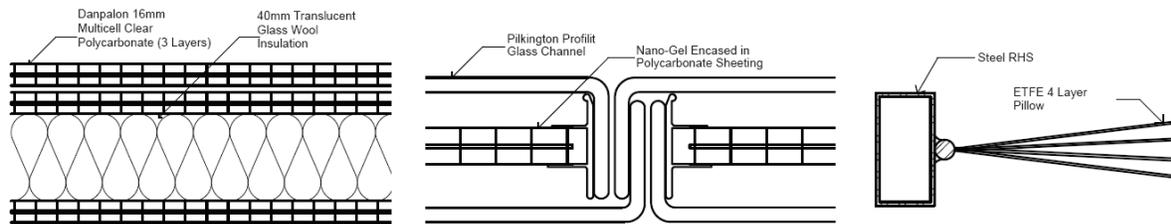


Figure 2: Composite skylight glazing construction details (a) Triple Layer Danpalon with translucent glass wool insulation, (b) Profilit glass channel with nano-gel insulation, (c) ETFE 4 layer pillow

	Tvis	SHGC	U-value
Danpalon Single	0.31	0.44	1.53
Profilit Nano-gel	0.38	0.31	0.19
ETFE 4 Layer	0.8	0.7	1.47
Danpalon Triple	0.36	0.21	0.56

Table 11: Thermal and optical properties of composite skylight glazing options

Chart 12, below shows the energy used by the HVAC system in kWh / day, this simulation was performed using the design days as defined by the weather file. As can be seen the loads for both heating and cooling stay within a 10kWh/day range for the various traditional (glass) glazing options. With regards to the composite glazing options, the cooling loads rise sharply. The most pronounced example of this is the ETFE pillow which approximately doubles the cooling load compared with the glass options. The exception to this rise is the triple layer Danpalon unit, which is in the same range (albeit the higher end) as the glass options, while removing the skylight altogether reduces the cooling load by at least 10kWh/day compared to the glass units. The heating loads for the single layer polycarbonate and the ETFE pillow are in the same range as the traditional options, whereas the nano-gel and the triple layer Danpalon reduce the heating loads to approximately 5 – 10kWh below the range of the glass options. Removing the skylight approximately halves the heating loads, this difference is much more significant than the decline in cooling loads. This suggests that the heat loss through the skylight is more significant than the heat gain, at least in terms of the impact it has on the energy demand of the HVAC system.

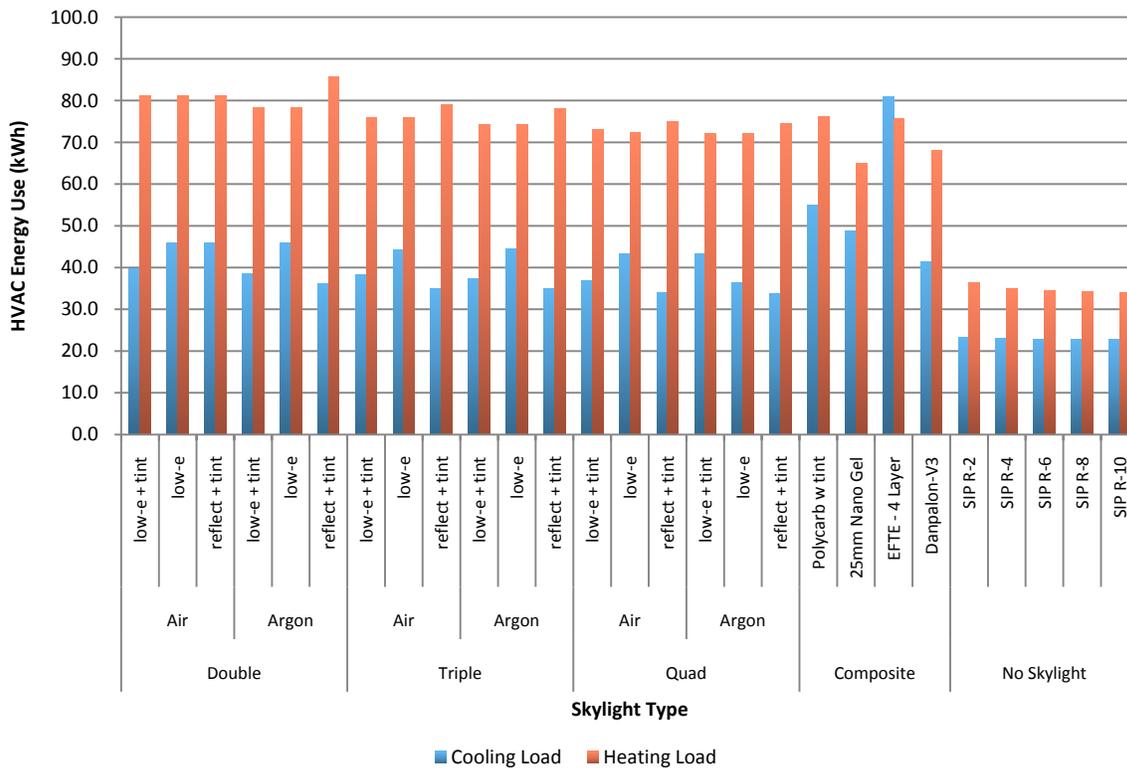


Chart 12: Skylight Constructions - Design Day HVAC Energy Use (kWh)

As with the first round of simulations, the heat gain through the glazing (windows and skylight) varies more depending on the glass type compared with changes in gas type and the number of layers in the IGU as seen in Chart 13. Amongst the glass skylight options the heat gain only varies slightly with a range of approximately 1kW (approximately 4 – 5kW). The single layer polycarbonate, nano-gel and ETFE result in significantly higher heat gain, almost double in the case of the ETFE (9.7kW peak), while the triple layer Danpalon is in the same range as the glass options. Removing the skylight altogether lowers the maximum heat gain to 3.1kW, which is the heat gain entering through all of the other glazing except the skylight. This is only 0.7kW below the best performing skylight glazing option (quad argon tinted reflective glass: 3.8kW), which suggests that there are higher levels of heat gain entering through the other windows. It should be noted that these are the maximum levels during the simulated period (September 1st - October 31st). The mean heat gains are much lower, at between 0.8 and 1.6kW, although this includes periods where there is no heat gain (mainly overnight).

As can be seen when comparing Chart 13 the heat loss is significantly lower than the heat gain, with a range between 0.8 – 1.2kW. Here it can be seen that the differences between the various glazing types are minimal, with the exception of the nano-gel which offers a comparatively significant reduction. The effects of adding argon gas and more layers to the IGU offers a comparatively more significant reduction in heat loss than heat gain. This effect is not as pronounced as in the previous round of testing which was simulated over the whole year (and therefore included the winter months where the temperature drops as low as -15°C (5°F)).

The next round of glazing simulations were conducted after local manufacturers had been contacted and the availability of various products had been established. After initial consultations it was decided that Metro Glasstech was the preferred option for supplying the insulated glazing units. The initial specification (Table 12) they provided has been simulated and the results shown in Chart 13: Maximum heat gain & loss (kW) through the glazing for the period from September 1st to October 31st.

Glazing Type	W5 ID #	Thick (mm)	Tsol	Rsol		Tvis	Rvis		Emis		K (W/m-K)
				Front	Back		Front	Back	Front	Back	
Standard Clear	9804	5.7	0.77	0.07	0.07	0.88	0.08	0.08	0.84	0.84	1.0
Argon Gas		12									0.026
ClimaGuard® Neutral 70	12042	5.7	0.558	0.18	0.13	0.75	0.05	0.07	0.17	0.84	1
Argon Gas		12									0.027
ClimaGuard® Neutral 70	12042	5.7	0.558	0.18	0.13	0.75	0.05	0.07	0.17	0.84	1

Legend:

W5 ID #	Window 5 ID number	Tvis	Visible Transmittance at Normal Incidence
Thick	Thickness	Rvis	Visible Reflectance at Normal Incidence
Tsol	Solar Transmittance at Normal Incidence	Emis	Infrared Hemispherical Emissivity
Rsol	Solar Reflectance at Normal Incidence	K	Conductivity at Normal Incidence

Table 12: Thermal and optical specifications for Metro Glasstech suggested IGU (*source: Metro Glasstech & Window 5*)

As can be seen the metro glass option performs well with regards to heat loss (better than any of the traditional glazing options previously tested), although has significantly higher heat gains at approximately 1.5 – 2.5kW above the other options.

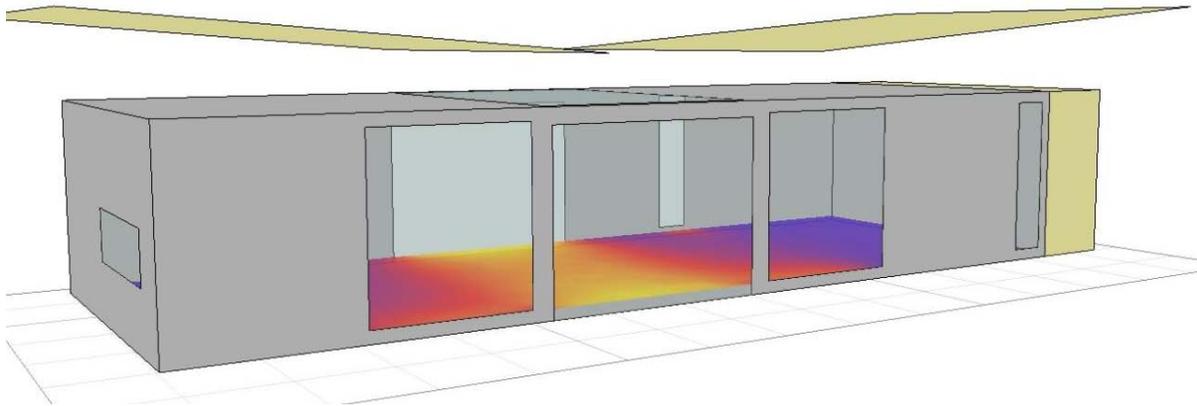


Figure 3: Daylighting Analysis - Triple Layer Danpalon Skylight

Simulations were performed using standard double glazing, Danpalon and Profilit glass channel with nano-gel, at both full size and the two thirds size, which is in the current design as specified in the thermal performance. An option was also explored where by the skylight was made up of an alternating series of solid and glazed strips with the intention of improving the thermal performance by reducing the glazed area.

8.3.7.2 THERM

Initial testing was performed in LBNL's THERM two-dimensional building heat-transfer modeling software on glazing framing members, in order to determine the heat flow paths through the various constructions and aid in specifying. A comparison was completed on a solid timber and APL thermally broken aluminum bi-fold head detail.

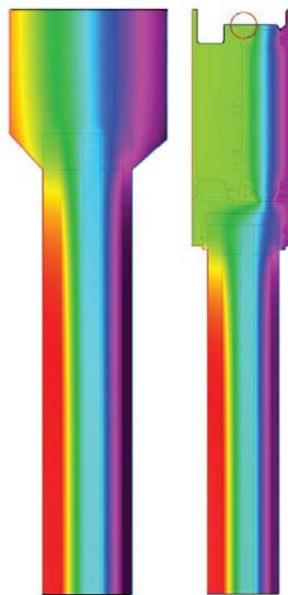


Figure 4: THERM infra-red heat transfer analysis of (a) solid timber bi-fold door head and (b) APL thermally broken aluminum bi-fold head

8.4 Final Simulations

8.4.1 Introduction

In order to predict how the building would perform; both in Washington during the competition week and in Wellington across a full year, the thermal and solar performance of the First Light House were conducted in the Energy Plus simulation software.

8.4.2 Assumptions

Computer simulation is always an abstraction of reality, it therefore requires the modeler to make several assumptions with regards to the building's construction and the way it is likely to be used once built. The main assumptions are described in the following subsections.

8.4.2.1 Construction

The final Energy Plus simulations were performed with updated construction elements, each is presented in Table 13 below. Please note that these construction details are those that were in use at the time that simulation was commenced, refer to the construction documentation drawings for current construction details.

<i>ELEMENT</i>	<i>DESCRIPTION</i>	<i>R-VALUE</i>
Walls	LVL Framing, Ecofleece Insulation, Plywood External and Internal Linings. Cedar External Weatherboards	R-5.77
Floor - Timber	LVL Joists, Ecofleece Insulation, Plywood Linings, Timber Interior Finish	R-5.88
Floor - Concrete	LVL Joists, Ecofleece Insulation, Plywood External Lining, Concrete Internal Finish	R-5.46
Roof	Plywood Framing, Ecofleece Insulation, Plywood External Lining, OSB Internal Lining	R-6.48
Glazing - Windows	6mm Metro Low-E Glass, Argon Filled, Triple Glazing, Timber Frames	R-1.11
Glazing - Skylight	6mm Metro Low-E Glass, Argon Filled, Triple Glazing, Timber Frames	R-1.11
Shading Canopy	Timber	-

Table 13: Construction R-Values used for final simulation

8.4.2.2 Heating and Internal Gains

Internal gains have been modeled within the FirstLight house according to the competition schedule for Washington and on an estimated average schedule for Wellington; based upon average occupant and appliance activity across a week. External shading from surrounding buildings and landscape has been modeled; however incidental shading from foliage has been ignored. Overhangs, balconies and other areas where the building provides shade for itself have been taken into account.

8.4.2.3 Ventilation and Infiltration

Infiltration was modeled at a rate of 0.1 Air Changes per Hour (ACH), this is if all the air in the room were replaced every ten hours through the infiltration of outside air through cracks in the building envelope,

around doors, windows and the like. Ventilation has been modeled as a variable of the HVAC system when it is on and modeled as 10ACH of natural ventilation when it is off in order to simulate opening all the doors. The HVAC systems schedule was determined by the competition schedule for Washington and was permanently on in Wellington.

8.4.2.4 Weather Information

Two types of weather files were used for the final simulations. The first type have been sourced from the US DOE Energy Plus Weather File Database. The files are based on data compiled by the New Zealand National Institute of Water and Atmospheric Research (NIWA) for simulations based in Wellington, and the US National Renewable Energy Laboratory (NREL) for Washington DC. The weather files are based on data gathered from Wellington International Airport, Wellington, and Ronald Reagan Airport, Arlington, VA, for the New Zealand and United States simulations respectively.

The NIWA files consist of hourly records for an artificial year created from twelve representative months, and the NREL files are from the Typical Meteorological Year 3 (TMY3) data set, which is made up of hourly values of solar radiation and meteorological elements for a 1-year period.

The second type was created by the FirstLight team out of weather data for Washington D.C. in each September between 1995 and 2010 sourced from the NASA database. The data for every hour of a day was then averaged and a standard deviation determined in order to create worst 5% and best 5% values for several weather variables, these weather variables include dry bulb temperature, direct solar radiation, precipitation and more. The weather values were then collated into eight different weather files, each expressing different weather phenomena. These eight weather files are

- CCS (Cold, Calm and Sunny)
- CWS (Cold, Windy and Sunny)
- CCR (Cold, Calm and Raining)
- CWR (Cold, Windy and Raining)
- HCS (Hot, Calm and Sunny)
- HWS (Hot, Windy and Sunny)
- HCR (Hot, Calm and Raining)
- HWR (Hot, Windy and Raining)

Their intended use is for computer simulations of solar energy conversion systems and building systems to facilitate performance comparisons of different system types, configurations, and locations in the United States. Because they represent typical rather than extreme conditions, they are not suited for designing systems to meet the worst-case conditions occurring at a location (design day data has been used for this purpose).

8.4.3 Results – Washington

The problem with designing a system to function perfectly over ten days is that the weather could do anything without the averaging effect gained by longer performance periods. Because of this 8 worst/best case scenario weather files were created in order to help us identify and improve on areas where the building might falter in certain atmospheric conditions.

The results of these weather file simulations on the final design can be seen in Chart 14 below. These simulations illustrate how well the building should perform with the “WASH WF” representing the Ronald Reagan Airport weather file sourced from the US DOE Energy Plus Weather File Database.

The performance of this final design is communicated in two ways, through the thermal performance (Energy Consumed) and the solar PV performance (Energy Produced).

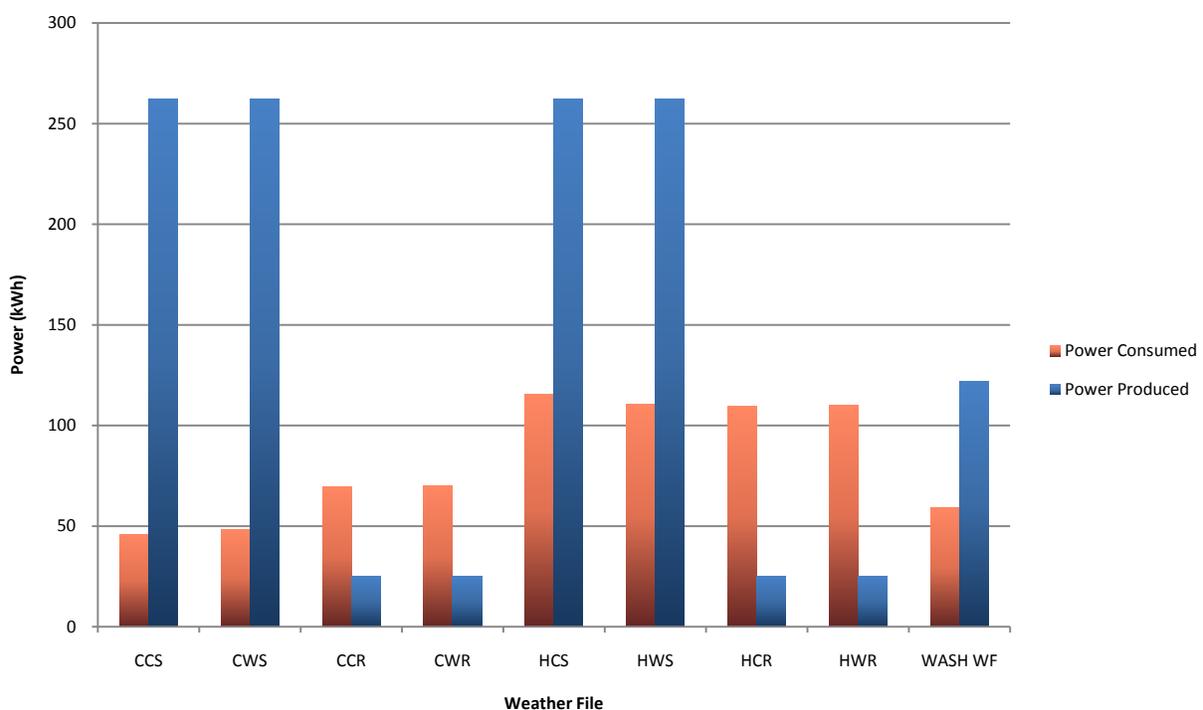


Chart 14: Power consumed and produced in kWh across the competition period for each weather file in Washington D.C.

Thermally the FirstLight house performs best in the colder temperatures of Washington's September climate resulting in less than 75kWh (CCR, CWR) across the competition days and when combined with a high level of solar radiation less than 50kWh (CCS, CWS). This is due to the colder temperatures being closer to the required temperature range as well as the larger COP (Coefficient of Performance) for heating in the heat pump. When the climate is hotter (HCS, HWS, HCR, HWR) the performance is worse however the performance is still very efficient with just over 100kWh used over the competition schedule as a worst case scenario with the averaged weather file (WASH WF) consuming a little more than 50kWh.

The FirstLight house's solar performance is best during the sunnier days in September (CCS, CWS, HCS, HWS) reaching approximately 260kWh over the course of the competition. This is in the case of CCS and CWS over five times the power consumed by the building and in the case of HCS and HWS over twice the power consumption. However on less sunny days when the solar radiation is virtually null the power produced is more than half the power consumed with only approximately 25kWh generated through the competition timeline. However the average weather files (WASH WF) solar performance is exceptional producing 120kWh over twice the power consumption.

8.4.4 Results – Wellington

Ultimately we have designed the house as a New Zealand home. Although undergoing significant thermal simulations based on the house during the competition we have always made sure that at home, in New Zealand the house meets its goals. The following simulation exhibited in Table 14 and Chart 15 quantifies the solar and thermal performance within the Wellington climate, in New Zealand.

<i>kWh PER YEAR</i>	<i>kWh PER YEAR</i>
Demand (First Light house)	3226
Demand (Average NZ House)	11,410
Produced (First Light house)	4931
Difference	1705

Table 14: Table of thermal and solar performance of final design in Wellington across an entire year

Table 12 illustrates an incredibly well performing building with the annual power demand being about a third of the average Wellington household's consumption as measured by BRANZ (Building Research Association of New Zealand) in their 2010 HEEP Report. This coupled with the PV panels generating 1705kWh of extra energy makes the FirstLight house perfectly constructed for the Wellington climate.

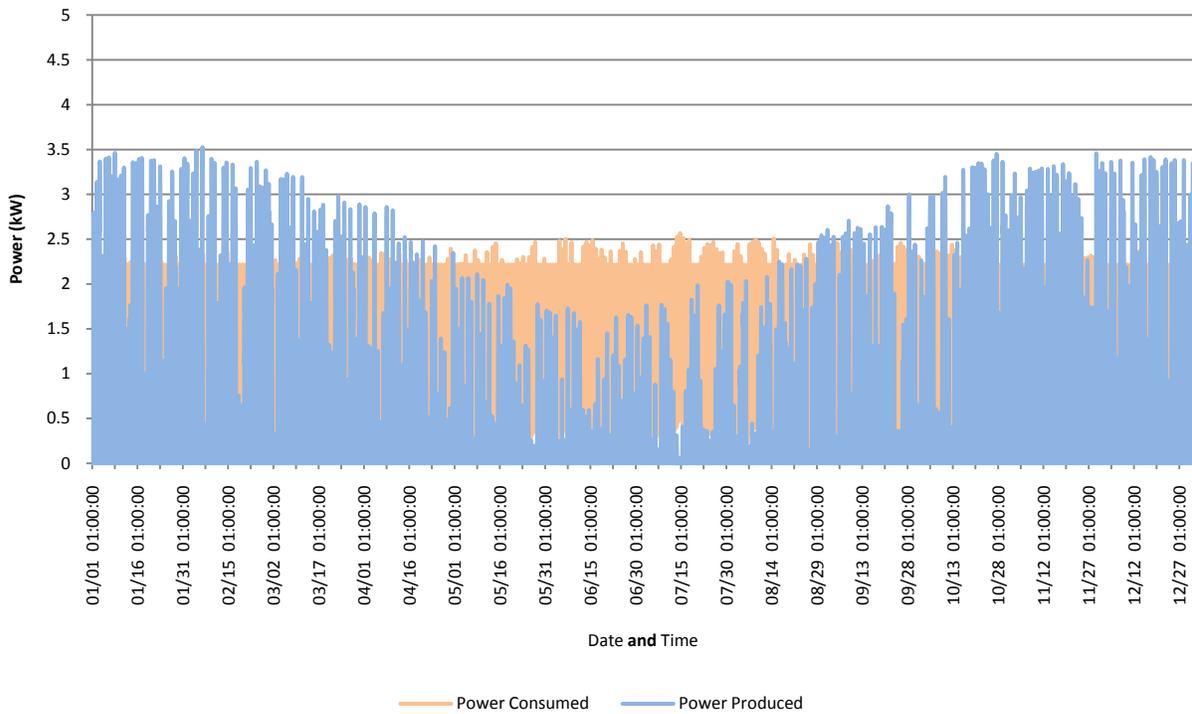


Chart 15: Hourly power consumption and generation in kW for a full year in Wellington

Chart 15 goes into further detail on the buildings performance across the year. From the chart it can be seen that the power produced over summer; approximately 3.5kW, is easily in excess of the power consumed; approximately 2.5kW. During the winter months however the power generated drops to a rate of at most 2kW while the energy consumption remains unchanged at 2.5kW. This ultimately results in the net energy gain exhibited in Table 14 of 1705kWh.

8.5 Mechanical

8.5.1 Introduction

Through comprehensive thermal modeling we have developed a high performing thermal envelope designed specifically for both the climate in Washington DC during the comp and through four seasons in New Zealand. This will reduce our reliance on mechanical forms of heating and cooling but will also improve their efficiency.

Through simulation we have shown that during a year in New Zealand, in order to maintain a comfortable internal temperature the system will use very little energy. The biggest loads that we have had to design for are cooling during the competition in DC. This creates an interesting challenge where we have had to design a system to meet two quite different demands.

We have made a specific effort to design a system that is simple and affordable, that utilizes off the shelf products where possible. This helps to keep costs down, and also allows easier maintenance in the long term.

8.5.2 System Design

8.5.2.1 Overview

The domestic hot water, as well as the hot water to power the hydronic dryer will be provided by Evacuated tube solar thermal collectors. This solar hot water system will be supplemented by an air to water heat pump, for periods of low solar insolation.

Space heating, cooling and ventilation in the First Light house are provided by a ducted, reverse cycle heat pump in conjunction with a fresh air energy recovery ventilator.

The Energy Recovery Ventilator (ERV) functions by drawing extract air from the house where it is passed through the Lossnay's core. Here the useful energy is recovered before the air is expelled to the exterior. Fresh, outdoor air is then drawn in and filtered, before being passed through the core where it is preheated or cooled as required by the recovered energy from the return air.

The output air from the Lossnay feeds the input air to the heat pump indoor unit where it is further heated or cooled as required. The air is then distributed to several outlet grilles throughout the house via the supply air duct in the services bulkhead.

The use of the Lossnay minimizes the energy demand of the heat pump by reducing the difference between the input air temperature and the required output temperature, while at the same time ensuring there is ample fresh air ventilation.

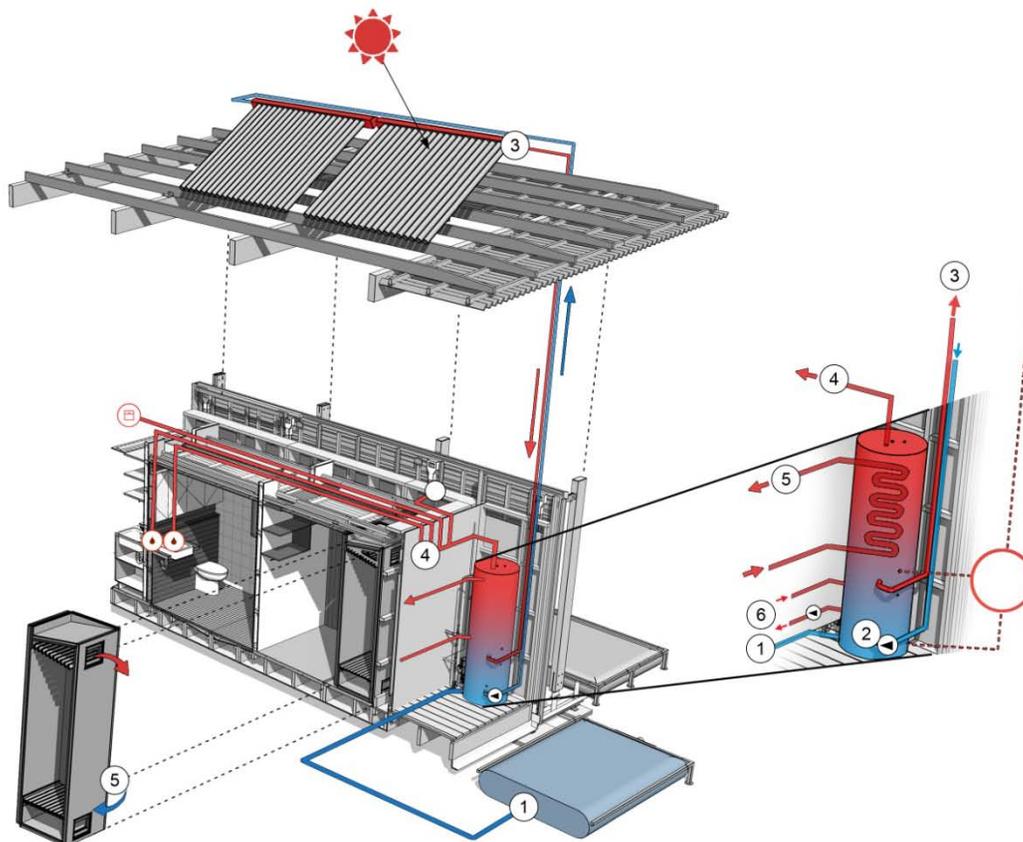
Figure 5: HVAC Overview Isometric (M-901)

8.5.3 Solar Collectors

Hot water accounts for 29% of the average energy use of New Zealand home. High levels of sunshine throughout the whole of New Zealand and dramatically improving solar hot water technology is making solar hot water an accessible, convenient and affordable way of reducing energy use in NZ homes.

The hot water system in the First light house is designed to function as follows:

- (1) Fresh water from the supply water tank is pumped into the bottom of the hot water tank
- (2) A 360 liter, super insulated hot water tank stores the hot water generated by the solar panels
- (3) 40 Evacuated tubes harness, free solar energy to heat up water, as the heat pipes within the tubes heat up a solar controller senses the rise in temperature and pumps water up to the canopy to be heated
- (4) A hot water manifold supplies hot water to the house, via separate hot water lines running to each outlet.
- (5) A closed loop hot water circuit pumps water to a hydronic drying room where fresh air is heated in order to quickly & efficiently dry clothing and towels
- (6) A air to water heat pump provides back up heating for the system for periods of low sunshine



8.5.3.1 Evacuated tubes

The first Light house has an evacuated tube solar hot water system that harness, free solar energy to heat up water quickly and effectively even on cloudy days. The evacuated tubes have a vacuum that acts as a super efficient heat trap. Heat pipes located within the evacuated tubes then conduct the heat trapped within the tube to the header to heat water, providing clean, free hot water to the house anytime of the day or night.



The copper heat pipes are evacuated and attached to aluminum nitrate heat fins that maximize solar energy absorption and heat transfer. On sunny days, these heat fins and heat pipe can exceed 150°C very quickly. As the heat is conducted to the top of the solar panel, a solar controller senses the rise in temperature and pumps the water to the panel on the canopy to be heated. The heated water is then circulated back to the storage hot water cylinder and through the house.

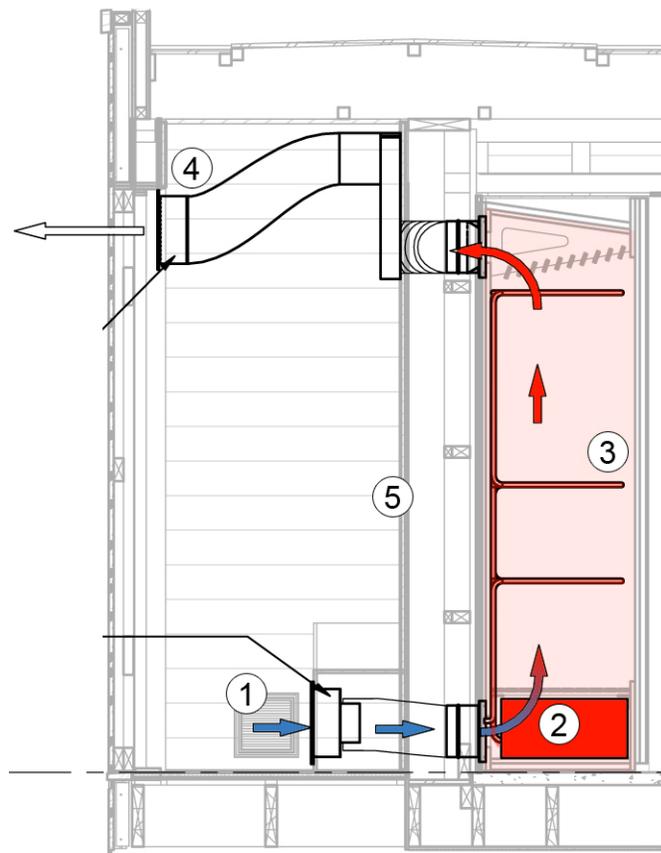
8.5.3.2 Hydronic drying cupboard

The drying cupboard uses hot water heated by the sun to dry clothing and towels. Development of the hydronic drying room has been progressing alongside the design of the house. We realized at an early stage the energy saving potential of using hot water from the sun to dry clothing. Using ideas that have been around for decades we have developed a efficient drying room that will dry 6 path towels in 2 hours. The only energy consumed in the process is the power needed to run two small fans, a pump.



The following is a brief explanation of how it works:

- (1) A small 60W fan draws in air from the outside
- (2) The air is passed through a heat exchanger at the base of the dryer. Hot water, heated by the sun is passed through the heat exchanger heating the air as it passes by.
- (3) Towels, hung on heated copper towel rails dry as warm air rises within the drying cupboard
- (4) A small exhaust air fan made from a recycled computer fan helps to draw out the warm air from inside the dryer to the outside
- (5) A programmable logic controller (PLC) controls the flow of air and water inside the drying room. A sensor inside the drying room provides information to the controller about temperature and humidity. Using this information it controls air flow and temperature within the cupboard to maximize the drying potential and minimize drying time. The drying room also acts as a heat dump during periods of high solar insolation or in case the temperature in the tank reaches 90 degrees Celsius. It is a way of releasing some of the energy to safe and manageable levels without losing all of the heat.



8.5.3.3 Drying room testing results

6 x Towels drying using 80degrees

Waterinlet

Test Drying time:

2.0hrs

AIR IN			
Hum rel. (%)	50		
Temp (°C)	20		
Pressure (mm Hg g)	8.1		
mm Hg	768.1		
mm Wg	110		
Q (m3/h) Sat. air	132	0.037 m3/s	
		0.011309	
Duct Dia. (m)	0.12	7 m2	
dry air flow (kg/s)	0.04407		
	0.000317		
steam flow (kg/s)	3		
	0.158660		
Air (tph)	2		
	0.001142		
Water (tph)	2		
	0.159802		
Total tph	4		
PVS (T*)	17.576	Partial Pressure - Dry bulb	
PV (mm Hg)	8.788	Partial Pressure	
W (Hum. Spec.)	0.007	kgv/kgas	
V(m3ah/kgas)	0.832		
Q (m3/h) Sat. air	132	2.2 m3/min	
		77.6 CFM	
		0.011309	
Duct Dia. (m)	0.12	7 m2	
Veloc. (m/s)	3.2		
Towel Weight (6 units)	5.7 kg		
% Water contained	37%		
Water contained	2.100 kg		
Drying Time	1.3 Hrs		
	80.1 Min.		
Heat Input	1.5 kW		
Water Inlet @ 80°C	2.5 LPM		

dT	8.00	°C	
AIR OUT			
Hum rel. (%)	36.7		
Temp (°C)	41.9		
Pressure (mm Hg g)	8.1		
mm Hg	768.1		
mm Wg	110		
Q (m3/h) Sat. air	132	0.037	m3/s
		0.011309	
Duct Dia. (m)	0.12	7	m2
dry air flow (kg/s)	0.04027		
	0.000754		
steam flow (kg/s)	1		
	0.144985		
Air (tph)	9		
	0.002714		
Water (tph)	8		
	0.147700		
Total tph	7		
PVS (T*)	61.218	Partial Pressure - Dry bulb	
PV (mm Hg)	22.447	Partial Pressure	
W (Hum. Spec.)	0.019	kgv/kgas	
V(m3ah/kgas)	0.910		

TEST 1

Room Temperature	20	°C
Room Humidity	50	%
Water Temp supply	80	°C
Water Temp return	72	°C
Water flow LPM	2.5	LPM
Pump Power Required (min. speed)	0.045	kW/hr
Fan Air Flow	132	m3/min
Towels initial weight	5.7	kg
Towels final weight	3.6	kg
Water removed after 1.5hr	2.1	kg
	T °C	H %
Box temp/Hum after 0.5hr	39	48
Box temp/Hum after 1hr	41	35
Box temp/Hum after 1.5hr	45.6	27
Average	41.9	36.7

HOT WATER GENERATION

Objetives :

DHW

1) It is required to provide 57Litre of hot water at 43°C, 16 times a week, this means 131L a day.

Dishwasher

2) There will be 5 loads of dishes per week, 8L of hot water at 55°C per load

Dryer

3) It is required to dry 48 towels in a week, an average of 7 towels per day

DOMESTIC WATER GENERATION

Notes: 1) The Table bellow represent a daily hot water generation required at 43°C (minimum). This is carry out mixing 15°C fresh water with water heated by Solar.

2) Depending of sun conditions, the tank temperature will be between 45°C to 90°C, the higher the temperature, the lower the volume required

DHW

Water Temperature (°C)

Volume Required (L)

	45	50	60	70	80	90
	123	105	82	67	57	49

COLD WATER

Water Temperature (°C)

Volume Required (L)

	15	15	15	15	15	15
	8.8	26.3	49.8	64.6	75.3	82.3

Water Required at 43°C (L)

132	131	132	132	132	131
-----	-----	-----	-----	-----	-----

Energy Required
Time

4.3	kWh
1.0	Hr

Note: Minimum energy required to achieve minimum temp. & flow requirement

DISHWASHER

Water Required at 48.9°C

8 L

Note: Per load as per manufacturer (Fisher & Paykel, 6 place setting)

Energy Required

0.3	kWh
-----	-----

Note: Minimum energy required to achieve minimum temp. & flow requirement

CLOTHES DRYER

Water Required at 45°C (min.)

3.5 LPM

- (5) Specially designed air diffusers throw air over the space creating a comfortable living environment throughout the entire space
- (6) A portion of the air from inside the house is drawn back out through a return air duct which reconditions and circulates back through the house, a smaller portion of air is extracted and replaced with fresh incoming air which maintains a comfortable and healthy indoor environment no matter what the season

8.5.4.2 Heat pump

This system was chosen as it allows greater flexibility and control compared to a standard indoor unit. This flexibility allows multiple outlets throughout the space so as to achieve a more consistent internal temperature. There is also an aesthetic advantage to this in that there is only a small grille for each outlet, as opposed to a large indoor unit typically found in domestic heat pump installations. Utilizing a ducted system also allows integration with the ERV as previously mentioned. This is crucial for reducing the energy consumption of the heat pump while at the same time ensuring there is adequate fresh air ventilation.

The heat pump output is rated at 7.1kW for cooling and 8.0kW for heating, with a rated input of 2.48kW and 2.47kW respectively, resulting in a coefficient of performance (COP) of 2.86 for cooling and 3.24 for heating. The unit is capable of airflow in the range of 367-450l/s (97 – 119 gallons/s) or 9.71 – 11.25 ACH. This is well within the requirements as determined with the thermal simulations

8.5.4.3 ERV

In order to maintain a healthy and comfortable indoor air quality it is necessary to introduce a certain amount of fresh outdoor air. This air is often significantly cooler or warmer than the internal conditioned temperature and thus requires significant energy to bring it to the required temperature. The purpose of the ERV is to precondition this air using energy from the exhaust air from the space. This occurs in a heat exchanger, which allows the transfer of sensible and latent heat from the return air to the supply air. It does this without contaminating the supply air with the moisture and pollutants that may be present in the stale return air.

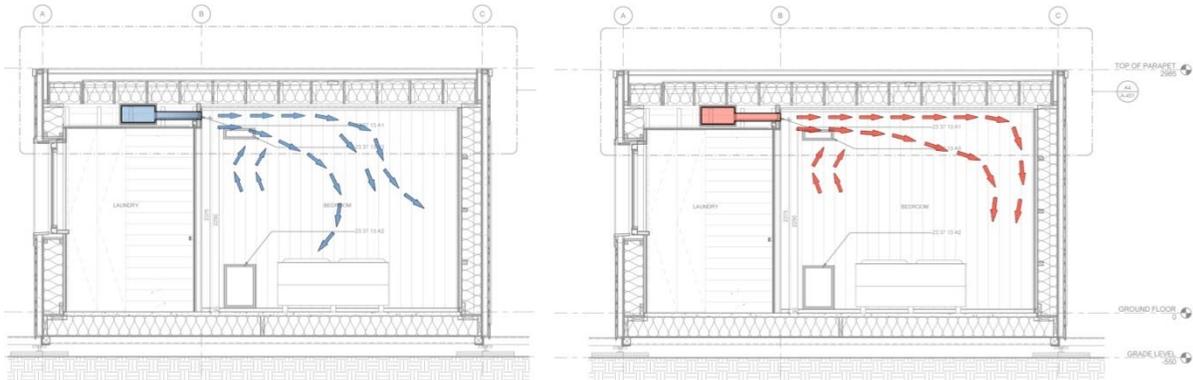
The ERV is to be a Mitsubishi Electric Lossnay, model LGH-25RX₅-E, which has an airflow capacity of 105 - 250 m³/h (3708 – 8829 ft³/h) and a power consumption of 56 - 129 W.

The ERV functions by drawing extract air from the house where it is passed through the Lossnay's core. Here the useful energy is recovered before the air is expelled to the exterior. Fresh, outdoor air is then drawn in and filtered, before being passed through the core where it is preheated or cooled as required, by the recovered energy from the return air.

The output air from the ERV feeds the input air to the heat pump indoor unit where it is further heated or cooled as required. The air is then distributed to several outlet grilles throughout the house.

The use of the Lossnay minimizes the energy use of the heat pump by reducing the difference between the input air temperature and the required output temperature, while at the same time ensuring there is ample fresh air ventilation.

Air distribution

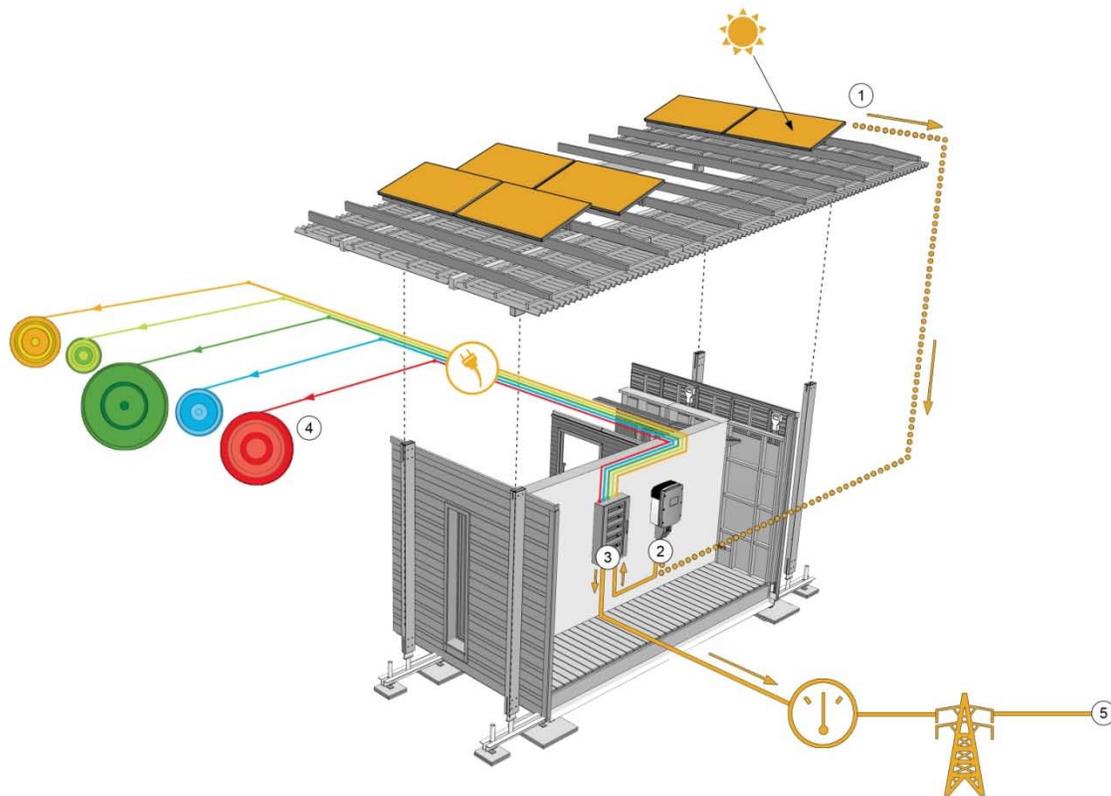


The size, location and the direction of the air diffusers that distribute air to the space has been specifically designed to get maximum throw across the space and a consistent temperature throughout the entire room. By locating the diffusers close to the ceiling we have maximized the systems effect in cooling, as we expect this will be the major load that we experience during the competition.

HVAC Controller

During the test assembly of the house here in New Zealand we spent a large amount of time developing the logic for the control of the HVAC system. A centralized building management system, discussed below, acts as the brains of the system controlling the temperature and humidity, making sure that it is always within the comfort bracket outlined for the competition. The system can be controlled via a simple and easy to use touch screen interface that has been specifically designed for the competition.

8.6 Electrical



8.6.1 Introduction

The design of the electrical system in the house required special attention, due to the differences in the systems in New Zealand and the United States; this is in addition to the special requirements of having a grid connected PV system.

Rather than using a bidirectional electricity meter the house will be supplied with 230V 50Hz (as per New Zealand standard) via a 40kVa voltage frequency converter supplied by the competition organizers. The power produced by the house shall be supplied to the micro grid at 120V 60Hz (as per the United States standard) from the photovoltaic modules via a United States inverter. For the competition this supply system is to be independent of the electrical system in the house (refer to construction documentation drawings E-601 – E-602).

Upon return to New Zealand the US inverter will be replaced with New Zealand inverters (240V 50Hz), these will feed into the distribution board, in place of the competition micro grid. Refer to construction documentation drawing E-602 for details.

Figure 6: Electric details isometric (E-901) showing inverter, distribution board and meter housings

8.6.2 Demand and Production Loads

The energy consumption of the house has been calculated using the completion schedule, energy use data from manufactures and simulation results to determine the total energy use per day and over the course of the competition period. This data is in turn used for sizing the photovoltaic (PV) system in combination with solar radiation data.

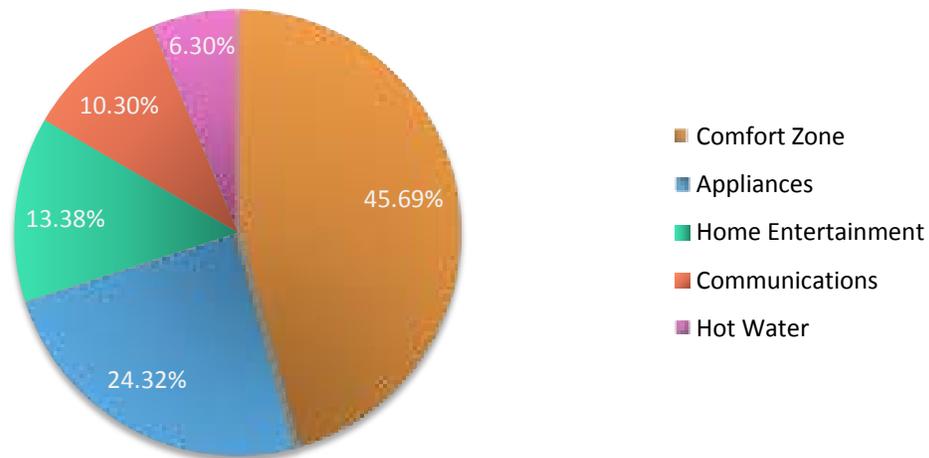


Chart 16: Summary of total electricity consumption over competition period

Due to the extreme variability in solar radiation levels it was deemed necessary to determine the level at which the risk of insufficient insolation levels was acceptable, while ensuring the system was not unnecessarily over sized. This was achieved using a statistical analysis of historic solar radiation data for Washington D.C. during the month of September for the years 1995-2005.

This data was analyzed and the average amount of energy produced was determined along with the standard deviation. The average amount of solar radiation data was found to be $3.7\text{kWh/m}^2/\text{day}$. The standard deviation was found to be $0.59\text{kWh/m}^2/\text{day}$. Using the average and standard deviation, a probability density function was generated (refer to Figure 7). The total area under this curve is equal to one. This means that all of the possibilities for energy production are contained in this graph. The peak on the graph occurs at the average of $3.78\text{kWh/m}^2/\text{day}$.

Using the average, standard deviation, a z-table and Equation 1 below, the probability that the energy produced would be at or above a certain level could be determined. A z-table provides the area under the curve between two standard deviations. For example, the area between -3.9 standard deviations and zero standard deviations is 0.5. This is the same as saying the area under the curve between the Z-score of -3.9 and zero is 0.5. With the total area being one this means that between $0\text{ kWh/m}^2/\text{day}$ and the average of $3.78\text{kWh/m}^2/\text{day}$ 50% of all the possible amounts of solar radiation are contained. This also means there is a 50% chance that the amount of solar radiation the PVs are exposed to is less than $3.78\text{ kWh/m}^2/\text{day}$.

$$Z = \frac{X - U}{\sigma}$$

Where:

$X = kWh/m^2/day$ where $0 < X \leq \infty$

$U = average = 3.78kWh/m^2/day$

$\sigma = standard\ deviation = 0.59kWh/kW\ of\ PV$

Equation 1: Standard score formula

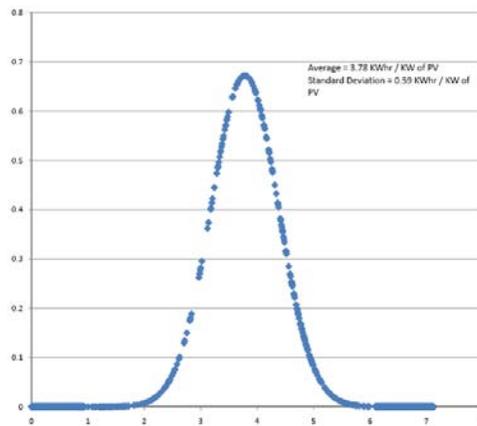


Figure 7: Probability density function

Initial PV sizing calculations were performed assuming a solar radiation level $2.8 kWh/m^2/day$. This value was entered into the formula above and the z-score was calculated to be -1.66 . Using the Z-table and finding 1.66 , it was determined that there was a 4.85% chance that the incident solar radiation levels are less than necessary, it was therefore decided to maintain this level.

8.6.3 System Design

8.6.3.1 DC side

8.6.3.1.1 PV's

Integral to a solar house are the photovoltaic modules, providing all of the necessary electricity. The Photovoltaic system for the First Light house is made up of 28 Mitsubishi Electric polycrystalline silicon 225Wp photovoltaic modules (PV-UJ225GA6) arranged in 2 strings of 14 modules. One of the reasons these panels have been chosen is they have a relatively high power rating per module, resulting in fewer modules. In addition to this these modules, unlike most, are rated highly for use in coastal areas. This may be important for the house upon return to New Zealand as the coast is central to the idea of the “kiwi bach”.

In order to determine the spacing between the PV modules several calculations and simulations were performed including a shadow study in Autodesk's Ecotect Analysis software. Refer to Figure 8: Solar

panel shading study – September 25, for an example conducted for September 25, clearly showing that the modules will remain un-shaded for the entire day.

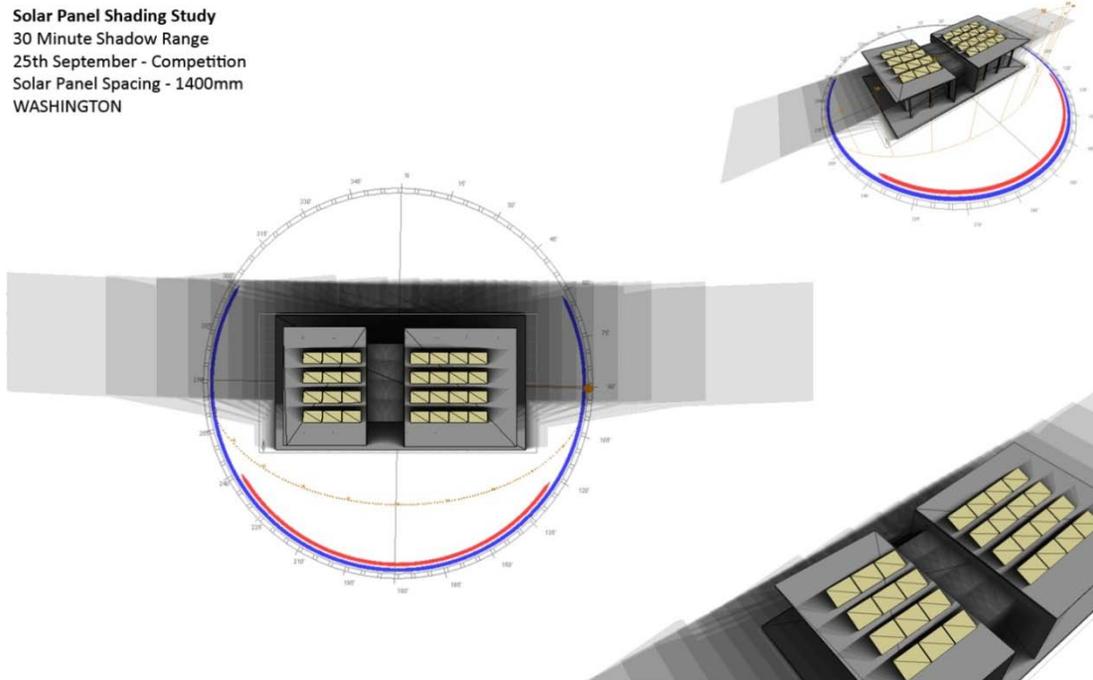


Figure 8: Solar panel shading study – September 25

8.6.3.1.2 Inverters

As outlined in section 8.6.1, above, different inverters will be used on the National Mall in Washington DC than in New Zealand due to the differing power systems used by the two countries. In the U.S. one 6kW SMA Sunny Boy 6000 inverter will be used, converting the direct current (DC) supply from the PV arrays to 110V 60Hz alternating current (AC) as required by the completion organizers. This AC supply will be fed into the completion micro-grid through a meter. This solution has been used rather than using a bi-directional voltage frequency converter which could not be easily sourced nor guaranteed to provide an uninterrupted electricity supply. In New Zealand the DC supply from the PV arrays will be converted to 240V 50Hz AC by two 3kW Enasolar inverters, which will feed directly into the distribution board.

8.6.3.2 AC side

8.6.3.2.1 Connection & Distribution

In the U.S. the First Light house electricity will come from the competition micro grid, via an organizer supplied voltage frequency converter so that the house can operate on a New Zealand standard electricity system of 240V at 50Hz. Each individual circuit from the distribution board is monitored using branch circuit power meters (BCPM). This allows comprehensive monitoring and control as detailed below in Section 8.7.1.4.

Electrical wire conventions in the U.S. and in New Zealand differ, therefore a combination of approaches have been taken to ensure the house complies with building codes and regulations in both countries. Throughout the house minimum 2.5mm² three-core wiring will be used to comply with U.S. standards, as opposed to the 1.5mm² required in New Zealand. The colors of wires also differ; refer to Table 15 for a comparison of NZ and US wire colors. In order to avoid confusion wires at entrance and exit points from the house will be taped to match the US standard.

	New Zealand	United States
Phase	Red	Black / Red
Neutral	Black	White
Earth	Green with yellow stripe	

Table 15: NZ – US electrical wire color conversion matrix

Power and lighting control circuits will be supplied to each module on multi-core cable, and connected with 19pin socapex connectors. This allows the electrical system to be connected quickly and safely during the assembly period, while still allowing separate circuits for control and monitoring. Refer to drawing E-101 for details.

8.6.3.2.2 Outlets and Lighting

Standard New Zealand socket outlets have been used throughout the house, although the lighting circuits are operated by push button controls. This simplifies the design of lighting circuits which span multiple modules by allowing the circuit to be controlled by a relay switch at the distribution board. Using push button controls also avoids confusion, as New Zealand rocker switches operate the opposite way to US switches (down on up off in NZ). In order to simplify use and encourage the users of the house to reduce their power consumption there will be a lighting kill switch. This will allow all of the lighting in the house to be switched off simultaneously, but lights need to be switched on individually in a normal manner. This has been implemented in part due to the house being designed as a “bach” (holiday home), and therefore potentially being uninhabited for prolonged periods.

8.7 Monitoring and Control

8.7.1 BMS

In order to control and monitor the operation of the house a Building Management System (BMS) will be utilized, primarily with regards to the Domestic Hot Water (DHW), Heating Ventilation Air conditioning (HVAC) and electricity generation and use. The First Light house will utilize a Schneider Electric Magelis all in one unit with touch screen interface. This provides a single integrated control solution for all of the components rather than having an array of separate controllers. This simplifies the user experience while de-cluttering the interior which integrates the technology in a subtle and functional way. There will be more extensive automatic control for the competition than will be used upon return to New Zealand. This

is due to the tight control required for the measured contests, as opposed to the humanized, user orientated system desired for the New Zealand market.

8.7.1.1 *Hot water*

The BMS compares the temperature in the hot water storage tank with that in the solar collector, when there is sufficient solar gain it activates a pump to circulate heated water from the collector to the hot water cylinder. It also provides frost protection by activating the pump if the temperature at the collectors falls below a certain level.

The Thermagenius air to water heat pump is fully integrated with the solar hot water system. It activates when there is insufficient solar radiation to heat the hot water and the tank temperature falls below a certain point.

8.7.1.2 *Heat Pump*

During the competition the heat pump will be scheduled to operate according to the measured periods for the comfort zone competition. The control of the heat pump will be via temperature and relative humidity sensors placed throughout the house. The BMS will also determine whether the heat pump draws its air from the return air, or the exterior via the ERV as detailed below in Section 8.7.1.3.

Upon return to New Zealand the user will have direct control over the operation and temperature set point of the heat pump. This will allow the freedom and flexibility to open up the house to the outdoors, which is central to the philosophy of the house and the kiwi lifestyle.

8.7.1.3 *ERV*

The ERV will be tightly controlled by the BMS both in the US and in New Zealand. It will be used only when necessary to introduce fresh air to the space. It will be used when it is beneficial from an efficiency perspective to utilize outdoor air rather than return air, and also for dehumidification, as determined by a relative humidity sensor in the return air duct.

8.7.1.4 *Electricity*

The electricity supply coming into the house, as well as use on each individual circuit, will be monitored by branch circuit power meters (BCPM), allowing a detailed breakdown of how much power is being used, and what it is being used for. The Inverter will also be monitored providing information on generation levels and efficiency.

8.7.2 *Energy Use Visualization*

The energy meter interface research team at Victoria University has designed an interface that more concretely visualizes and emotionally represents energy use. The aim of this interface is to help the user conceptualize in tangible and everyday terms, the significance of the energy that they are using. Tangible understanding of energy will help incentivize users to actively engage in the task of reducing energy use. The interactive monitoring system is focused on the domestic market, focusing on humanizing the technology and simplifying the process for monitoring the home and allowing for the possibility that house appliance monitoring can be retrofitted to existing infrastructure.



9 CONSTRUCTION SPECIFICATION

9 CONSTRUCTION SPECIFICATION

1. SECTION 05 12 00 – STRUCTURAL STEEL FRAMING

1. GENERAL

SECTION INCLUDES

Structural steel framing members, support members, base plates, connections and bolts.

1. 05 12 00.A1 - 100X100X10MM EA FOUNDATION BEARER
2. 05 12 00.A2 - 100X100X100X10 EA FOUNDATION BRACING STRUT. BOLT FIXED THROUGH BOTTOM FLANGE TO FOUNDATION BEARER
3. 05 12 00.A3 - 10MM STEEL CONNECTION PLATE WELDED TO FOUNDATION BEARER
4. 05 12 00.A4 - 10MM STEEL PLATE
5. 05 12 00.A5 - 75X100X10MM UA FOUNDATION OUTRIGGER.
6. 05 12 00.A6 - 160X50X10MM STEEL SUPPORT PLATE
7. 05 12 00.A7 - 50X50X4MM SHS CANOPY POST SUPPORT
8. 05 12 00.A8 - 50X50X4MM SHS STEEL ADJUSTABLE INSERT
9. 05 12 00.A9 - STEEL SCAFFOLD SCREW JACK NUT
10. 05 12 00.A10 - 230X160X10MM STEEL POST CONNECTION PLATE
11. 05 12 00.A12 - ADJUSTABLE STEEL SCAFFOLD SCREW FOOTING
12. 05 12 00.A13 - 65X65X5MM SHS STEEL FOUNDATION SLEEVE PACKER
13. 05 12 00.A14 - 100X100X10MM EA FOUNDATION BEARER CONNECTON ANGLE

RELATED SECTIONS

Section 05 50 00 – Metal Fabrications

Section 09 97 13 – Steel Coatings

REFERENCES

2. AISC, Section 10 - Architecturally Exposed Structural Steel of AISC - Standard Practise for Steel Buildings and Bridges.
3. ASTM A36/A36M-08 - Carbon Structural Steel.
4. ASTM A53/A53M-07 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
5. ASTM A108-07 - Steel Bar, Carbon and Alloy, Cold-Finished.
6. ASTM A123/A123M-09 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
7. ASTM A153/A153M-09 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

8. ASTM A242/A242M-04e1 - High-Strength Low-Alloy Structural Steel.
9. ASTM A307-07b - Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
10. ASTM A325-09 - Structural Bolts, Steel, Heat Treated.
11. ASTM A500/A500M-09 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
12. ASTM A514/A514M-05(2009) - High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
13. ASTM A568/A568M-09a - Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.
14. AWS (American Welding Society) A2.1-DC - Welding Symbol Chart.
15. AWS (American Welding Society) D1.1/D1.1M-2008 - Structural Welding Code - Steel.
16. CAN/CGSB-1.40-97 - Anti-corrosive Structural Steel Alkyd Primer.
17. CAN/CGSB-85.10-99 - Protective Coatings for Metal.
18. CAN/CSA-G40.20-04/G40.21-04 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
19. CSA-S16-09 - Design of Steel Structures.
20. CISC - Code of Standard Practice - Manual of Steel Construction - Allowable Stress Design (ASD).
21. CSA-W47.1-09 - Certification of Companies for Fusion Welding of Steel Structures.
22. CSA-W48-06 - Filler Metals and Allied Materials for Metal Arc Welding.
23. CSA-W55.3-08 - Certification of Companies for Resistance Welding of Steel and Aluminum.
24. CSA-W59-03 - Welded Steel Construction (Metal Arc Welding).

SUBMITTALS FOR REVIEW

25. Shop Drawings: Indicate profiles, sizes, spacing, locations of structural members, attachments, fasteners.

SUBMITTALS FOR INFORMATION

26. Manufacturer's Mill Certificate: Certify that Products meet or exceed requirements.

27. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.

QUALITY ASSURANCE

28. Fabricate structural steel members to CISC Code of Standard Practice, an, CSA-W59, AWS D1.1/D1.1M.
29. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
30. Welders' Certificates: Submit certifying welders employed on the Work, verifying qualification within the previous twelve (12 months) to CSA-W59, AWS D1.1/D1.1M.
31. Verify dimensions against site measurements prior to fabrication. For existing structures, verify grade of steel and dimensions against site measurement.

2. PRODUCTS

MATERIALS

1. Structural Steel Members: CAN/CSA G40.20/G40.21 Grade 300W unless otherwise noted.
2. Structural Steel Members: ASTM A36/A36M.
3. Structural Tubing: ASTM A500/A500M.
4. Pipe: ASTM A53/A53M, Grade B.
5. Shear Stud Connectors: ASTM A108.
6. Bolts, Nuts, and Washers: ASTM A325 bolts. Galvanized to ASTM A123/A123M for galvanized structural members and to A153/A153M .
7. Anchor Bolts: ASTM A307.
8. Welding Materials: Type required for materials being welded.
9. Shop and Touch-Up Primer: Manufacturer's standard, complying with SSPC-Paint 15.
10. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type II - Organic.

FABRICATION

11. Fabricate structural steel to CSA-S16 and in accordance with reviewed shop drawings.

12. Seal joined members by continuous welds. Grind exposed welds smooth.
13. Fabricate connections for bolt, nut, and washer connectors.
14. Develop required camber for members.

FINISH

15. Clean, prepare surfaces, and shop prime structural members to CAN/CSA-S16 and CAN/CGSB-85.10, except as noted below.
16. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
17. Galvanize structural steel members to ASTM A123/A123M. Provide minimum 1.25 oz/sq ft galvanized coating.

3. EXECUTION

1. EXAMINATION

1. Verify existing conditions before starting work.

2. ERECTION

1. Erect structural members to CSA-S16.
2. Perform welding: to CSA-W59 or AWS D1.1/D1.1M.
3. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
4. Do not field cut or alter structural members without approval of Consultant.
5. After erection, prime welds, abrasions, and surfaces not shop primed, galvanized, except surfaces to be in contact with concrete.

3. FINISHING

1. Grind off burrs and sharp arrises.
2. Remove oil and grease by the use of solvents

3. Clean to bright metal, but avoid producing a polished surface. Select grit type and equipment such that the cleaned surface profile between peaks and valleys does not exceed one third of the dry film thickness.
4. Touch up all damaged surfaces and exposed surfaces without shop coat, with primer to CAN/CGSB-1.40.

4. ERECTION TOLLERANCES

1. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION 05 12 00

2. SECTION 05 50 00 – METAL FABRICATIONS

GENERAL

SECTION INCLUDES

1. This section relates to the fabrication and installation of metallic items of a general nature, including:
 1. 05 50 00.A2 - 63.5X31.75X4.763MM UA1563 ALUMINIUM CHANNEL
 2. 05 50 00.A3 - 50.8X34.92X3.175MM UA1562 ALUMINIUM CHANNEL
 3. 05 50 00.A12 - CLADDING WALL CHANNEL TYPE C06
 4. 05 50 00.A14 - CLADDING WALL CHANNEL TYPE C08
 5. 05 50 00.B10 - 6MM STAINLESS STEEL PLATE
 6. 05 50 00.C01 - 10MM STEEL FOUNDATION PLATE
 7. 05 50 00.C03 - 50 X 50 X 3MM STAINLESS STEEL ANGLE BRACKET (40MM WIDTH). ENGINEER TO SPECIFY FIXINGS
- 2.

RELATED SECTIONS

3. Section 03 41 00 – Precast Structural Concrete
4. Section 05 05 23 – Metal Fastenings
5. Section 05 12 00 – Structural Steel Framing
6. Section 09 97 13 – Steel Coatings

REFERENCES

7. ASTM A53/A53M-07 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
8. ASTM A153/A153-09 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
9. ASTM A307-07b - Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
10. ASTM A500/A500M-09 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
11. ASTM A501-07 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
12. ASTM B177- 01 - Engineering Chromium Electroplating.

13. ASTM B209-07 - Aluminum and Aluminum-Alloy Sheet and Plate.
14. ASTM B210-04 - Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
15. ASTM B211-03 - Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
16. ASTM B221-08 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
17. CAN/CGSB-1.40-97 - Anti-corrosive Structural Steel Alkyd Primer.
18. CAN/CGSB-1.181-99 - Ready-Mixed, Organic Zinc-Rich Coating.
19. CAN/CSA-G40.20-04/G40.21-04 (R2009) - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
20. CSA-W47.1-09 - Certification of Companies for Fusion Welding of Steel Structures.
21. CSA-W47.2-M1987 (R2009) - Certification of Companies for Fusion Welding of Aluminum.
22. CSA-W48-06 - Filler Metals and Allied Materials for Metal Arc Welding.
23. CSA-W55.3-08 - Certification of Companies for Resistance Welding of Steel and Aluminum.
24. CSA-W59-03 (R2008) - Welded Steel Construction (Metal Arc Welding).
25. CSA-W59.2-1991(R2008) - Welded Aluminum Construction.
26. SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.

SUBMITTALS FOR REVIEW

Samples of finish

Submit samples on request of finish offered.

Shop drawings

Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

Indicate welded connections using standard welding symbols. Indicate net weld lengths.

QUALITY ASSURANCE

27. Welders' Certificates: Submit certifying welders employed on the Work, verifying qualification within the previous twelve (12) months to CSA-W47.1 (steel), CSA-W47.2 (aluminum) CSA-W55.3.
28. Welded Steel Construction: CSA-W59.

29. Welded Aluminum Construction: CSA-W59.2.
30. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located.

2. DELIVERY, STORAGE, AND PROTECTION

1. Do not deliver any elements to the site which cannot be unloaded immediately into suitable storage conditions.

PRODUCTS

MATERIALS

Steel sections and Plates: CAN/CSA-G40.20/G40.21, Grade 300W.

Steel Pipe: ASTM A53/A53M, Grade A Schedule 40, standard weight, black finish.

Steel Tubing: ASTM A500/A500M, Grade B ; ASTM A501, black finish.

Aluminum sheets and extrusions to ASTM B209-07.

Screws, Bolts, Nuts, and Washers: ASTM A307, galvanized to ASTM A153/A153M for galvanized components, Grade 316 stainless steel components used when suitable for work and locations.

Screws: Self-tapping with head, length, guage and thread to suite work and location.

Welding Materials: Type required for materials being welded.

Welding Filler Material: CSA-W48.

Shop and Touch-Up Primer: CAN/CGSB-1.40; SPCC-Paint 15.

Touch-Up Primer for Galvanized Surfaces: CAN/CGSB-1.181 zinc rich; SSPC-Paint 20, Type II – Organic.

FABRICATION TOLERANCES

2. Squareness: 1/8 inch maximum difference in diagonal measurements.
3. Maximum Offset Between Faces: 1/16 inch.
4. Maximum Misalignment of Adjacent Members: 1/16 inch.
5. Maximum Bow: 1/8 inch in 4 ft.

6. Maximum Deviation From Plane 1/16 inch in 4 ft.

FINISHES – STEEL

7. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
8. Do not prime surfaces in direct contact with concrete or where field welding is required.
9. Do not prime surfaces in direct contact with concrete or where field welding is required.
10. Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M. Provide minimum 2.0 oz/sq ft galvanized coating.
11. Non-structural Items: Galvanized after fabrication to ASTM A123/A123M. Provide minimum 1.25 oz/sq ft galvanized coating.
12. Chrome Plating: ASTM B177, weight, nickel-chromium alloy, satin, polished finish.

3. FINISHES – ALUMINUM

1. Finish coatings to conform to AAMA 603.
2. Exterior Aluminum Surfaces: AAMA A41 anodized, prepared with a chemical pre-treatment; colour as selected.
3. Interior Aluminum Surfaces: Hardcoat anodized, to 0.0007 inch thickness; colour as selected.
4. Apply two (2) coats of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

EXECUTION

4. EXAMINATION

1. Verify that field conditions are acceptable and are ready to receive work.
2. Verify dimensions, tolerances, and method of attachment with other work.
3. Cold formed work to be free from warping, buckling and fractures. Form bends with a brake press or by cold rolling.

5. PREPARATION

1. Clean and strip primed steel items to bare metal where site welding is required.

2. Supply steel items required to be cast into concrete with setting templates to appropriate sections.

6. INSTALLATION

1. Install items plumb and level, accurately fitted, free from distortion or defects.
2. When assembled, all moving parts must move freely and without binding.
3. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
4. Field weld components indicated.
5. Remove all burrs and sharp arises which would be visible after fixing, or a hazard to the user.
6. Perform field welding to CSA requirements.
7. Unless specified otherwise, mitre junctions of identical sections.
8. Obtain approval prior to site cutting or making adjustments not scheduled.
9. After erection, prime welds, abrasions, and surfaces not shop primed, galvanized, except surfaces to be in contact with concrete.
10. Bed in mastic all mechanical joints of elements which will be located externally, including all mating surfaces, cleats and other fixings.
11. Elements must not carry any structural load unless designed to do so. Do not use as strutting or support when in place.
12. Isolate dissimilar materials (metal and non-metal) in close proximity as necessary by painting the surfaces or fitting separator strips. Place isolators between metals and treated timber and cement-based materials.
13. Welding of steel:
 1. Use one of the following methods:
 1. Gas welding
 2. Metal-arc welding
 3. Projection welding
 4. Seam welding
 5. Other methods subject to approval.
 2. Prevent weld spatter falling on surfaces of materials which will be self finished and/or visible in completed work.

3. Finish butt welds which will be visible in completed work smooth and flush with adjacent surfaces.

7. ERECTION TOLERANCES

1. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
2. Maximum Offset From True Alignment: 1/4 inch.
3. Maximum Out-of-Position: 1/4 inch.

CLEANING

Ensure all elements are free of marks or blemishes, with all moving parts working fully and freely.

Remove all debris, unused materials and elements from the site.

END OF SECTION 05 12 00

3. SECTION 06 05 23 – WOOD FASTENINGS

1. GENERAL

1. SECTION INCLUDES

1. Pre-engineered metal connectors used to support a wood, plated truss, or composite wood member(s) from a concrete, masonry, steel, wood, or composite wood supporting member(s).

2. RELATED SECTIONS

1. Section 05 12 00 – Structural Steel Framing
2. Section 05 50 00 – Metal Fabrications
3. Section 06 11 00 – Wood Framing
4. Section 06 15 13 – Wood Floor Decking
5. Section 06 16 00 - Sheathing

3. REFERENCES

1. ASTM A36 – Carbon Structural Steel
2. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
3. ASTM A193-B7 – Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
4. ASTM A307 – Carbon Steel Bolts and Studs
5. ASTM A500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and shapes
6. ASTM A625 – Tin Mill Products, Black Plate, Single Reduced
7. ASTM A653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
8. ASTM A706 – Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
9. ASTM A924/A 924M – General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip process
10. ASTM A1011 – Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

11. ASTM F1667 – Driven Fasteners: Nails, Spikes, and Staples
12. ASTM D1761 – Standard Test Methods for Mechanical Fasteners in Wood

4. DELIVERY, STORAGE, AND HANDLING

1. Deliver products to job site in manufacturer's or distributor's packaging undamaged, complete with installation instructions.
2. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration

2. PRODUCTS

1. ACCESSORIES

1. Fasteners and Anchors:
 1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 2. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
2. Corrosion risks: Use stainless steel fixings, connectors, etc in all zones, with the timber treatments CuAz (Preservative code 58) and ACQ (Preservative code 90).
3. Structural Framing Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
4. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

3. EXECUTION

1. FABRICATION

1. Shop assembly to occur per the manufacturer's approved production drawings.
2. Fabrication tolerances per manufacturer.

2. TESTING

1. Allowable loads published in manufacturer's catalogue to be determined using the minimum load from the static and/or cyclic analysis and one or more of the following test methods:
 1. Static load tests in wood assemblies.
 2. Static load tests in steel jigs.

3. Cyclic or static load tests in wood assemblies (Anchor tiedown system).
2. Testing to determine allowable loads shall be performed as per ICBO Acceptance Criteria¹³ and/or ASTM D1761.
3. Allowable loads for hangers are determined by a static load test resulting in not more than a 1/8" deflection of the joist relative to the header, or the lowest test ultimate load divided by 3, or the fastener allowable load as determined by the NDS, whichever is lower.
4. Testing shall be conducted under the supervision of an independent laboratory.
5. Manufacturer to provide code testing data on all products that have been code tested upon request.

3. FIELD QUALITY CONTROL

1. Determine that the proper part is being used in correct application and has been fabricated by the approved manufacturer by observation of the stamp into the metal part and/or the adhesive label on the product denoting part and manufacturer name.
2. Before substituting another brand, confirm load capacity based on published testing data. The engineer/designer shall evaluate and give written approval for substitution prior to installation.

4. INSTALLATION

1. Unless otherwise noted in the manufacturer's catalogue, bolts and nails shall not be combined.
2. Galvanized connectors should not be placed in contact with treated wood unless the treated wood is adequately verified to be suitable for such contact. Some wood treatments may accelerate metal deterioration. See wood material supplier for specific recommendations.
3. The screws must be overdriven. Fasteners installed in preservative-treated wood shall have corrosion protection in accordance with recommendations of the evaluation report holder.
4. Built-up lumber (multiple members) must be fastened together to act as one unit to resist the applied load.

END OF SECTION 05 12 00

4. SECTION 06 10 00 – WOOD FRAMING

GENERAL

SECTION INCLUDES

This section relates to the supply and erection of timber framing and engineered wood products as a framed structure, for the walls, floors and roof of the modules of the First Light House.

1. 06 15 13.A2 - 90X21MM DECKING TIMBER
2. 06 15 13.A4 - 100X50MM ROUGH SAWN TIMBER JOISTS
3. 06 15 13.A6 - 50X50MM TIMBER HALF JOIST
4. 06 15 13.A7 - 100X45MM TRIMMING JOIST
5. 06 11 00.A1 - 75X19 CEDAR SLATS AT 100MM CENTRES FIXED TO 65X35MM BATTENS.
CONSTRUCTED IN PANELISED SYSTEM FOR ONSITE ASSEMBLY.
6. 06 11 00.A2 – 90 x 45MM TIMBER SUPPORT STUD
7. 06 11 00.A8 - 30X45MM TIMBER BLOCKING
8. 06 11 00.A9 - 90 X 25 CAVITY BATTEN PERMANENTLY FIXED TO LVL TOP PLATE
9. 06 11 00.B2 - 70X45MM TIMBER STUD
10. 06 11 00.B3 - 70X45MM HORIZONTAL TIMBER
11. 06 11 00.B4 – 70X45MM TIMBER TOP PLATE
12. 06 11 00.B5 – 70X45MM TIMBER BOTTOM PLATE
13. 06 11 00.B8 - 140X45MM TIMBER LINTEL
14. 06 11 00.B9 - 140X45MM TIMBER STUD
15. 06 11 00.B10 - 140X45MM HORIZONTAL TIMBER
16. 06 11 00.B11 - 140 X 45 TIMBER BLOCKING BETWEEN FLOOR JOISTS
17. 06 11 00.C1 - 240X45MM LVL TRIMMING JOIST
18. 06 11 00.C2 - 240X45MM LVL WALL STUD
19. 06 11 00.C3 - 240X45MM TIMBER SILL
20. 06 11 00.C4 - 240X45MM TIMBER HEAD
21. 06 11 00.C5 - 240X45MM TIMBER BLOCKING
22. 06 11 00.C6 - 240X45MM LVL FLOOR JOIST
23. 06 11 00.C7 - 240X45MM TIMBER TOP PLATE
24. 06 11 00.C8 - 190X45MM LVL TRIMMING JOIST
25. 06 11 00.C9 – 190X45MM BLOCKING
26. 06 11 00.C12 - 240X45MM LVL WALL STUD AT MODULE EDGE
27. 06 11 00.D1 - 240X45MM LVL FLOOR JOISTS
28. 06 11 00.D1 - 240X45MM LVL FLOOR JOISTS AT 500 MAX CENTRES NOTCHED 50 X 185MM AT DOOR SILL.

29. 06 11 00.D3 - 100X63MM LVL NOGS. 2 MULTI GRIPS EACH END CUT TO SHOWER FALLS
30. 06 11 00.D9 - 420X69MM PLYWOOD BOXBEAM: 45X45MM TIMBER TOP AND BOTTOM CHORDS. 45X45MM TIMBER STIFFENERS @ 400MM CENTRES. 12MM PLYWOOD WEBS
31. 06 11 00.D10 - 360X87MM PLYWOOD BOXBEAM: 63X45MM LVL TOP AND BOTTOM CHORDS. 63X100MM LVL STIFFENERS @ 1200MM CENTRES. 12MM PLYWOOD WEBS.
32. 06 11 00.F1 - 90X45 TIMBER WALL STUD
33. 06 11 00.F2 - 90X45MM TIMBER BOTTOM PLATE
34. 06 11 00.F3 - 90X45MM TIMBER TOP PLATE
35. 06 11 00.F4 – 90X45MM TIMBER LINTEL
36. 06 11 00.F5 - 35X25 INTERMEDIATE TIMBER PANEL BACKER
37. 06 11 00.F6 - 90X45 TIMBER BLOCKING
38. 06 11 00.F7 - 90X90MM TIMBER EDGE BLOCK
39. 06 11 00.F8 - 45° BRACING STRUT - 90 X 40MM
40. 06 11 00.F9 - 240 X 45MM LVL ROOF BEAM
41. 06 11 00.G1 - 45X45MM HORIZONTAL TIMBER
42. 06 11 00.G2 - 45X45MM BLOCKING TIMBER
43. 06 11 00.G3 - 45X45MM TIMBER STUD
44. 06 11 00.G4 - 45X45MM TIMBER PLYWOOD BOX BEAM TOP CHORD
45. 06 11 00.G5 - 45X45MM TIMBER PLYWOOD BOX BEAM BOTTOM CHORD
46. 06 11 00.G6 - 45X45MM CONTINUOUS TIMBER
47. 06 11 00.G7 - 45X45MM CLEAR BLOCKING
48. 06 11 00.G8 - 45X25MM INTERNAL TIMBER CAVITY BATTENS
49. 06 11 00.G9 - 45X25 VERTICAL INTERNAL TIMBER CAVITY BATTENS
50. 06 11 00.G10 – 45X25MM HORIZONTAL INTERNAL TIMBER CAVITY BATTENS
51. 06 11 00.G11 - 100 X 25MM VERTICAL BLOCKING
52. 06 11 00.H1 - 210X30MM TIMBER WINDOW SILL
53. 06 11 00.I1 - 63X45MM LVL PLYWOOD BOX BEAM TOP CHORD
54. 06 11 00.I2 - 63X45MM LVL PLYWOOD BOX BEAM BOTTOM CHORD
55. 06 11 00.I3 - 63X100MM LVL STIFFENERS
56. 06 11 00.I4 - 420X69MM INSULATED PLYWOOD BOX BEAM - 45X45 TIMBER TOP AND BOTTOM CHORDS, 12MM PLY WEBS
57. 06 11 00.I5 - 340 X 114MM INSULATED PLYWOOD BOX BEAM - 2(45X90) TIMBER TOP CHORD AND 45 X 90 BOTTOM CHORD, 12MM PLY WEBS
58. 06 11 00.N1 - 2 (100 X 45MM) DRESSED TIMBER RAFTERS

RELATED SECTIONS

Section 06 05 23 - Wood Fastenings

Section 06 15 13 - Wood Floor Decking

Section 06 16 00 – Sheathing

Section 06 18 00 – Glue Laminated Construction

Section 07 13 00 - Sheet Waterproofing

Section 08 14 00 - Wood Doors

Section 08 52 00 - Wood Windows

REFERENCES

CSA-O80 Series-08 - Wood Preservation

CSA-O86-09 - Engineering Design in Wood

CSA-O141-05 - Softwood Lumber

CSA- S347-99(R2009) - Method of Test for Evaluation of Truss Plates Used in Lumber Joints

CSA-O325-07 - Construction Sheathing

Preservative treatment: US Spec 061100 (NZ Spec-3821)

NLGA (National Lumber Grades Authority) - Standard Grading Rules for Canadian Lumber

AWPA (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process

ULC (Underwriters Laboratories of Canada) - List of Equipment and Materials for
Building materials
Fire Resistance
Firestop Systems and Components

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

MANUFACTURER'S DOCUMENTS

JNL documents relating to work in this section are:

LVL product brochure

Copies of the above literature are available from Junken NZ Ltd

Web: www.jnl.co.nz

Email: sales@jnl-ms.co.nz

Telephone: +64 6 370 0650

Facsimile: +64 6 370 0653

ENVIRONMENTALLY SUSTAINABLE DESIGN

The building has been designed using Environmentally Sustainable Design principles. These range from minimizing energy and water consumption, considering user comfort, utilising material that use recycled content and/or can be recycled, using materials that have low particulate emissions and VOC ratings, considering the embodied energy in materials specified and selecting materials that have certification with environmental agencies. In all cases ESD principles shall be used for product selection and wherever possible and practicable ESD products shall be specified.

Products and materials specified shall not be substituted unless the alternative product meets or exceeds the ESD objectives of the original product.

Sustainable timber

All timber and composite timber products used in the building and construction works are required to be sourced from either, or a combination of, the following:

Post-consumer re-used timber; or

Forest Stewardship Council (FSC) certified timber

Where FSC certified timber is used certification receipts or evidence shall be kept.

Wherever such systems/materials are available and meet technical requirements:

Adhesive/sealant materials and other finishes shall be waterbased low VOC.

Timber treatment alternatives to timber with CCA or LOSP to be used (eg CuAz copper azole and ACQ alkaline copper quaternary).

All timber shall be from certified sustainable sources, eg:

Forestry Stewardship Council

Programme for endorsement of Forest Certification

The 'Eco Timber' trademarked scheme

Harvested under MAF sustainable management plans or permits

QUALITY ASSURANCE

2. Perform Work in accordance with the following agencies:
 1. Lumber Grading Agency: Certified by NLGA.
3. Design structural engineered wood under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the place where the Project is located.
4. Lumber to be grade stamped. If grade stamping is not present, submit manufacturer's certificate certifying that products meet or exceed specified requirements.

2. DELIVERY, STORAGE, AND PROTECTION

1. Protect materials from warping or other distortion by stacking in vertical position.
2. Protect all timber against damage and from inclement weather. Ensure that any variation in moisture content is kept to a minimum, before and after erection and before enclosure.

PRODUCTS

LUMBER MATERIALS

Lumber Grading Rules: NLGA.

Framing lumber: for joists, studs, structural and non structural, Species: Pinus Radiata, No 2 or better SPF grade; maximum moisture content of 14% prior to preservative treatment.

Finish: square gauged.

Engineered Lumber products: LVL and Glue Laminated members.

ACCESSORIES

Fasteners and Anchors:

Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

Corrosion risks: Use stainless steel fixings, connectors, etc in all zones, with the timber treatments CuAz (Preservative code 58) and ACQ (Preservative code 90).

Die Stamped Connectors: hot dipped galvanized steel.

Structural Framing Connectors: Stainless steel, sized to suit framing conditions.

Subfloor Glue: APA AFG-01 waterproof of water base, air cure type, cartridge dispensed.

Building Paper: Spun bonded polyethylene.

Termite Shield: Galvanized sheet steel.

PRESERVATIVE TREATMENT

3. Wood Preservative (Pressure Treatment): CSA-O80 [US Spec 061100] (NZ Spec-3821). Series using water borne preservative.

1. *TPA spec 1.1 CuAz or ACQ*
2. *Copper Azole [from Coppers Arch] or*
3. *ACQ [from Osmose NatureWood]*

4. Wood Preservative (Surface Application): US Spec 061100 (NZ Spec-3821). Clear.

5. CCA and LOSP treatments are NOT permitted.

EXECUTION

FRAMING

6. Set structural members level and plumb, in correct position.
7. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing/
8. Place horizontal members, crown side up.
9. Construct load bearing framing members' full length without splices.
10. Double members at openings Space short studs over and under opening to stud spacing.
11. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists. Frame rigidly into joists.
12. Fit solid blocking and bridging at ends of members.
13. Coordinate installation of wood decking, glue laminated structural units.
14. Fix to steelwork with bolts and washers or approved proprietary fastenings at not less than 2 fixings to each member, and to engineering specific design.
15. Do not use steel timber connectors and fixings on any structural framing exposed to view unless detailed on the drawings.
16. Position and fix all necessary members for the fixing of all services, fittings, fixtures, edges of linings or claddings, and to provide lateral support to load carrying framing
17. Separate all timber framing timbers from concrete, by:
 1. a full length polyethylene damp-proof membrane overlapping timber by at least 6mm; or
 - a 12mm minimum free draining air space

Framing moisture content

Maximum allowable equilibrium moisture content (EMC), for framing to which linings are attached.

At construction: 18% EMC maximum.

At lining: 14% EMC maximum.

DPC to Timber: Refer to Section 07 26 00 – Vapour Retarder

SITE APPLIED WOOD TREATMENT

18. Apply preservative treatment to manufacturer's written instructions.
19. Brush apply two (2) coats of preservative treatment on wood including cut ends.
20. Allow preservative to dry prior to erecting members.

3. ERECTION TOLERANCES

1. Permissible deviations from established lines, grades and dimensions equal to or less than the following. Multiples of given limits are not cumulative.
 1. Deviation in plan, up to 10 metres, 5mm.
 2. Deviation in plan, over 10 metres, 10mm total.
 3. Deviation from horizontal, up to 10 metres, 5mm.
 4. Deviation from horizontal, over 10 metres, 10mm total.
 5. Deviation from vertical position per 3 metres, 3mm.
 6. Deviation from horizontal and vertical, within openings, 3mm.
2. Refer also to Engineer's structural tolerance requirements.

SCHEDULES

3. Roof Sheathing, plywood, roof joists, LVL members: Preservative treated to H3.2 hazard classification.
4. Wall floor structure members, blocking plywood: preservative treated to H3.2 hazard classification.
5. Sub floor lumber: preservative treated to H4 Hazard Classification.
6. Interior wall lumber, bathroom plywood: preservative treated to H1.2 Hazard Classification (Boron).
7. All engineered strand board members in ceiling of main area: Untreated.
8. Exterior Decking materials: untreated

CLEAN UP

Clean up timber framing as the work proceeds so no off-cuts, chips, sawdust or any other matter or items remain behind the claddings or linings.

Remove

Remove debris, unused materials and elements from the site.

END OF SECTION 05 12 00

5. SECTION 06 15 13 – WOOD FLOOR DECKING

1. GENERAL

1. SECTION INCLUDES

1. This section relates to the supply and erection of timber framing and decking timbers for the exterior decking and associated structure.
 1. 06 15 13.A1 - 90X45MM BLOCKING TIMBER
 2. 06 15 13.A2 - 90X21MM DECKING TIMBER
 3. 06 15 13.A3 – 45X45MM BLOCKING TIMBER
 4. 06 15 13.A4 – 90X45MM TIMBER JOISTS
 5. 06 15 13.A5 – 140X45MM TIMBER JOISTS
 6. 06 15 13.A6 – 45X45MM TIMBER HALF JOISTS
 7. 06 15 13.A7 – 90X45MM TIMBER TRIMMING JOISTS
 8. 06 15 13.A8 – 90X45MM TIMBER END JOISTS
 9. 06 15 13.A9 – 75X45MM COASTAL PLANTER SUPPORT TIMBER
 10. 06 15 13.B1 - PANELISED 25 X 140MM DECKING TIMBERS
 11. 06 15 13.B2 - 140 X 45MM TIMBER TRIMMER

2. RELATED SECTIONS

This specification is to be read in conjunction with the following sections:

1. Section 06 05 23 - Wood Fastenings
2. Section 06 11 00 - Wood Framing

3. REFERENCES

Documents referred to in this section are:

1. CSA-O80 Series-08 - Wood Preservation
2. CSA-O141-05 - Softwood Lumber
3. CSA- S347-99(R2009) - Method of Test for Evaluation of Truss Plates Used in Lumber Joints
4. Preservative treatment: US Spec 061100 (NZ Spec-3821)
5. NLGA (National Lumber Grades Authority) - Standard Grading Rules for Canadian Lumber
6. AWWA (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process
7. ULC (Underwriters Laboratories of Canada) - List of Equipment and Materials for
 1. Building materials
 2. Fire Resistance
 3. Firestop Systems and Components
8. Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

4. ENVIRONMENTALLY SUSTAINABLE DESIGN

The building has been designed using Environmentally Sustainable Design principles. These range from minimizing energy and water consumption, considering user comfort, utilizing material that use recycled content and/or can be recycled, using materials that have low particulate emissions and VOC ratings, considering the embodied energy in materials specified and selecting materials that have certification with environmental agencies. In all cases ESD principles shall be used for product selection and wherever possible and practicable ESD products shall be specified.

Products and materials specified shall not be substituted unless the alternative product meets or exceeds the ESD objectives of the original product.

Sustainable timber

All timber and composite timber products used in the building and construction works are required to be sourced from either, or a combination of, the following:

Post-consumer re-used timber; or

Forest Stewardship Council (FSC) certified timber

Where FSC certified timber is used certification receipts or evidence shall be kept.

Wherever such systems/materials are available and meet technical requirements:

Adhesive/sealant materials and other finishes shall be waterbased low VOC.

Timber treatment alternatives to timber with CCA or LOSP to be used (eg CuAz copper azole and ACQ alkaline copper quaternary).

All timber shall be from certified sustainable sources, eg:

Forestry Stewardship Council

Programme for endorsement of Forest Certification

The 'Eco Timber' trademarked scheme

Harvested under MAF sustainable management plans or permits

QUALITY ASSURANCE

1. Perform Work in accordance with the following agencies:
 1. Lumber Grading Agency: Certified by NLGA.
2. Lumber to be grade stamped. If grade stamping is not present, submit manufacturer's certificate certifying that products meet or exceed specified requirements.

5. DELIVERY, STORAGE, AND PROTECTION

1. Protect materials from warping or other distortion by stacking in vertical position.
2. Protect all timber against damage and from inclement weather. Ensure that any variation in moisture content is kept to a minimum, before and after erection and before enclosure.

2. PRODUCTS

LUMBER MATERIALS

Lumber Grading Rules: NLGA.

Framing and decking lumber: for joists, studs, structural and non structural, Species: Pinus Radiata, No 2 or better SPF grade; maximum moisture content of 14% prior to preservative treatment.

Finish: square gauged.

ACCESSORIES

Fasteners and Anchors:

Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

Corrosion risks: Use stainless steel fixings, connectors, etc in all zones, with the timber treatments CuAz (Preservative code 58) and ACQ (Preservative code 90).

Die Stamped Connectors: hot dipped galvanized steel.

Structural Framing Connectors: Stainless steel, sized to suit framing conditions.

PRESERVATIVE TREATMENT

1. Wood Preservative (Pressure Treatment): CSA-O80 [US Spec 061100] (NZ Spec-3821). Series using water borne preservative.
 1. *TPA spec 1.1 CuAz or ACQ*
 2. Copper Azole [from Coppers Arch] or
 3. *ACQ [from Osmose NatureWood]*
2. Wood Preservative (Surface Application): US Spec 061100 (NZ Spec-3821). Clear.
3. CCA and LOSP treatments are NOT permitted.

3. EXECUTION

FRAMING

1. Set structural members level and plumb, in correct position.
2. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing/
3. Place horizontal members, crown side up.
4. Construct load bearing framing members' full length without splices.
5. Fit solid blocking and bridging at ends of members.
6. Coordinate installation of wood decking, glue laminated structural units.
7. Fix to steelwork with bolts and washers or approved proprietary fastenings at not less than 2 fixings to each member, and to engineering specific design.
8. Do not use steel timber connectors and fixings on any structural framing exposed to view unless detailed on the drawings.
9. Position and fix all necessary members for the fixing of all services, fittings, fixtures, edges of linings or claddings, and to provide lateral support to load carrying framing

SITE APPLIED WOOD TREATMENT

10. Apply preservative treatment to manufacturer's written instructions.
11. Brush apply two (2) coats of preservative treatment on wood including cut ends.
12. Allow preservative to dry prior to erecting members.

2. ERECTION TOLERANCES

1. Permissible deviations from established lines, grades and dimensions equal to or less than the following. Multiples of given limits are not cumulative.
 1. Deviation in plan, up to 10 metres, 5mm.
 2. Deviation in plan, over 10 metres, 10mm total.
 3. Deviation from horizontal, up to 10 metres, 5mm.
 4. Deviation from horizontal, over 10 metres, 10mm total.
 5. Deviation from vertical position per 3 metres, 3mm.
 6. Deviation from horizontal and vertical, within openings, 3mm.
2. Refer also to Engineer's structural tolerance requirements.

SCHEDULES

3. Sub floor lumber: preservative treated to H4 Hazard Classification.
4. Exterior Decking materials: untreated

CLEAN UP

Clean up timber framing as the work proceeds so no off-cuts, chips, sawdust or any other matter or items remain behind the claddings or linings.

Remove debris, unused materials and elements from the site.

END OF SECTION 05 12 00

6. SECTION 06 16 00 – SHEATHING

GENERAL

SECTION INCLUDES

This section relates to the use of plywood sheets for:

Roof sheathing

Exterior cladding installed as sub-sheathing for bracing purposes

1. 06 16 00.A1 - 12MM PLYWOOD BRACING SHEETS LAID VERTICALLY
2. 06 16 00.A2 - 18MM PLYWOOD
3. 06 16 00.A3 - 21MM PLYWOOD
4. 06 16 00.A4 - 12MM PLYWOOD
5. 06 16 00.A5 - 12MM PLYWOOD GUSSET @ MID SPAN AND ENDS (SHOWN ABOVE)
6. 06 16 00.A6 - 21MM PLYWOOD BOTTOM PLATE
7. 06 16 00.A7 - 21MM PLYWOOD RIBS. CNC CUT TO FALLS.
8. 06 16 00.A8 - 21MM PLYWOOD BLOCKING
9. 06 16 00.A9 - 12MM INTERIOR PLYWOOD LINING - FINISHED WITH HIGH GLOSS PAINT
10. 06 16 00.A10 - 12MM PLYWOOD LINING

RELATED SECTIONS

Section 07 13 00 – Sheet Waterproofing

Section 06 26 13 – Profile Board Paneling

REFERENCES

2. CANPLY (Canadian Plywood Association) - Grading and certification.
3. CSA-O80 Series-08 - Wood Preservation
4. CSA-O325-07 - Construction Sheathing
5. APA (American Plywood Association) - Grades and Specifications
6. NLGA (National Lumber Grades Authority) - Standard Grading Rules for Canadian Lumber

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

DELIVERY, STORAGE, AND PROTECTION

7. Handle sheets carefully and reject all those with damaged faces or edges.
8. Store sheets in stacks clear off of the ground, supported flat and true, without sagging on evenly spaced horizontal bearers.
9. Protect from damage and weather.

PRODUCTS**MATERIALS**

10. Plywood Roof Sheathing: Rotary cut radiata pine veneer, rated ply sheathing. Treated H3. 5/8 inch thick to roof. Unsanded.
11. Plywood Wall Sheathing: Rotary cut radiata pine veneer, rated ply sheathing. Treated H3. ½ inch thick to walls. Unsanded.

Floor Underlayment: Rotary cut radiata pine veneer treated ply sheathing. 12mm thick to underfloor, to be painted and sealed with Oil based paint coat. Exposure Durability 1; unsanded.

SHEATHING AND UNDERLAYMENT LOCATIONS

12. Flat Roof Sheathing: 5/8 inch thick, 48 x 96 inch sized sheets, square edges, preservative treated.
13. Floor Underlayment: 1/2 inch thick, 48 x 96 inch sized sheets.

2. ACCESSORIES

1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
2. Corrosion risks: Use stainless steel fixings, connectors, etc in all zones, with the timber treatments CuAz (Preservative code 58) and ACQ (Preservative code 90).
3. Nails: Refer to the panel manufacturer's requirements. Use 30mm x 2.5mm with 7mm thick plywood, up to 60mm x 2.8mm with 21mm plywood. Use 40mm x 2.0mm for non-structural proprietary cladding. Galvanized, aluminium or stainless steel for natural finish.
4. Flashing: Material, grade and colour as detailed and scheduled. Ensure that materials used for flashings are compatible with the window frame materials and fixings and cladding materials and fixings. Refer to 07 62 00 SHEET METAL FLASHING AND TRIM section

EXECUTION**SHEATHING**

Ply wall to be fully sealed. Lay sheets parallel to wall studs, flash at horizontal joints with proprietary 'h' flashing, and tape all vertical joints with fully bonded flashing joints.

Roof ply to be laid to falls in conjunction with tapered ply roof structure, and gutters in roof modules to be fully laid to falls as indicated on drawings. All joints to be filleted and chamfered prior to laying of Butynol roofing membrane over.

SITE APPLIED WOOD TREATMENT

5. Apply preservative treatment to manufacturer's instructions.
6. Brush apply one (1) coat of preservative treatment on wood in contact with cementitious materials, roofing and related metal flashings. Treat site-sawn cuts.
7. Allow preservative to dry prior to erecting members.

APPLICATION

8. Screw fix plywood sheets with a 3mm gap between sheets for membrane type roofing to the membrane roofing manufacturers requirements.
9. Confirm that exterior wall openings have been prepared ready for the installation of all window and door frames and other penetrations through the cladding. Required preparatory work includes the following:
 1. Wall cladding underlay/building wrap to openings finished and dressed off ready for the installation of window and door frames and other penetrations.
 2. Seal cut edges of plywood before fixing with primer or sealer to suit the surface finish being used.
 3. A maximum of 15mm from the edge, 150mm centres along edges and 300mm centres on intermediate supports.
10. Fit and fix plywood cladding to the manufacturer's requirement with sheets and trim all in plumb, true alignment and face.
11. Install flashings, covers and soakers as detailed on the drawings and to BRANZ Bulletins 467 "Principles of flashing design" and 465 "Domestic flashing installation."

COMPLETION

12. Ensure the work is complete with all flashings, finishings and trim properly installed so the cladding system is completely weathertight.
13. Replace all damaged or marked up articles on the project.
14. Remove all debris, unused materials and elements from site.

END OF SECTION 05 12 00

7. SECTION 06 18 00 – GLUE LAMINATED CONSTRUCTION

1. GENERAL

1. SECTION INCLUDES

1. This section relates to the supply and erection of glue laminated engineered wood products as a part of the canopy structure of the First Light House.
 1. 06 18 00.A1 - 318X90MM GLUE-LAMINATED TIMBER BEAM SPANNING BETWEEN COLUMNS, TAPERING TO 135X90 AT CANTILEVERED ENDS.
 2. 06 18 00.A2 - 135X42MM GLULAM GL8 RAFTERS AT 750MM NOMINAL CENTRES SPANNING FULL LENGTH OF CANOPY, TAPERING TO 70X42MM AT CANTILEVERED ENDS.
 3. 90X180MM GLULAM GL10 COLUMN.

2. RELATED SECTIONS

This specification is to be read in conjunction with the following sections:

1. Section 06 05 23 - Wood Fastenings
2. Section 06 15 13 - Wood Floor Decking
3. Section 06 11 00 – Wood Framing
4. Section 06 16 00 – Sheathing
5. Section 07 13 00 - Sheet Waterproofing
6. Section 08 14 00 - Wood Doors
7. Section 08 52 00 - Wood Windows

3. REFERENCES

Documents referred to in this section are:

1. CSA-O80 Series-08 - Wood Preservation
2. CSA-O86-09 - Engineering Design in Wood

3. CSA-O141-05 - Softwood Lumber
4. CSA- S347-99(R2009) - Method of Test for Evaluation of Truss Plates Used in Lumber Joints
5. Preservative treatment: US Spec 061100 (NZ Spec-3821)
6. NLGA (National Lumber Grades Authority) - Standard Grading Rules for Canadian Lumber
7. AWPA (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process
8. ULC (Underwriters Laboratories of Canada) - List of Equipment and Materials for
 1. Building materials
 2. Fire Resistance
 3. Firestop Systems and Components
9. Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

4. ENVIRONMENTALLY SUSTAINABLE DESIGN

The building has been designed using Environmentally Sustainable Design principles. These range from minimizing energy and water consumption, considering user comfort, utilizing material that use recycled content and/or can be recycled, using materials that have low particulate emissions and VOC ratings, considering the embodied energy in materials specified and selecting materials that have certification with environmental agencies. In all cases ESD principles shall be used for product selection and wherever possible and practicable ESD products shall be specified.

Products and materials specified shall not be substituted unless the alternative product meets or exceeds the ESD objectives of the original product.

Sustainable timber

All timber and composite timber products used in the building and construction works are required to be sourced from either, or a combination of, the following:
Post-consumer re-used timber; or
Forest Stewardship Council (FSC) certified timber

Where FSC certified timber is used certification receipts or evidence shall be kept.

Wherever such systems/materials are available and meet technical requirements:

Adhesive/sealant materials and other finishes shall be waterbased low VOC.

Timber treatment alternatives to timber with CCA or LOSP to be used (eg CuAz copper azole and ACQ alkaline copper quaternary).

All timber shall be from certified sustainable sources, eg:

Forestry Stewardship Council

Programme for endorsement of Forest Certification

The 'Eco Timber' trademarked scheme

Harvested under MAF sustainable management plans or permits

QUALITY ASSURANCE

1. Perform Work in accordance with the following agencies:
 1. Lumber Grading Agency: Certified by NLGA.
2. Design structural engineered wood under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the place where the Project is located.
3. Lumber to be grade stamped. If grade stamping is not present, submit manufacturer's certificate certifying that products meet or exceed specified requirements.

5. DELIVERY, STORAGE, AND PROTECTION

1. Protect materials from warping or other distortion by stacking in vertical position.
2. Protect all timber against damage and from inclement weather. Ensure that any variation in moisture content is kept to a minimum, before and after erection and before enclosure.

2. PRODUCTS

LUMBER MATERIALS

Lumber Grading Rules: NLGA.

Engineered Lumber products: LVL and Glue Laminated members.

ACCESSORIES

Fasteners and Anchors:

Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

Corrosion risks: Use stainless steel fixings, connectors, etc in all zones, with the timber treatments CuAz (Preservative code 58) and ACQ (Preservative code 90).

Die Stamped Connectors: hot dipped galvanized steel.

Structural Framing Connectors: Stainless steel, sized to suit framing conditions.

Building Paper: Spun bonded polyethylene.

Termite Shield: Galvanized sheet steel.

PRESERVATIVE TREATMENT

1. Wood Preservative (Pressure Treatment): CSA-O80 [US Spec 061100] (NZ Spec-3821). Series using water borne preservative.
 1. *TPA spec 1.1 CuAz or ACQ*
 2. Copper Azole [from Coppers Arch] or
 3. *ACQ [from Osmose NatureWood]*
2. Wood Preservative (Surface Application): US Spec 061100 (NZ Spec-3821). Clear.
3. CCA and LOSP treatments are NOT permitted.

3. EXECUTION

FRAMING

1. Set structural members level and plumb, in correct position.
2. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing/
3. Coordinate installation of wood decking, glue laminated structural units.
4. Fix to steelwork with bolts and washers or approved proprietary fastenings at not less than 2 fixings to each member, and to engineering specific design.
5. Do not use steel timber connectors and fixings on any structural framing exposed to view unless detailed on the drawings.

6. Position and fix all necessary members for the fixing of all services, fittings, fixtures, edges of linings or claddings, and to provide lateral support to load carrying framing
7. Separate all timber framing timbers from concrete, by:
 1. a full length polyethylene damp-proof membrane overlapping timber by at least 6mm; or
 - a 12mm minimum free draining air space

Framing moisture content

Maximum allowable equilibrium moisture content (EMC), for framing to which linings are attached.

At construction: 18% EMC maximum.

At lining: 14% EMC maximum.

DPC to Timber: Refer to Section 07 26 00 – Vapour Retarder

SITE APPLIED WOOD TREATMENT

8. Apply preservative treatment to manufacturer's written instructions.
9. Brush apply two (2) coats of preservative treatment on wood including cut ends.
10. Allow preservative to dry prior to erecting members.

2. ERECTION TOLERANCES

1. Permissible deviations from established lines, grades and dimensions equal to or less than the following. Multiples of given limits are not cumulative.
 1. Deviation in plan, up to 10 metres, 5mm.
 2. Deviation in plan, over 10 metres, 10mm total.
 3. Deviation from horizontal, up to 10 metres, 5mm.
 4. Deviation from horizontal, over 10 metres, 10mm total.
 5. Deviation from vertical position per 3 metres, 3mm.
 6. Deviation from horizontal and vertical, within openings, 3mm.
2. Refer also to Engineer's structural tolerance requirements.

SCHEDULES

3. Roof Sheathing, plywood, roof joists, LVL members: Preservative treated to H3.2 hazard classification.

CLEAN UP

Clean up timber framing as the work proceeds so no off-cuts, chips, sawdust or any other matter or items remain behind the claddings or linings.

Remove

Remove debris, unused materials and elements from the site.

END OF SECTION 05 12 00

8. SECTION 06 22 00 – MILLWORK

1. GENERAL

1. SECTION INCLUDES

1. Joinery fittings and cabinetwork, purpose made in a factory and fitted on site:
 1. Countertops
 2. Cabinet hardware
 3. Prefinished surfaces
 4. Preparation for installing utilities

2. REFERENCES

1. ASTM E84-09c - Test Method for Surface Burning Characteristics of Building Materials.
2. BHMA A156.9-2003 - Cabinet Hardware.
3. CAN/CGSB-11.3-M87 – Hardboard.
4. CSA-O80 Series-08 - Wood Preservation.
5. CSA O151-M1978(R1998), Softwood Plywood.
6. NPA A208.2-2009 - Medium Density Fibreboard (MDF) for Interior Applications.
7. AWS (AWMAC Architectural Woodwork Standards).
8. CSA O112.7-Series M-1977, Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing).

3. ENVIRONMENTALLY SUSTAINABLE DESIGN

The building has been designed using Environmentally Sustainable Design principles. These range from minimizing energy and water consumption, considering user comfort, utilising material that use recycled content and/or can be recycled, using materials that have low particulate emissions and VOC ratings, considering the embodied energy in materials specified and selecting materials that have certification with environmental agencies. In all cases ESD principles shall be used for product selection and wherever possible and practicable ESD products shall be specified.

1. Products and materials specified shall not be substituted unless the alternative product meets or exceeds the ESD objectives of the original product.

2. ESD performance specification requirements
 1. All timber shall be from certified sustainable sources.
 2. Plywood is to be Phenol Formaldehyde bonded.
 3. MDF to be 'low formaldehyde' MDF as defined as Class 1 under BS.EN 622-1:1997.
 4. Alternatives to timber with CCA & LOSP treatment to be used.
 5. Boron timber treatments where H1 required.

4. SUBMITTALS FOR INFORMATION

1. Installation data: Provide installation and adjustment instructions.

5. QUALITY ASSURANCE

1. Products of This Section: Manufactured ISO 9001 certification requirements.
2. Perform work to AWMAC/AWS Premium quality.
3. Certification: Upon award of contract, register Work under this Section with the AWMAC Quality Certification Program.

6. DELIVERY, STORAGE, AND PROTECTION

1. Protect units from moisture damage as specified in AWMAC/AWS QSI.

7. ENVIRONMENTAL REQUIREMENTS

1. During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

2. PRODUCTS

1. LUMBER MATERIALS

1. Lumber: To the requirements of AWMAC/AWS interior-grade specified.
2. Hardwood Lumber: Rimu species, plain, maximum moisture content of 9%; with flat grain, of quality suitable for transparent finish.
3. Softwood Lumber: Pinus Radiata species, plain, maximum moisture content of 14%; with flat grain, of quality suitable for transparent finish.

2. SHEET MATERIALS

1. Softwood Plywood: Veneer, Rimu face species, rotary cut; of quality suitable for transparent opaque finish.
2. Medium Density Fibreboard (MDF): NPA A208.2; Veneer, composed of wood fibre core, Rimu face species, medium density, moisture resistant; of quality suitable for transparent finish; sanded faces.

3. ACCESSORIES

1. Adhesive: Urea-formaldehyde resin, Resorcinol formaldehyde.
2. Fasteners: Size and type to suit application.
3. Concealed Joint Fasteners: Threaded steel.

4. HARDWARE

1. Benchtops: Stainless Steel: ASTM A167, Type 302 (18-8), soft temper, smooth No. 4 finish.
2. Drawer Slides: Stainless steel construction, groove-mounting-type, precision running ball bearings separating tracks, full extension, bright steel finish.
3. Butt Hinges: Stainless steel, with finish to suit or as per manufacturer's details.
4. Concealed Hinges: All-metal zinc alloy with automatic spring.

5. FABRICATION

1. Shop prepare and identify components for matching during site assembly.
2. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
3. When necessary to cut and fit on site, provide materials with ample allowance for site cutting and scribing.

6. WOOD FINISHES

1. Factory Finishing:
 1. Finishing System: AWMAC/AWS Custom grade, pre-catalyzed lacquer finish system with stain.

7. SITE FINISHING

1. Sand work smooth and set exposed screws.

3. EXECUTION**1. EXAMINATION**

1. Verify existing conditions before starting work.
2. Verify adequacy of backing and support framing.
3. Verify location and sizes of utility rough-in associated with work of this section.

2. INSTALLATION

1. Install Work to AWMAC/AWS Premium Grade.
2. Set and secure casework in place; rigid, plumb, and level.
3. Install cabinets with no variations in flushness of adjoining surfaces by using concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework face.
4. Scribe fit adjustable shelves with 4 shelf pins to each and with force fit pin holes at 2" maximum centres in solid cheeks.
5. Locate and drive connectors to the board manufacturer's requirements. Fit plastic cap where detailed. Form joints, fit and rotate sphere connector to finish it rigid and tightly fitting over the whole length of the joint.

Fasten each cabinet to adjacent unit and to structural members of wall construction. Fasten wall cabinets through back, near top and bottom, at ends and not less than 600 mm o.c.

Use No. 10 wafer-head screws sized for 25-mm penetration into wood framing, blocking, or hanging strips.

1. Use toggle bolts through metal backing behind cementitious backing board.
6. Secure cabinetry to floor using appropriate angles and anchorages.
7. Arrange jointing so that shrinkage in any part and direction will not impair the strength or appearance of the finished work or damage the adjoining work.

3. ADJUSTING

1. Test installed work for rigidity and ability to support loads.
2. Adjust moving or operating parts to function smoothly and correctly.

4. PROTECTION OF FINISHED WORK

1. Protect finished surfaces from damage.

5. CLEANING

1. Clean counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 05 12 00

9. SECTION 06 26 00 – PROFILE BOARD PANELLING

1. GENERAL

1. SECTION INCLUDES

1. 06 20 13.A1 - 65X19MM CEDAR SLATS @100MM CENTRES.
2. 06 20 13.A2 -
3. 06 20 13.A3 - 60X45MM HORIZONTAL CEDAR SUPPORT BATTEN AT 562 MAX CENTRES
4. 06 20 13.A4 - 75X19MM VERTICAL CEDAR SLATS AT 100MM CENTRES FIXED TO 65X45MM HORIZONTAL BATTENS
5. 06 20 13.A5 - 19X65 VERTICAL CEDAR SLAT
6. 06 20 13.A9 - 39X65 NOTCHED CEDAR BATTEN
7. 06 20 13.A10 - 39X90 CEDAR STUD
8. 06 20 13.B5 - TIMBER PARAPET FURRING TO ACHIEVE PARAPET FALL
9. 06 26 13.A1 - PANELIZED REMOVABLE HORIZONTAL SHIPLAP CEDAR WEATHERBOARD
10. 06 26 13.A2 - PRE-FORMED EXTERNAL CEDAR CORNER COVERBOARD
11. 06 26 13.A4 - PARAPET COVERBOARD
12. 06 26 13.A5 - 90X18 CEDAR COVERBOARD (HERMAN PACIFIC PROFILE HP202)
13. 06 26 13.A6 - 69X18 CEDAR COVERBOARD (HERMAN PACIFIC PROFILE HP201)
14. 06 26 13.A7 - 42X18.5 CEDAR EXTERNAL CORNER MOULD (HERMAN PACIFIC PROFILE HP42)

2.

2. RELATED SECTIONS

1. Section 07 13 00: Sheet Waterproofing
2. Section 09 91 00: Painting
3. Section 06 16 00 – Sheathing
4. Section 06 05 23 - Wood Fastenings

3. REFERENCES

1. APA (The Engineered Wood Association).
2. ASTM E84-09c - Test Method for Surface Burning Characteristics of Building Materials.
3. CSA-O80 Series-08 - CSA Standards for Wood Preservation.

4. CSA-O141-05 - Softwood Lumber.
5. Herman Pacific Ltd (Hermpac) documents relating to work in this section are:
 - Construction details
 - Standard profiles
 - Custom profiles
 - Set out tools
 - Board to board lap and set out details
 - Profiles catalogue - Current Volume
 - Grade descriptions
 - Hermpac architectural resource box
 - Vertiline installation specification
 - Hermpac Table 1: Nail fixings
 - Machinecoat - Flood Coat Inundation versus Spray Application
 - Custom profile drawing template and request form
 - Legal and / or Sustainable Certification
 - Maintenance of selected oil stain finishes
 - BRANZ Appraisal 524 - Cavity Batten System
1. BRANZ Appraisal 650 - Vertiline Shiplap Cedar Weatherboard Cavity System
2. Copies of the above literature and resource are available from Herman Pacific Ltd:
 1. Kyle Deans:
 1. Phone: 021 771 857
 2. Email: kyle.deans@hermpac.co.nz
 2. Jonathan Rugg:
 1. Phone: 021 770 320
 2. Email : jonathan.rugg@hermpac.co.nz
 3. Web: www.hermpac.co.nz
 4. Email:
 1. technical@hermpac.co.nz
 2. information@hermpac.co.nz
 5. Telephone:
 1. Auckland: 09 377 1426
 2. Wellington: 04 234 1208

4. SUBMITTALS FOR REVIEW

1. Technical Drawings: Indicating materials, component profiles and elevations, assembly methods, joint details, fastening methods and accessory listings are available by request from the manufacturer.

2. Product Data: Available by request from manufacturer.
3. Samples: Samples illustrating species, applied finish options and colour.

5. DELIVERY, STORAGE, AND PROTECTION

1. Take delivery of Herman Pacific timber products, dry, unmarked and undamaged from freight and handling (Grade characteristics excluded). Store on site, laid flat and true.
2. Protect work from moisture damage.

2. PRODUCTS

1. LUMBER MATERIALS

1. Lumber: To the requirements of PEFC, CSA, SFI or FSC grades specified.
2. Weatherboards: HERMPAC Western Red Cedar species, band sawn, maximum moisture content of 14%-18%; horizontal shiplap, HERMPAC Premium Clears No.1 Grade. 15-year durability performance.
3. Cover Boards: HERMPAC Western Red Cedar species, band sawn, maximum moisture content of 14%-18%; HERMPAC Premium Clears No.1 Grade. 15-year durability performance.
4. Fascia: HERMPAC Western Red Cedar species, band sawn, horizontal shiplap, HERMPAC Premium Clears No.1 Grade. 15-year durability performance.
5. Cedar Slats in Canopy: HERMPAC Western Red Cedar species. 15-year durability performance.
6. Exterior Cavity Wall Battens: Removable cladding panelling system, fixed with aluminum channels and angles. 50-year durability performance.

2. FASTENERS

1. Fasteners: Hermpac Crown, Rose, Flat or Jolt Head, Annular Grooved Shank Grade Stainless steel screws; 15mm size.
2. Flashings: Material, grade and colour as detailed and scheduled. Ensure that materials used for flashings are compatible with the window frame materials and fixings and cladding materials and fixings.

3. ACCESSORIES

1. Lumber for Shimming and Blocking: Softwood lumber of HERMPAC Western Red Cedar species.

2. Primer: Premium Oil-based type.

4. WOOD FINISHES

1. Factory pre-finishing system: Sikkens Cetol HLS Premium grade, factory spray oil stain finish.
 1. Refer to Machinecoat (NZ).
 2. Sikkens:
 1. Cetol HLS – supplied by JaJay
 1. PO Box 12 161, Penrose, Auckland
 2. Ph 09 571 0023
 3. Fax 09 571 0022
 4. **25 Walls Rd, Penrose.**
 5. **0800 SIKKENS (745 536)**
 3. All finishes to be confirmed with Architect prior to application.

3. EXECUTION

1. EXAMINATION

1. Verify adequacy of backing and support framing.

2. PRIMING

1. If not pre-finished before delivery, prepare and coat all faces and edges with one coat of premium oil based primer and one coat of premium oil based undercoat, to coating Manufacturer's specifications.
2. Allow each board to dry with the back facing down, ensuring faces remain well finished, untouched and unblemished.
3. Place boards in fillet stack, laid flat and true, until fixed. Keep dry and undamaged.
4. Coat to suit the paint system specified in Section 09 91 00: PAINTING.

3. INSTALLATION

1. Install 20mm minimum thickness drain cavity as indicated on the drawings.
2. Install vermin-proofing at base.
3. Set and secure materials and components in place, plumb and level.

4. Confirm that exterior wall openings have been prepared ready for the installation of all window and door frames and other penetrations through the cladding.
5. Set-out the overlap boards to ensure dimension to exposed face in line of weather is constant and that boards remain horizontal/vertical. Align all nailing that will be visible in the finished work, accurately in straight lines.
6. Coat all cut ends with oil stain treatment before fixing.
7. Lay cladding panels out in as shown on drawings. All boards to be screw fixed from reverse side, through aluminium channel and provide a 2mm expansion gap between successive boards. Single fix all weatherboards to every fixing point, just clear of the lapped board below.
8. Install flashings as per drawing details.

4. SITE APPLIED WOOD TREATMENT

1. Apply preservative treatment to manufacturer's instructions.
2. Brush apply one (1) coat of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.
3. Allow preservative to dry prior to erecting panelling.

5. PREPARATION FOR SITE FINISHING

1. Site Finishing: Refer to Section 09 91 10: Painting.
2. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

6. COMPLETION

1. Ensure the work is complete with all flashings, finishings and trim properly installed so the cladding system is completely weathertight.
2. Replace all damaged or marked elements.
3. Remove all debris, unused materials and elements from the site.

END OF SECTION 05 12 00

10. SECTION 06 40 23 – INTERIOR ARCHITECTURAL WOODWORK**1. GENERAL****1. SECTION INCLUDES**

1. 06 40 23.A1 - 83X12MM TONGUE & GROOVE PROFILE TIMBER BOARD
2. 06 40 23.A2 - 135X19MM WHITEWASHED TONGUE & GROOVE PROFILE VERTICAL TIMBER BOARD
3. 06 40 23.A6 - REMOVABLE COVER BOARD SCREW FIXED OVER MODULE JOIN
4. 06 40 23.B1 - 135X19MM WHITEWASHED TONGUE & GROOVE PROFILE TIMBER BOARD TO CEILING ALIGNED TO DIRECTION INDICATED
5. 06 40 23.B2 - 135 X 19MM REMOVABLE WHITEWASHED TIMBER BOARD TO MODULE JOIN

2. RELATED SECTIONS

1. Section 06 16 00 - Sheathing
2. Section 07 13 00 - Sheet Waterproofing
3. Section 07 26 00 – Vapour Retarder

3. REFERENCES

1. ASTM E1333-96, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
2. CSA-O80 Series-08 - Wood Preservation.
3. CSA-O151-09 - Canadian Softwood Plywood.
4. NLGA (National Lumber Grades Authority) - Standard Grading Rules for Canadian Lumber, 2007 Edition.
5. NHLA (National Hardwood Lumber Association).

4. ENVIRONMENTALLY SUSTAINABLE DESIGN

The building has been designed using Environmentally Sustainable Design principles. These range from minimizing energy & water consumption, considering user comfort, utilising materials that use recycled content and/or can be recycled, using materials that have low particulate emissions and VOC ratings,

considering the embodied energy in materials specified and selecting materials that have certification with environmental agencies. In all cases ESD principles will be used for product selection and wherever possible and practicable ESD products will be specified.

It is important to note that products and materials should not substituted unless the alternative product meets or exceeds the ESD objectives of the original product.

Sustainable timber

All timber and composite timber products used in the building and construction works are required to be sourced from either, or a combination of, the following:

Post-consumer re-used timber; or

Forest Stewardship Council (FSC) certified timber

Where FSC certified timber is used certification receipts or evidence must be kept or logged.

Other requirements

Plywood is to be Phenol Formaldehyde bonded.

MDF to be 'low formaldehyde' MDF as defined as Class 1 under BS.EN 622-1:1997.

Alternatives to timber with CCA & LOSP treatment to be used.

1. Boron timber treatments where H1 required.

5. SUBMITTALS

1. Provide samples as requested to confirm the required appearance of material and finish.

6. DELIVERY, STORAGE, AND PROTECTION

1. Take delivery of lumber, dry, unmarked and undamaged. Store on site, laid flat and true.
2. Protect work from moisture damage.

2. PRODUCTS

1. MATERIALS

1. Stainless Steel Nails: 60mm x 2.8mm and 75mm x 3.15mm stainless steel.
2. Flashing: Materials used for flashings are to be compatible with the window frame materials, fixings and cladding materials and fixings.

3. Semi-Transparent Staining: Water borne acrylic stain, solvent borne semi-transparent oil stain, or solvent-borne semi-transparent oil-alkyd stain to suit the lumber.

2. FINISHING

1. If not pre-finished before delivery, coat all faces and edges immediately the block stack is opened.
2. Stack, laid flat and true, until fixed. Keep dry and undamaged. Coat to suit the paint system specified in Section 09 91 00 PAINTING.
3. Coat all cut ends before fixing. Drill all fixings located within 25mm of board ends. Finish fixings flush.

3. EXECUTION

1. EXAMINATION

1. Verify that field measurements are as indicated on Shop Drawings.
2. Verify adequacy of backing and support framing.
3. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

2. INSTALLATION

1. Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
2. Test the moisture content of the boards. Use an electrical moisture meter to test 5% of boards, but not less than 10 boards in the centre of the length. Do not start fixing until 90% of the values obtained are within the range of allowable moisture content (%) at time of installation or in the case of framing lumber at time of enclosure.
3. Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.
4. Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.
5. Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
6. Fit hardware accurately and securely in accordance with manufacturer's written instructions.

3. COMPLETION

1. Replace all damaged or marked elements
2. Remove all debris, unused materials and elements from the site.

END OF SECTION 05 12 00

11. SECTION 07 21 00 – THERMAL INSULATION**1. GENERAL****1. SECTION INCLUDES**

1. This section relates to ecoinsulation products installed, laid, hung or fitted as thermal insulation, including:
 1. 07 21 16.A1 - WOOL INSULATION BATTS

2. RELATED SECTIONS

1. Section 07 26 00 – Vapour Retarder

3. REFERENCES

1. ASTM C665-06 - Mineral-Fibre Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
2. Ecoinsulation documents relating to work in this section are:
 1. Construction R-values for specific ecoinsulation products catalogue
 2. BRANZ Appraisal 464 - Ecofleece Insulation
 3. Ecofleece[®] Data Sheet
 4. Ecofleece[®] Installation Guide

4. PERFORMANCE REQUIREMENTS

1. Insulation Design: Insulation to withstand specified loads without loss, failure of seals, product deterioration, and other defects.
2. Installation: Work to be carried out by tradesmen experiences, competent and familiar with **ecoinsulation** materials and techniques specified.

5. ADMINISTRATIVE REQUIREMENTS

1. Coordinate with other work having a direct bearing on work of this section.

6. WARRANTY

1. Provide an **ecoinsulation** durability statement on completion of the installation by approved installer.
 1. Provide guarantee in **ecoinsulation** standard form.

2. PRODUCTS**1. MANUFACTURERS**

1. Ecoinsulation; Product: Ecofleece[®] wool/polyester thermal insulation recycled blanket.
2. Substitutions: Not permitted.

2. MATERIALS

1. Insulation: ASTM C665, preformed mineral fibre/sheep's wool blend, in blanket form; friction fit.
2. Staples: Steel wire; type and size to suit application.
3. Tape: Polyethylene self-adhering type, 2 inches wide.

3. EXECUTION**1. EXAMINATION**

1. Verify existing conditions before starting work.
2. Verify that substrate, adjacent materials, wraps, and insulation are dry and ready to receive insulation.
3. Ensure vapour barriers form a homogeneous sheet vapour barrier before installing insulation.

2. INSTALLATION

1. Install in exterior walls, roof and flooring spaces without gaps or voids. Do not compress insulation unless compression is an installation system requirement.
2. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
3. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
4. Staple facing flanges in place at maximum 12 inches on centre or tape in place. Avoid creases and folds.
5. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
6. Do not leave insulation unprotected by roofing at the completion of the day's work.
7. Coordinate work of this section with construction of air barrier seal specified in Section 07 26 00.

3. CLEANING

1. Remove debris, unused materials and elements from site.

END OF SECTION 05 12 00

12. SECTION 07 26 00 – VAPOUR RETARDER

1. GENERAL

1. SECTION INCLUDES

1. Sheet and sealant materials for controlling vapour diffusion.
 1. 07 26 00.A1 - PROCLIMA VAPOUR CHECK MEMBRANE

2. RELATED SECTIONS

1. Section 07 21 00 – Thermal Insulation
2. Section 07 92 00 – Joint Sealants

3. REFERENCES

1. ASTM C920-08 - Elastomeric Joint Sealants.
2. ASTM E96/E96M-05 - Test Methods for Water Vapour Transmission of Materials.
3. CGSB-19-GP-14M-1984 - Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
4. CAN/CGSB-19.13-M87 - Sealing Compound, One-component, Elastomeric, Chemical Curing.
5. CAN/CGSB-51.34-M86 - Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

4. DEFINITION

1. Vapour Retarder: A material or assembly of materials that resists water vapour diffusion through it.

5. PERFORMANCE REQUIREMENTS

1. Vapour Permeability (Perm): Maximum water vapour permeance to ASTM E96/E96M.

6. ADMINITRATIVE REQUIREMENTS

1. Coordination: Coordinate with other work having a direct bearing on work of this section.

7. WARRENTY

1. Provide a durability statement on completion of the installation by approved installer.
 1. Guarantee for 6 years: for replacement of materials and labour.

2. Provide guarantee on standard form.

8. QUALITY ASSURANCE

1. The IAS installation to be verified by an airtightness test either by Pro Clima WINCON or by blower door method.

2. PRODUCTS

1. SHEET MATERIALS

1. Sheet Retarder Type 1: CAN/CGSB-51.34, polyethylene film for above grade application, 6 milimetres thick.
2. Sheet Retarder Type 2: INTELLO[®] internal vapour check, manufactured from 0.2mm thick polyethylene copolymer membrane and polypropylene non-woven fabric, for use on the warm side of fibrous insulation materials.

2. ACCESSORIES

1. Tape: Polyethylene / Polyester self-adhering type, 2 inch wide, compatible with sheet material.
2. Electrical Vapour Barrier Box: Rigid, moulded polyethylene box with reinforced flanges.
- 3.

3. EXECUTION

1. EXAMINATION

1. Verify condition of substrate and adjacent materials.

2. PREPARATION

1. Remove loose or foreign matter which might impair adhesion.
2. Clean and prime substrate surfaces to receive adhesive or sealant in accordance with manufacturers' written instructions.

3. INSTALLATION

1. Vapour Retarder For Solid Substrate: Secure sheet barrier to solid construction with adhesive / tape. Lap edges and ends 6 inches and seal to ensure complete and continuous seal.

2. Vapour Retarder For Stud Framed Walls: Secure sheet barrier to stud faces. Lap edges over stud faces, lap ends onto adjacent construction; caulk ends with sealant to ensure complete seal.
3. Vapour Retarder For Stud Framed Walls: Secure sheet barrier to stud faces. Lap edges over stud faces, lap ends onto adjacent construction; caulk ends with sealant to ensure complete seal.
4. Vapour Retarder Seal For Openings: Install sheet barrier between window / door frames and adjacent vapour retarder and seal with sealant. Caulk with sealant to ensure complete seal. Position laps over firm bearing.
5. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges or where compatibility with adjacent materials may be in doubt.
6. Vapour Barrier Box: Install vapour barrier boxes at electric outlet and switch locations on exterior walls. Lap and seal perimeter with sheet barrier.

END OF SECTION 05 12 00

13. SECTION 07 58 00 – SINGLE PLY ROOFING**1. GENERAL****1. SECTION INCLUDES**

1. This section relates to Butynol as single-layer external waterproof covering bonded to roof of all individual modules of Firstlight House.
 1. 07 58 00.A1 - BUTYNOL ROOFING MEMBRANE
 2. 07 58 00.A2 - ROOF MODULES GENERALLY BUTYNOL ROOFING MEMBRANE ON PLYWOOD SUBSTRATE AND CNC ROUTED JOISTS TO FALLS. SEE RELEVANT DETAIL
2. Sheathing over deck surface, including all underlays and accessories.
3. Membrane roofing flashings.

2. RELATED SECTIONS

1. Section 06 16 00 – Sheathing
2. Section 07 62 00 – Sheet Metal Flashing and Trim
3. Section 08 80 00 – Glazing

3. REFERENCES

1. ASTM D412- 06a - Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
2. ASTM E96/02 - Test Methods for Water Vapor Transmission of Materials
3. CSA-O121-08 - Douglas Fir Plywood
4. CSA-O151-09 - Canadian Softwood Plywood
5. CAN/ULC-S107-03 - Methods of Fire Tests of Roof Coverings
6. FM (Factory Mutual) - Roof Assembly Classifications
7. CRCA (Canadian Roofing Contractors' Association) – CRCA Roofing Specifications Manual
8. UL/ULC (Underwriters Laboratories of Canada) - List of Equipment and Materials for:
 1. Building Materials.
 2. Fire Resistance.

4. SYSTEM DESCRIPTION

1. Assembly of components includes conventional one (1) ply membrane system adhered to plywood decking.

5. ADMINISTRATIVE REQUIREMENTS

1. Coordinate with other work having a direct bearing on work of this section.
2. Coordinate the work with the installation of associated metal flashings, as the work of this section proceeds.
3. Pre-installation Meetings:
 1. Convene one (1) week before starting work of this section.
 2. Review preparation and installation procedures and coordinating and scheduling required with related work.

6. QUALITY ASSURANCE

1. Perform Work to CRCA Roofing Specifications Manual and manufacturer's instructions.
2. Applicator Qualifications: Company specializing in performing the work of this section with minimum Three (3) years documented experience.

7. REGULATORY REQUIREMENTS

1. Conform to applicable code for roof assembly fire hazard requirements.
2. CAN/ULC-S107: Class A Fire Hazard Classification.

8. BUTYNOL WARRANTY

1. Contractor's Warranty: Provide five (5) year warranty on roofing, dated from time of Substantial Performance.
2. Manufacturer's Warranty: Provide a twenty (20) year manufacturer's warranty to include coverage for failure to meet specified requirements, including damage to building resulting from failure to prevent penetration of water.

2. PRODUCTS**1. MANUFACTURERS – MEMBRANCE MATERIAL**

1. Ardex; Product: Single ply membrane compounded from Butynol.

2. Substitutions: Not permitted.

2. MEMBRANE MATERIALS

1. Membrane: Synthetic Rubber materials, 55 inch wide roll x 58 feet, 1/16 inch thick, light grey.
2. Seaming Materials: Ardex uncured butyl cold gum seam tape.
3. Adhesives and Solvents: specifically formulated for Butynol.
4. Flashing Tape: Malleable tape for moulding in gussets, pipe flashings; 4" wide.
5. Detail Tape: Ardex semi-cured silicone backed detail/finishing tape.
6. Edge Trim: Metal or timber to Ardex details to suit the specific location.

3. CANTS

1. Wood Cant Strip: pressure preservative treated.

4. ACCESSORIES

1. Ardex substrate ventilators, roof outlets, overflows, scuppers and rainwater heads.

3. EXECUTION

1. EXAMINATION

1. Verify that surfaces and site conditions are ready to receive work.
2. Verify deck is supported and secured.
3. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped.
4. Confirm dry deck by moisture meter to meet manufacturer recommended range.
5. Verify roof openings, curbs, pipes, conduit, sleeves, ducts, and vents through roof are solidly set, and cant strips, wood nailing strips, terminations are in place.

2. PREPARATION – WOOD DECK

1. Verify flatness and tight joints of wood decking. Seal joints of plywood with tape. Fill knot holes and joints to meet manufacturer requirements.

3. MEMBRANE APPLICATION

1. Apply membrane and primer to manufacturer's written instructions.
2. Roll out membrane, free from air pockets, wrinkles, or tears. Firmly press sheet into place without stretching.
3. Overlap edges and ends and seal. Extend membrane up cant strips onto vertical surfaces.
4. Seal membrane around roof penetrations.

4. FLASHINGS AND ACCESSORIES

1. Apply flexible flashings to seal membrane to vertical elements.
2. Secure to nailing strips at 4 inches on centre.
3. Install prefabricated roofing control joints, expansion joints to isolate roof into areas to manufacturer's written instructions.
4. Seal flashings and flanges of items penetrating membrane.

5. FIELD QUALITY CONTROL

1. Require site attendance of roofing material manufacturers during installation of the Work.

6. CLEANING

1. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
2. Repair or replace defaced or disfigured finishes caused by Work of this section.

END OF SECTION 05 12 00

14. SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM**1. GENERAL****1. SECTION INCLUDES**

1. Metal parapet, cap, sill, and lintel flashings.
2. Facia scuppers.
3. Metal counter-flashings.

2. RELATED SECTIONS

- 1.

3. REFERENCES

1. ASTM A167-99 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
2. NRCA (National Roofing Contractors Association - USA) - Roofing and Waterproofing Manual.
3. ASTM A653/A653M-09 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM B32-08 - Solder Metal.
5. ASTM B209/B209M-07 - Aluminum and Aluminum-Alloy Sheet and Plate.
6. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - Architectural Sheet Metal Manual.

4. ADMINISTRATIVE REQUIREMENTS

1. Coordinate with other work having a direct bearing on work of this section.

5. QUALITY ASSURANCE

1. Products of This Section: Manufactured to ISO 9001 certification requirements.
2. Work to be carried out by tradesmen experienced, competent and familiar with the materials and techniques specified.
3. Perform Work to SMACNA and NRCA standard details and requirements.

4. For flashings where there are no specific details or drawings, provide a full size mock up of the flashing to integrate components into the weather tight system. Co-ordinate with the trades affected by the installation.

6. DELIVERY, STORAGE, AND PROTECTION

1. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
2. Prevent contact with materials which may cause discolouration or staining.

2. PRODUCTS

1. SHEET MATERIALS

1. Stainless Steel: ASTM A167, Type 304, soft temper, smooth Iron Sand finish.
2. Pre-Coated Galvanized Steel: ASTM A653/A653M, Z275 / G90. core steel. Shop pre-coated, colour as selected.
3. Aluminum Sheet: ASTM B209, mill, Shop pre-coated, colour as selected.
4. Fabricate flashings from a ductile grade of metal designed for lateral strength by folding, stiffening or ribbing on external edges, having a maximum un-stiffened width of 12".

2. ACCESSORIES

1. Fasteners: Same material and finish as flashing metal with soft neoprene washers.
2. Underlayment: CAN/CGSB 51.34.
3. Sealant: Neutral curing silicone rubber sealant that is acetic acid free with low resistance to compression and be-able to withstand large temperature variations.
4. Downspout Anchorage Devices: SMACNA requirements.
5. Protective Backing Paint: Bituminous.
6. Solder: ASTM B32.

3. COMPONENTS

1. Downspouts: Rectangular profile.

2. Accessories: Profiled to suit gutters and downspouts.

4. FABRICATION

1. Form sections true to shape, accurate in size, square, and free from distortion or defects.
2. Fabricate cleats of same material as sheet, interlockable with sheet.
3. Form material with standing seams.

3. EXECUTION

1. EXAMINATION

1. Verify that substrate surfaces, adjacent materials and flashings are clean, dry, and free of debris and ready to receive work.
2. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set.
3. Verify roofing termination and base flashings are in place, sealed, and secure.
4. Verify dimensions against site measurements prior to fabrication.

2. CONDITIONS

1. Avoid distortion and contact with potentially damaging surfaces/substances. Do not drag flashings across each other, or across other surfaces. Protect edges, corners and surfaces from damage.
2. Protect surfaces, window and door joinery, and finishes already in place, from the possibility of damage during the installation process.

3. INSTALLATION

1. Conform to drawing details included in the SMACNA and NRCA manual.
2. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
3. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
4. All Head and Sill flashings to be stop-ended and be free draining to outside.
5. Seal metal joints watertight.

4. FINAL INSPECTION

1. Final inspection to take place after completion of the flashing work. Any defects or subsequent damage to be made good.

5. CLEAN UP

1. Remove debris, unused materials and elements from site.

END OF SECTION 05 12 00

15. SECTION 07 92 00 – JOINT SEALANTS

GENERAL

SECTION INCLUDES

This is a reference section dealing with the selection of and application methods for sealants nominated in other work sections.

REFERENCES

US Federal Specification:

TT-S-00230C: Sealing compound, elastomeric type, single component (for caulking, sealing and glazing in buildings and other structures).

TT-S-001543A: Sealing compound, silicone rubber base (for caulking, sealing and glazing in buildings and other structures)

ASTM C834-10 - Latex Sealants

ASTM C920-08 - Elastomeric Joint Sealants

ASTM C1184-05 - Structural Silicone Sealants

ASTM C1193-09 - Guide for Use of Joint Sealants

ASTM C1311-10 - Solvent Release Sealants

ASTM C1401-09a - Guide for Structural Sealant Glazing

ASTM E330-02 - Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

CAN/CGSB-19.17-M90 - One-Component Acrylic Emulsion Base Sealing Compound

CAN/CGSB-19.22-M89 - Mildew-Resistant Sealing Compound for Tubs and Tiles

SUBMITTALS

Submit samples of each sealant specified, made up into representative demonstration joints, displaying the primer, backing rod and sealant as appropriate. Include final tooling.

Before commencing work submit the manufacturer's specifications for the specified sealant system, including the following:
trade name

generic type: one/multi part, non slump/self levelling, low/medium/high modulus
chemical composition
maximum joint movement
tensile strength
elastic recovery
service temperature range
shrinkage
staining properties
toxicity
tack free time
through cure time
colour range
life expectancy
clean up solvents required
primers required
method of preparing surface
method of application.

REQUIREMENTS

Before commencing the sealant installation, obtain and submit a certificate from the sealant manufacturer confirming that adjoining substrates and materials have been examined and are deemed suitable for sealant application, and are compatible with the sealant material specified.

Upon submission of the required sealant certificate and confirmation of sample materials, prepare and install a sample joint for each sealant type, each not less than 3 metres in length, in a selected locations. Following review and confirmation that work may proceed, the sample joint becomes the quality control standard for subsequent work of each type. Sample joints may be retained as part of the completed work.

Sealant work, including preparation, to be carried out by competent and experienced sealant applicators, approved by the sealant manufacturer. Provide evidence of technical competence and experience for review before commencing work.

Use the research and development, and the technical information provided by the various sealant manufacturers throughout the design, development, prototype testing and installation stages of sealant work.

WARRANTIES

WARRANTY

Warrant this work under normal environmental and use conditions against failure of materials and execution

Warranty period: 10 years

PRODUCTS

MATERIALS

JOINTING SEALANT, INTERNAL

For use between pre-finished fibre cement sheets.

1-part, non-acetic, low modulus silicone rubber, to US Federal Specification TT-S-00230C. Sealant to contain mould inhibiting agents.

Colour: White

MOVEMENT JOINT SEALANT, INTERIOR WALL TILING

1-part, non-acetic, neutral cure, low modulus silicone rubber, to US Federal Specification TT-S-00230C. Sealant to contain mould inhibiting agents.

Colour: White

SEALANT, SANITARY FIXTURES

For between sanitary fixtures and accessories and adjacent floor or wall surfaces.

1-part, silicone, containing mildew resistant agents.

Colour: White

ACCESSORIES

Joint Cleaning Materials: Xylol, methyl-ethyl-ketone, toluol, as acceptable for the substrate material and/or finish and as required by the sealant manufacturer for the particular application. Test solvents to confirm suitability before using on finished work.

Masking Tape: Pressure sensitive, self adhesive crimped paper tape.

Do not use masking-grease materials.

Surface Primer: As required by the sealant manufacturer for each surface substrate and particular applications.

Primers to suit the various project conditions.

Joint Backing Rod: Extruded closed cell polyethylene foam rod, open cell foam polyurethane, or rod stock of butyl or Neoprene, chemically compatible with the sealant. Use backing rod diameter 25% greater than the joint width before installation. Use in long lengths.

Bond Breaker Tape: Pressure sensitive self adhesive polyethylene breaker tape.

Masking tape or PVC insulation tape is not permitted.

EXECUTION**CONDITIONS**

Ensure sealants, joint fillers, primers, backing rods, bond breaker tape and cleaning solutions are compatible with each other.

Use only non bleeding sealants capable of supporting their own weight (non slump), except for self-levelling sealant.

Where colour not specified, choose sealant colours from the manufacturer's standard/special colour ranges.

Arrange for the sealant manufacturer to visit the site to examine the site conditions, to inspect the surfaces and joints, and to discuss the installation procedures, before any sealing work proceeds.

PREPARATORY WORK

Ensure that joints to receive sealants are suitable for the proposed application. Ensure that surfaces are sound, dry, free from dust, dirt, scale, laitance, corrosion or other loose material, oil, grease, paint, release agents or other contaminants which may affect the bond, or the performance of the sealing material.

Ensure that joints and spaces receiving sealant are not less than 12mm deep, with width to suit the sealant being used.

Test substrates for indications of staining or poor adhesion. If poor adhesion is evident from initial tests, consult the sealant manufacturer about the application of a suitable primer. Only use combinations of sealants and substrates for which favourable adhesion and compatibility have been confirmed sufficiently for satisfactory adhesion of the selected sealant.

Do not apply sealant to concrete or concrete block until concrete and/or mortar has cured.

Clean joints as required by the manufacturer to achieve acceptable joint surfaces for the application of sealant. Protect adjacent surfaces from abrasion or other damage.

Clean metal surfaces with solvent to remove any grease deposits.

Mask adjacent surfaces alongside joints to prevent contamination. Mask off any surfaces which would be difficult to clean if smeared with sealant, or where excess sealant could not be neatly trimmed off or removed.

Ensure adequate ventilation for sealant applicators during the preparation and application of sealant work.

APPLICATION

Prepare joints in accordance with the sealant manufacturer's requirements, using only recommended solvents and cleaning methods.

Insert backing material in joints. Use only blunt instruments to install backing rods to avoid puncturing or damage. Do not twist rods when installing. When using backup material do not leave gaps and do not reduce the depth of the sealant joint to less than the minimum required by the sealant manufacturer.

Use manufacturer supplied/recommended primers. Allow to cure for the manufacturer recommended time (minimum and maximum). Refer to manufacturer for instructions if maximum cure time is exceeded before sealant is applied. Do not contaminate bond breakers with sealant.

Allow primer to dry as recommended by the manufacturer. Do not prime more than can be completed in one day. Prevent contamination of the primed surfaces prior to applying sealant.

Fill joint cavity with sealant in accordance with the sealant manufacturer's requirements and quality control programmes. Use a pressure gun with a nozzle cut to suit the required joint width. Ensure sealant is deposited in a uniform, continuous bead, without gaps or air pockets and with clean, neat edges.

Tool sealant to form a smooth, flat bead, or a smooth convex fillet, with a profile as required by the sealant manufacturer. Complete tooling before the sealant surface starts to form a skin.

FINISHING

Remove masking immediately after tooling and before sealant surface starts to skin. Remove excess sealant from adjoining surfaces before the sealant has set, using the cleaning materials and methods required by the sealant manufacturer, leaving surfaces clean and the sealant runs undamaged.

CLEANING

1. Remove debris, unused materials and elements from site.
2. Leave surrounding surfaces in a neat, clean condition with no evidence of spill overs.

END OF SECTION 05 12 00

16. SECTION 04 14 00 – WOOD DOORS**1. GENERAL**

1. Exterior wood doors; flush and flush glazed.

Wood trim for exterior finishing.

Operating hardware and insect screens.

Note: Louvred shed doors to be supplied by main contractor.

RELATED SECTIONS

2. Section 06 40 23 – Interior Architectural Woodwork
3. Section 07 26 00 – Vapour Retarder
4. Section 07 92 00 – Joint Sealants
5. Section 08 80 00 – Glazing
6. Section 09 91 00 – Painting

REFERENCES

7. ANSI A135.4-2004 - Basic Hardboard.
8. ASTM E413-04 - Classification for Rating of Sound Insulation.
9. AWMAC (Quality Standards for Architectural Woodwork), 8th Edition.
10. HPVA (Hardwood Plywood and Veneer Association).

WARRANTIES

11. Provide five (5) year warranty to include coverage for failure to meet specified requirements.
 1. Include coverage for delaminating of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

DELIVERY, STORAGE, AND PROTECTION

12. Do not deliver any elements which cannot be unloaded immediately into suitable storage conditions.

13. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.
14. Handle, unload and store elements without distortion and avoiding pre-finished surfaces rubbing together, and contact with mud, moisture and other damaging materials.
15. Protect all elements against damage to arises and glazing beads. Store frames and doors flat and away from moisture or direct sunlight.

PERFORMANCE

16. The structural and weather-tight performance of the completed window installation, the glazing and infill panels is the responsibility of the window manufacturer.

2. PRODUCTS

1. MATERIALS

Exterior timber frames

Manufacturer: Eco Windows

Timber species: European Larch

Grade: No. 1 clears

Treatment: H3.1, treatment type to be confirmed

Finish: 3 coats transparent timber finish – Sikkens HLS

Metal component: colorsteel: ironsand

1. Louvred doors (shed)

Manufacturer: Mainzeal

Timber species: Western Red Cedar

Door type: louvred doors, refer drawings for details and dimensions

Door finish: finish to be as per external – Sikkens HLS 3 coats

Hinge type and finish: heavy duty 70mm hinges required as per drawings

Standard doorsets, sliding-folding (bi-folds)

Manufacturer: Eco Windows

Door type: Triple glazed, timber framed bi-folds

Door leaf dimensions: refer drawings

Door finish: 3 coats Sikkens transparent timber finish – HLS

Frame material and finish: Alum low-sill (accessible) profile, natural anodised.

Jams & head constructed as per drawings.

Hinges type and finish: to be confirmed prior to window manufacture.

Wall type and thickness: varies, refer drawings

Wood: Solid timber. Moisture content 16% ex factory. Species type suitable for transparent or opaque exterior finish. Moisture content 10-14% for interior wood.

Exterior facings and scribes: Treated H3.1 unless durable heart wood, to profiles detailed/scheduled.

Refer to Section 08 80 00: GLAZING for glass type and thickness.

2. ACCESSORIES

Flashings generally: Ensure that materials used for head, jamb and sill flashings are compatible with the window frame materials and fixings and cladding materials.

Metal fastenings: Galvanized steel or non-corrodible metal.

Screws: Stainless steel or non-corrodible metal. Length sufficient to penetrate into the background support up to the shank. Screws for fixing hinges, hardware or furniture to match the item being attached.

Nails: Length sufficient to penetrate into the background support at least half the nail length; three-fifths their length where penetrating into Radiata pine.

1. Hinges: Stainless steel, size and gauge suitable to carry door size and weight.

3. FINISH

Preservative treatment: Frames and sash components to be treated to H3.1 Hazard Classification

Primer: Alkyd wood primer coating system, where painted. Sealed as per external timber cladding where visible to external face.

Interior Surfaces: Site painted, as specified in Section 09 90 00.

1. Screens: Colour As selected.

3. EXECUTION

1. EXAMINATION

1. Verify wall openings and adjoining air and vapour seal materials are ready to receive work of this section.

2. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment

2. INSTALLATION

1. Install non-rated doors in accordance with AWMAC Quality Standards requirements.
2. Trim non-rated door width by cutting equally on both jamb edges.
3. Trim door height by cutting bottom edges to a maximum of 3/4 inch.
4. Machine cut for hardware.
5. Coordinate installation of glazing.
6. Install door louvres plumb and level.

3. INSTALLATION TOLERANCES

1. Conform to AWMAC requirements for fit and clearance tolerances.
2. Conform to AWMAC Section 1300 requirements for maximum diagonal distortion.

CONDITIONS

Fabricate doorsets in the factory with doors hung, provision for furniture made, finishes applied and fully operable.

Check all openings on site for size and standard of execution before installing window or door frames.

Confirm that exterior wall openings have been prepared ready for the installation of all window and door frames. Do not proceed with the window and door installation until required preparatory work has been completed.

ASSEMBLY

Manufacture and fabricate frames, doors and sashes as detailed. Install hinges, stays and running gear as scheduled.

Fabrication sashes: Solid/finger-jointed timber to profiles detailed, complete with weather seals and weather hoods as necessary and as detailed.

Hinges: Joiner to fit appropriate hinge capacity and number to support door size and weight. Fit minimum 4 hinges per window sash

INSTALLATION

Proprietary elements: Fix in accordance with the door manufacturer's requirements.

Frames finished to match the width of lined walls. Wedge frames into opening and nail through into the studs.

Locate all wedges and fixing at hinge positions and opposite, with one fixing in the vicinity of the lock.

Fixings concealed behind planted stops.

Hang doors on hinges, sliding or bi-fold gear as specified and to operate freely. Fit all hardware and door furniture.

Provide for specified floor coverings plus 5mm clearance at any point of swing. When floor covering is not specified, allow 25mm total.

Remove doors from the frames if necessary to protect them, or for re-finishing, store safely and near completion refit them, all without any damage

Prime rebates and beads; install sealant backing strips or silicone. Install dry beading to outside of panels as selected. Do not mitre corners of beads

Install latches, locks and door furniture as scheduled.

Check and adjust operation of all doors, hardware and furniture.

Protect all finishes against damage from adjacent and following work.

CLEANING

3. Clean off or remove safety indicators at completion of the building.
4. Remove safety indicators and protective coverings, and wipe down all doorsets thoroughly. Remove all debris, unused materials and elements from the site

END OF SECTION 05 12 00

17. SECTION 08 52 00 – WOOD WINDOWS**1. GENERAL****SECTION INCLUDES**

Exterior wood window glazing units.

Operating hardware and insect screens.

Perimeter sealant.

Wood trim for exterior finishing.

RELATED SECTIONS

1. Section 06 40 23 – Interior Architectural Woodwork
2. Section 07 26 00 – Vapour Retarder
3. Section 07 92 00 - Joint Sealants
4. Section 08 80 00 – Glazing
5. Section 09 90 00 – Painting

REFERENCES

6. CSA-A440.4-07 - Window, Door, and Skylight Installation.
7. ASTM F588-07 - Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
8. ASTM E330-02 - Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
9. AAMA/WDMA/CSA/101/I.S.2/A440-08 – NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Unit Skylights.

WARRANTIES

10. Provide five (5) year warranty to include coverage for failure to meet specified requirements.
 1. Include coverage for degradation of colour finish
 2. Include coverage for delamination or separation of finish cladding from window member.

SUBMITTALS FOR INFORMATION

11. Sample of wood finish to be supplied for team confirmation prior to window manufacture.

PERFORMANCE REQUIREMENTS

Conform to performance requirements of AAMA/WDMA/CSA/101/I.S.2/A440, Designation.

Limit air leakage through assembly to 0.34 cfm/min/sq foot wall area, measured at a reference differential pressure across assembly of 1.57 psf measured in accordance with ASTM E283.

Window assemblies to be water tight when measured in accordance with ASTM E331.

Drain water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system, to the exterior by a weep drainage network.

Maintain continuous air and vapour barrier throughout assembly, primarily in line with pane of glass and heel bead of glazing compound.

The structural and weather-tight performance of the completed window installation, the glazing and infill panels is the responsibility of the window manufacturer.

DELIVERY, STORAGE AND PROTECTION

12. Do not deliver any elements which cannot be unloaded immediately into suitable storage conditions.
13. Handle, unload and store elements without distortion and avoiding pre-finished surfaces rubbing together, and contact with mud, moisture and other damaging materials.
14. Protect all elements against damage to arises and glazing beads. Store frames and windows flat and away from moisture or direct sunlight.

2. PRODUCTS**1. MATERIALS**

Exterior timber frames:

Manufacturer: Eco Windows

Timber species: European Larch

Grade: No. 1 clears

Treatment: H3.1, treatment type to be confirmed

Finish: 3 coats transparent timber finish – Sikkens HLS

Metal component: colorsteel: ironsand

1. Exterior timber sashes:
Manufacturer: Eco Windows
Timber species: European Larch
Grade: No. 1 clears
Treatment: H3.1, treatment type to be confirmed
Finish: 3 coats transparent timber finish – Sikkens

Hinges, windows:

- Type: to be confirmed prior to window manufacture.
- Pin: Fixed pin

2. Flashings: Material/type: Colorsteel: "ironsand" form and install as per drawings

Wood: Solid timber. Moisture content 16% ex factory. Species type suitable for transparent or opaque exterior finish. Moisture content 10-14% for interior wood.

Exterior facings and scribes: Treated H3.1 unless durable heart wood.

Refer to Section 08 80 00: GLAZING for glass type and thickness.

ACCESSORIES

Ensure that materials used for head, jamb and sill flashings are compatible with the window frame materials and fixings and cladding materials.

Metal fastenings: Galvanized steel or non-corrodible metal.

Screws: Stainless steel or non-corrodible metal. Length sufficient to penetrate into the background support up to the shank. Screws for fixing hinges, hardware or furniture to match the item being attached.

Nails: Length sufficient to penetrate into the background support at least half the nail length, three-fifths when penetrating into Radiata pine.

FINISH

3. Preservative treatment: Frames and sash components to be treated to H3.1 Hazard Classification.
4. Alkyd wood primer coating system, where painted. Sealed as per external timber cladding where visible to external face.
5. Interior Surfaces: Site painted, as specified in Section 09 91 00 PAINTING.
6. Screens: Colour As selected.

FABRICATION

Check all openings on site for size and standard of execution before installing window frames.

Confirm that exterior wall openings have been prepared ready for the installation of all window and frames.

Do not proceed with the window installation until required preparatory work has been completed.

Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet allowing installation and dynamic movement of perimeter seal.

Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.

Assemble insect screen frame, mitre and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with four (4) spring loaded steel pins.

Double weatherstrip operable units.

Factory glaze window units.

ASSEMBLY

7. Fabrication sashes: Solid/finger-jointed timber to profiles detailed, complete with weather seals and weather hoods as necessary and as detailed.

3. EXECUTION**EXAMINATION**

1. Verify wall openings and adjoining air and vapour seal materials are ready to receive work.

INSTALLATION

2. Install window assembly to CSA-A440.4.
3. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
4. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
5. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

6. Coordinate attachment and seal of perimeter air and vapour barrier materials.
7. Install operating hardware.
8. Install glass to Section 08 80 00 GLAZING.
9. Install perimeter sealant in accordance with Section 07 92 00 JOINT SEALANTS
10. Protect all finishes against damage from adjacent and following work.

CLEANING

Replace damaged, cracked or marked elements.

Clean off or remove safety indicators at completion of the building.

Remove safety indicators and protective coverings.

Remove all debris, unused materials and elements from the site.

ERECTION TOLERANCES

Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative, or 1/8 inches per 10 ft, whichever is less.

ADJUSTING

11. Adjust hardware for smooth operation and secure weather tight closure.

END OF SECTION 05 12 00

18. SECTION 08 80 00 – GLAZING**GENERAL****SECTION INCLUDES**

This section relates to the supply and fixing of glass into external and internal joinery, the supply of specialty glasswork including:

Triple glazed windows

Triple glazed skylight

Splash back to kitchen benches

Mirrors to bathroom and wardrobe

Tiles to bathroom walls

Sliding glass doors

1. 08 71 00.A1 - FRAMELESS ETCHLITE GLASS DOOR ON DORMA ANGLE 150 SLIDING SYSTEM
2. 08 80 00.A3 - TRIPPLE GLAZED THREE PART CUSTOM SKYLIGHT

RELATED SECTIONS

Section 08 14 00 - Wood Doors

Section 08 52 00 - Wood Windows

REFERENCES

ANSI Z97.1-04e1 - Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

ASTM E84-09c - Test Method for Surface Burning Characteristics of Building Materials.

ASTM E283-04 - Test Method For Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.

CAN/CGSB 12.1-M90 - Tempered or Laminated Safety Glass.

CAN/CGSB 12.8-97 - Insulating Glass Units.

IGMAC Insulating Glass Manufacturers Association of Canada - Sealed Insulating Glass: Certification Program.

IGMA Insulating Glass Manufacturers Alliance

Manufacturer's and supplier's documents relating to work in this section are:

Metropolitan Glass – Glazing Generally

Thermosash – Skylight only
ECO Windows – Timber Doors and Windows

PERFORMANCE REQUIREMENTS

2. Products of This Section: Manufactured to ISO 9001 certification requirements.
3. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as measured to ASTM E283.
 1. Refer to ENGINEER'S SPECIFICATION

2. SUBMITTALS

1. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
2. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colours.
3. Manufacturer's Certificate: Certify that sealed insulated glass, meets or exceeds specified requirements

PRODUCTS

SEALED INSULATING GLASS UNITS

Triple glazed **window** insulated glazing units:

Brand/type: Metro GlassTech

Inner glass: 6mm toughened Guardian Middle East ClimaGuard® Neutral 70 (Low-e)

Air gap: 8mm – 100% Argon filled

Middle glass: 6mm toughened Guardian Middle East ClimaGuard® Neutral 70 (Low-e)

Air gap: 10mm – 100% Argon filled

Outer glass: 6mm toughened Pilkington North America "Optifloat Grey" (grey tint)

O/A thickness: Nom. 36mm

3. SEALED INSULATING GLASS SKYLIGHT UNIT

1. Triple glazed **skylight** insulated glazing units :

Brand/type: Metro GlassTech

Inner glass: 6mm toughened Guardian Middle East ClimaGuard® Neutral 70 (Low-e)

Air gap: 12mm – 100% Argon filled

Middle glass: 6mm toughened Guardian Middle East ClimaGuard® Neutral 70 (Low-e)

Air gap: 12mm – 100% Argon filled

Outer glass: 6mm toughened Pilkington North America "Optifloat Grey" (grey tint)
O/a thickness: Nom. 42mm

4. MISCELANEOUS GLASS PRODUCTS

1. Glass tile selections:
Location: Bathroom (refer to I-561)
Type and thickness: Metroglass "colour bak" Graphic Glass, 5mm, "Etchlite" finish to front surface, Flat grind edge finish
Colour: tbc – to be selected from the Resene colour range
Fixing: fixed to wall lining with tile adhesive - details tbc
2. Sliding glass door selections:
Location: Bathroom, Laundry/Dressing ID01-4 & ID02-5 (refer to I-531)
Type and thickness: Metroglass translucent laminate, Toughened to NZS 4223, 10mm
3. Glass Shelf selections:
Location: Kitchen
Type and Thickness: Toughened clear glass, 6mm
Width: 100mm
Fixing: Supported by stainless steel rods, detail to be confirmed
4. Mirror selections
Location: Bathroom and Laundry, fixed to cabinet doors (refer to I-520)
Type and thickness: Vinyl backed 4mm
5. Splashback selections:
Location: Kitchen (refer to I-420)
Type and thickness: Metroglass "colour bak" back painted glass, 5mm
Flat grind edge finish
Holes drilled as per cutting schedule
Colour: tbc – to be selected from the Resene colour range

5. SAFETY MIRROR GLASS

1. 4mm Float plate mirror with silver plating and vinyl coating, safety glazing material.
2. Mirror Adhesive: Adhesive mirror-mastic and double-sided adhesive tape.

Temporary protection film: Factory applied UV resistant film to protect the glass from construction damage.

Safety splash back: Back Painted Graphic Glass safety glazing material to AS/NZS 2208. Metro GlassTech
"Colour Bak"

Glass tile: Back Painted Graphic Glass safety glazing material to AS/NZS 2208. With frosted front face

COMPONENTS

Jointing, putty and sealing materials: Ensure jointing, putty and sealing materials compatible with glass substrates. Confirm compatibility with laminated glass.

Sprigs: Diamond metal pieces to retain glass in timber sashes and frames.

Glazing tapes: Single/double pressure sensitive self-adhesive low/medium/high density vinyl foam tapes/butyl tapes selected to suit the glazing detail.

Setting blocks: Santoprene/Neoprene, 80-90 Shore hardness, set at quarter points or to detail, to support the base of the glass panes. Use with bead glazing and for IGU's.

EXECUTION**EXAMINATION**

Inspect to insure all glass is accurate size with clean, undamaged edges and surfaces.

ASSEMBLY

Edgework other than a clean cut. Refer to drawings for type.

APPLICATION - TIMBER GLAZING

Ensure all rebates and grooves are clean, dry and unobstructed at time of priming, sealing and glazing.

Ensure that all rebates have been primed with a primer suitable for this purpose and applied to the requirements of 09 91 00 PAINTING.

Before fixing ensure that timber beads are sealed and painted to match the timber surround.

Centralise the glass in the rebate opening using setting, location and spacer blocks as required in NZS 4223.1, Section 4 Glazing, to prevent movement of glass in the rebate and cushion the effect of wind loading on the sealing system.

Bead glazing, preformed strips: Apply the preformed tape to the rebate upstand with securely formed butt joints at corners. Place setting blocks, offer the glass and press back against the tape centralised in the opening and apply the second tape. Press the beads against and compressing the tapes and fix true to

line and face sufficiently rigid to prevent flexing or movement. Trim off excess strip. Clean and prime the glass surface and when dry apply sealant capping between bead and glass, finishing to a smooth camber.

Bead glazing, non setting compounds: Apply compound to the rebate. Push setting blocks into place with distance pieces against the rebate upstand before offering the glass to the surround on setting blocks, centralised in the opening and pushed back into the glazing compound. Fill all voids with compound and apply more compound before setting distance pieces in it opposite the distance pieces already in place. Bed the beads to the glass and rebate and fix true to line and face sufficiently rigid to prevent flexing or movement. Finish compound off at an angle both sides of the glass.

Installing insulating glass units: Refer to the glazing manufacturer's requirements and before glazing ensure that the materials forming the opening are strong enough to accept the weight, the rebates are the correct size and prepared to receive the units. Fit setting and location blocks and bead glaze units using a compatible sealant and to the glazing manufacturer's requirements.

APPLICATION - MIRRORS

Mirrors, adhesive fixed: Fix with adhesive mirror-mastic and double-sided adhesive tape. Adhesive mastic area 2.7 ft² per 10.8 m² of mirror. Fixed to bathroom cabinetry.

FINISHING

Safety: Indicate the presence of transparent glasses for the remainder of the construction period, with whiting, tape or signs compatible with the glass type. Indicators other than whiting must not be applied to the glass surface.

COMPLETION

Replace damaged, cracked or marked elements.

Leave work to the standard required by following procedures.

Remove debris, unused materials and elements from the site.

CLEANING

3. Remove glazing materials from finish surfaces.
4. Remove labels after Work is complete.
5. Clean glass and adjacent surfaces.

6. SCHEDULE

1. Individual glass data for panes that make up triple glazing:
 1. 12042 makes up 2 x inner panes
 2. 9834 to be outer pane of windows and skylight

ID	12042 (low-e)	9834 (grey tint)
Product Name	ClimaGuard® Neutral 70	Optifloat Grey
Manufacturer	Guardian Middle East	Pilkington North America
Thickness mm	5.74	5.918
Solar Transmission Tsol	0.558	0.408
Solar Reflection		
Rsol1	0.131	0.05
Rsol2	0.181	0.05
Visible Transmission Tvis	0.753	0.438
Visible Reflectance		
Rvis1	0.069	0.052
Rvis2	0.05	0.052
Infrared Transmission Tir	0	0
Emissivity		
emis1	0.84	0.84
emis2	0.171	0.84
Conductivity Cond	1	1

END OF SECTION 05 12 00

19. SECTION 09 28 13 – CEMENTITIOUS BACKING BOARDS**1. GENERAL****SECTION INCLUDES**

Cementitious backer board and joint treatment on bathroom tiles wall and kitchen backsplash.

RELATED SECTIONS

Section 06 11 00 – Wood Framing

REFERENCES

ANSI A118.9-1999- Cementitious backer units

ASTM C475/C475M-02 - Joint Compound and Joint Tape for Finishing Gypsum Board.

ASTM C1288-99 - Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets.

GA-216-07 (Gypsum Association) - Application and Finishing of Gypsum Panel Products.

WARRANTIES

Provide manufacturer/supplier warranty of 15 years from date of purchase.

QUALITY ASSURANCE

1. Perform Work in accordance with ASTM C840.
2. Installer Qualifications: Company specializing in performing the work of this section with documented experience.

2. PRODUCTS**1. MANUFACTURER**

1. James Hardie™; Product: VillaBoard®
2. Substitutions: Not permitted.

2. CEMENTITIOUS FIBRE BOARD MATERIALS

1. Cementitious Backer Board: ASTM C1325, high density, fibre reinforced cementitious board, smoothed edges, ends square cut.

ACCESSORIES

2. 9mm linings: 40mm x 2.8mm galvanized flathead HardiFlex[®] nails
3. Joint materials: ASTM C475

9mm PVC jointers.

Self adhesive polyethylene for behind expressed joints and expressed control joints.

Joint reinforcing tape: 52mm wide perforated paper tape.

Bedding compound: James Hardie[®] Base Coat compound powder.

Finishing compound: James Hardie[®] Top Coat premixed.

Sealant: Silicone or polyurethane sealant.

Cementitious Board Fasteners: manufacturer's purpose made VillaDrive or HardDrive stainless steel screws

4. Polyurethane wallboard adhesive: Refer to manufacturers installation manual

3. SELECTIONS**1. EXAMINATION**

1. Verify existing conditions before starting work

2. FIBRE CEMENT BOARD INSTALLATION

1. Install fibre cement board to manufacturers written instructions.

JOINT TREATMENT

2. Finish in accordance with ASTM C840.
3. Fill and finish joints and corners of cementitious backing board.

TEXTURE FINISH

4. Apply finish texture coating to manufacturer's written instructions.

3. CEMENTITIOUS BOARD INSTALLATION

1. Erect single layer fibre cement board in most economical direction with ends and edges occurring over firm bearing.
2. Use screws when fastening fibre cement board to wood furring or framing.
3. Place control joints consistent with lines of building spaces.
4. Place PVC corner mould at internal corners. Use longest practical length.

4. JOINT TREATMENT

1. Finish in accordance with ASTM C840.
2. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
3. Fill and finish joints and corners of cementitious backing board.

STORAGE AND HANDLING

4. Store and handle material to prevent moisture damage and distortion of materials.
5. Protect corners and edges from damage.
6. Protect cabinetry, fitting and finishes already in place from water staining and installation of fibre cement board.

COMPLETION

Clean adjoining surfaces and fittings of spots, marks, dust and droppings.

7. Remove debris, unused materials and components from the site

END OF SECTION 05 12 00

20. SECTION 09 30 00 – TILING**GENERAL****SECTION INCLUDES**

Glass wall tile using the liquid application method.

Cementitious backing board.

Waterproofing membrane.

REFERENCES

CAN/CGSB-51.34-M86 - Vapour Barrier, Polyethylene Sheet for Use in Building Construction

TCA A137.1-1988 - Specifications for Ceramic Tile.

SUBMITTALS

Submit on request samples of the tiles specified, sufficient to show the pattern and the range of colour finish.

Provide written instructions for using adhesives and grouts.

REQUIREMENTS

Adhesives selected for use on proprietary substrates or waterproof membranes to have documented compatibility approval from the respective manufacturers.

Certify that Products meet or exceed the requirements of CAN/CGSB-75.1.

WARRANTIES

Provide a two (2) year warranty to include coverage for failure to meet specified requirements.

QUALITY ASSURANCE

1. Products of This Section: Manufactured to ISO 14000 certification requirements.
2. Manufacturer Qualifications: Competent workers experienced with the materials and techniques required.

2. DELIVERY, STORAGE AND HANDLING

1. Protect adhesives from freezing or overheating in accordance with manufacturer's written instructions.

2. Take delivery of packets of tiles undamaged and dry. Handle tiles with care to avoid chipping, soiling and damage. Store on hard level standings in non-traffic, non work areas that are enclosed, clean and dry.
3. Store tiles on hard level standings in an enclosed, dry, clean area away from foot-traffic to protect from damage.

3. ENVIRONMENTAL REQUIREMENTS

1. Do not install adhesives in an unventilated environment.
2. Do not carry out tiling where the substrate temperature is below 5°C or above 40°C

PRODUCTS

MATERIALS

Wall tiles: Custom Glass tiles by Metro GlassTech
Refer to 4611 GLAZING for further details

Sheet waterproofing membrane: Proprietary sheet waterproofing system.

Mortar and Grout: ANSI A118.8, modified epoxy emulsion mortar and grout, colour as selected

ADHESIVE MATERIALS

3. Tile Setting Adhesive: Liquid applied.
4. Epoxy Adhesive: ANSI A118.3 thin set bond type.

Movement joint sealant

Neutral cured sealant for areas where waterproof membranes are used or where used against aluminium.

1. Acid cured sealant except for areas where waterproof membranes are used or where used against aluminium.

EXECUTION

4. EXAMINATION

1. Check tiles to ensure that they are as specified, from the same batch, of a consistent colour and pattern and sufficient to complete the work. Reject tiles that vary widely in colour or pattern. Reject tiles that are damaged.

2. Verify that surfaces are ready to receive work.
3. Check the deflection of walls does not exceed $1/360^{\text{th}}$ of the span under dead and live load.

5. PREPARATION

1. Protect surrounding work from damage or disfiguration
2. Apply sealer to substrate surfaces in accordance with adhesive manufacturer's written instructions.
3. Before commencing the setting out confirm the number and location of cut tiles. Minimise in number with no cut tiles less than half size and only at the perimeter of the work.

INSTALLATION – NOTCHED TROWEL METHOD

4. Install waterproofing membrane between the tile adhesive and the substrate as indicated on the drawings, from floor to ceiling.

Install mortar bed, tile, and grout to manufacturer's instructions.

Install membrane; lap and seal watertight edges and ends.

Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar or excess grout.

Apply adhesive to a maximum 3mm bed thickness with a minimum of voids.

Grout tile joints until joints are completely filled. Remove any access grout with a damp cloth.

CLEANING

Upon completion of setting and grouting, thoroughly sponge and wash the tiles to leave them completely clean and without blemish. Finally polish glazed tiles with a clean dry cloth.

Remove debris, unused materials and elements from the site.

END OF SECTION 05 12 00

21. SECTION 09 64 00 – TIMBER FLOORING**1. GENERAL****1. SECTION INCLUDES**

1. Timber decking
 1. 09 64 00.A1 - 90X12MM TIMBER TONGUE & GROOVE FLOORBOARDS
2. Surface finishing

2. RELATED SECTIONS

1. Section 06 11 00 – Wood Framing

REFERENCES

ASTM E84-08a - Test Method for Surface Burning Characteristics of Building Materials.

WARRANTIES

Warrant this work under normal environmental and use conditions against failure by shrinkage and/or swelling for a period of one (1) year.

REQUIREMENTS

Samples: Submit samples illustrating floor finish, pattern, colour, and sheen.

Product Data: Provide data for flooring and floor finish materials.

ENVIRONMENTAL REQUIREMENTS

Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized.

QUALITY ASSURANCE

2. Installer Qualifications: Floor layers to be experienced competent workers, familiar with the materials and the techniques specified.

3. DELIVERY, HANDLING AND STORAGE

1. Take delivery of flooring dry and undamaged and store on site under cover to keep in that condition. Allow timbers to acclimatise to interior building conditions on site (2-3 weeks) prior to commencing laying.

2. PRODUCTS**1. MANUFACTURERS**

1. ThermoForest Products; Product: ThermoWood.

MATERIALS

Flooring: Species and grade stamped on underside of each piece. Tongue and groove profile (unless detailed or selected otherwise). 10 to 12 percent moisture content at time of installation.

Damp-proof course: Heavy kraft strip laminates saturated and coated with bitumen.

COMPONENTS

Flooring nails: 50mm x 2.4mm steel wire floor brads, or as specified by manufacturer.

2. Sheathing Paper: Asphalt impregnated paper.

3. EXECUTION**EXAMINATION**

1. Verify existing conditions before starting work.
2. Verify wood subfloor is properly secured, smooth and flat to plus or minus 1/4 inch in 10 feet.
3. Verify that required floor mounted utilities are in proper location.

2. PREPARATION

1. Broom-clean substrate

3. INSTALLATION

1. Install flooring to manufacturer instructions.
2. Blind nail flooring in accordance with manufacturer's written instructions.

3. Lay flooring perpendicular to joists in straight parallel lines. Verify alignment as work progresses.

CONDITIONS

Use a moisture meter to the flooring supplier's stated requirements, testing 5% of not less than 10 boards in the centre of the length. Do not commence laying if 90% of values obtained are not within the range specified.

Make arrangements for operating the heating or air conditioning installation from laying of flooring up to completion of the works.

Do not start cutting down and laying and fixing flooring before the building is enclosed, external moisture is excluded from the area and all wet work is complete.

APPLICATION

Lay flooring strips at right angles to floor joists or battens in straight parallel lines, tongues fitted into grooves and cramped together strip by strip. Skew nail to every joist or batten through the tongue to allow full entry of the groove of the next strip. Form tongue and groove end joints tight and random staggered across adjacent boards.

FINISHING

4. Sand flooring for smooth even finish with no evidence of sander marks. Take precautions to contain dust. Remove dust by vacuum.

Mask off adjacent surfaces.

CLEANING

Clean floor surfaces in accordance with manufacturer's written instructions.

PROTECTION OF FINISHED WORK

Leave the whole of this work free of blemishes, undamaged and to the standard of finish required for following work.

Protect laid floor from moisture and spilled liquids at all times, and from long exposure to direct sunlight.

Protect the completed work and make good before any surface finish is applied.

Ensure that the completed surface is not used for traffic until curing is complete. Continue to protect the surface until completion of the contract works.

5. Protect finished work from moisture at all times.

END OF SECTION 05 12 00

22. SECTION 09 91 00 – PAINTING

GENERAL

SECTION INCLUDES

Surface preparation and field application of paints and coatings.

RELATED SECTIONS

1. Section 05 50 00 – Metal Fabrications.
2. Section 06 22 00 – Millwork.

REFERENCES

OPCA (Ontario Painting Contractors Association) – Architectural Painting Specification Manual.

SSPC (The Society for Protective Coatings) – Steel Structures Painting Manual.

MPI (Master Painters Institute) – Architectural painting Specification Manual.

NACE (National Association of Corrosion Engineers).

AWWA (American Water Works Association) – D102-0 – Coating Steel Water Storage Tanks

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Abbreviations

VOC Volatile organic compound

SUBMITTALS

Prepare samples of the finished work as scheduled, including preparation and colour as specified. Obtain written approval of the appearance before proceeding. Refer to SCHEDULE for requirements.

DELIVERY, STORAGE, AND PROTECTION

3. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, colour designation, and written instructions for mixing and reducing.

2. ENVIRONMENTAL REQUIREMENTS

1. Store paint materials at minimum ambient temperature of 7 degrees C and a maximum of 32 degrees C, in ventilated area, and as required by manufacturer's written instructions.
2. Minimum application temperature for varnish finishes: 18 degrees C for interior or exterior, unless required otherwise by manufacturer's written instructions.

PRODUCTS**MATERIALS**

3. Substitutions: Not permitted.

Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

FINISHES

4. Refer to schedule at end of section for surface finish and colour schedule.

EXECUTION**EXAMINATION**

5. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
6. Examine surfaces scheduled to be finished prior to commencement of work.
7. Test shop applied primer for compatibility with subsequent cover materials.
8. Ensure moisture content at the time of application is near to the equilibrium moisture content pertaining to the particular locality in which the timber is used, without any excessive moisture content gradient between core and surface.

PREPARATION

Where surfaces have been treated with preservatives or fire retardants, check with the treatment manufacturer that coating materials are compatible with the treatment and do not inhibit its performance. If they are not compatible, obtain instructions before proceeding.

The coatings listed in schedules and elsewhere are of necessity simplified. Coat ancillary exposed surfaces to match similar or adjacent materials or areas, except where a fair-faced natural finish is required or items are completely prefinished. In cases of doubt obtain instructions before proceeding.

Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

Correct defects and clean surfaces which affect work of this section.

Seal with shellac and seal marks which may bleed through surface finishes.

Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Clean surfaces with solvent. Prime bare steel surfaces.

Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

Exterior Wood Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied.

Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

APPLICATION

Apply products to manufacturer's written instructions.

Do not apply finishes to surfaces that are not dry.

Apply each coat to uniform finish.

Sand lightly between coats to achieve required finish.

Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

Allow applied coat to dry before next coat is applied.

Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

Prime concealed surfaces of woodwork with primer paint.

Prime concealed surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25% with mineral spirits.

Ensure LOSP. treated joinery has dried sufficiently to lose odour.

Concealed cabinetry surfaces: Apply off-site coatings to all surfaces including those which will be concealed when incorporated into the building

Prime or seal and paint all six faces of doors before hanging.

Before glazing apply the first two coats, or the primer and one undercoat, to rebates of stained, varnished or painted joinery and beads.

FIELD QUALITY CONTROL

Allow the paint manufacturers to inspect the work in progress and to take samples of their products from site if requested.

Inspection of the whole of the work at each of the stages scheduled may be made. Agree a programme that will facilitate such inspection, including notification when each part and stage of the work is ready for inspection.

CLEANING

Clean adjoining surfaces, glass and fittings of any paint contamination. Clean off glass indicators at completion of the building works. Clean glass inside and out to a shining finish.

Remove dropsheets, coverings and masking to leave surrounding surfaces and areas clean, tidy and undamaged. Remove debris, unused materials and elements from the site.

Replace hardware without damage to it or the adjoining surface. Leave properly fitted and in working order.

SCHEDULE – INTERIOR SURFACES

9. Wood – Painted: Resene One-Line Spec. No. 2i 1.3 (EC)
 1. One (1) coat of Resene TimberLock D48^{NEC} preserver/conditioner.
 2. One (1) coat of Resene Quick Dry D45 primer.
 3. Two (2) coats of Resene Lumbersider D34 latex, satin.

10. Wood – Painted: Resene One-Line Spec. No. 2i 1.4 ZS (EC)
 1. One (1) coat of Resene TimberLock D48^{NEC} preserver/conditioner.
 2. One (1) coat of Resene Quick Dry D45 primer.
 3. Two (2) coats of Resene Zylone Sheen or Resene Zylone Sheen VOC Free D302 latex, eggshell.

11. Wood – Transparent: Resene One-Line Spec. No. 2i 3.3
 1. One (1) coat of Resene Waterborne Colorwood D50a, wood stain.
[OR]
 2. One (1) coat of Resene Waterborne Colorwood Reducing Base D50a, clear coat.
 3. Four (4) coats of Resene Aquaclear D59 satin urethane.

3. SCHEDULE – STEEL COATINGS

1. External steelwork protective coating
 1. One line Data Sheet 24e 2.2 ULT
 2. 1st coat Epoxy Primer Armourcote 220 RA34
 3. 2nd coat Acrylic Urethane Uracryl 402 Semi-gloss
 4. 3rd coat Acrylic Urethane Uracryl 402 Semi-gloss
 5. 4th coat Acrylic Urethane-clear Uracryl 402 UVS Clear

END OF SECTION 05 12 00

23. SECTION 11 31 00 – RESIDENTIAL APPLIANCES**1. GENERAL****1. SECTION INCLUDES**

1. 11 31 13 A1 - Fisher & Paykel Fridge Freezer Model E331T
2. 11 31 13 A2 - Fisher & Paykel 6 Place Single Dishdrawer Model DD60SCX6
3. 11 31 13 A3 - Fisher & Paykel Rangehood Model HC60PCHTX1
4. 11 31 13 A4 - Fisher & Paykel Slimline Induction Hob
5. 11 31 13 A5 - Fisher & Paykel Compact Oven OB60NDEX1
6. 11 31 13 A1 - Fisher & Paykel Washing Machine WA55T56GW1

2. SECTION REQUIREMENTS

1. Allowances: See Division 01 Section "Price and Payment Procedures" for appliance allowances.
 1. Submittals: Product Data.
2. Regulatory Requirements: Comply with provisions of the following product certifications:
 1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
 3. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.
 4. NAECA: Provide residential appliances that comply with NAECA standards.
3. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
4. Energy Ratings: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

3. REFERENCES

1. Manufacturers Documents
 1. Fisher & Paykel documents relating to work in this section are::
 1. Induction Cook top installation instructions and user guide

2. OB60 series built in oven installation instructions and user guide
 3. Refrigerator & Freezer installation instructions and user guide
 4. DishDrawer installation instructions and user guide
 5. Washing machine installation instructions and user guide
2. Copies of the above literature should be supplied with the appliances. It is also available from Fisher & Paykel:
1. Web: www.fisherpaykel.co.nz
 2. Telephone: 0800 FP CARE (0800 37 2273)

2. PRODUCTS

1. RESIDENTIAL APPLIANCES

1. Slimline “Designer” induction cooktop
 1. Product:
 1. Fisher & Paykel, CI302DTB1
 2. Cooking Zones: 2
 3. Zone Ratings:
 1. Front: 1400 W – 1800 W
 2. Rear: 1850 W – 2500 W
 4. Current Rating: 15 A
 5. Colour: Black
2. Built-in “Designer” compact electric oven
 1. Product:
 1. Fisher & Paykel, Model: OB60NDEX1
 2. Designer Range handle
 3. Colour: Stainless Steel Finish
 4. Dimensions (DxHxW): 556 mm x 450 mm x 595 mm
 5. Electrical Specifications:
 1. Power: 2800 W
 2. Current: 12.8 A
3. Active smart refrigerator with top mount freezer
 1. Product:
 1. Fisher & Paykel, Model: E331T
 2. Designer Range handle
 3. Dimensions (DxHxW): 736 mm x 1425 mm x 635 mm
 4. Capacity:
 1. Refrigerator: 232 L
 2. Freezer: 97 L

3. Total: 329 L
5. Colour: Custom stainless steel door
4. Single DishDrawer dishwasher
 1. Product:
 1. Fisher & Paykel, Model: DD60SCX
 2. Capacity: 6 place settings
 3. Energy Star Rating
 4. Dimensions (DxHxW): 570 mm x 409 mm x 599 mm
 5. Water Rating: 4 star (WELS)
 6. Color: EZKleen Stainless Steel
5. Wall canopy rangehood
 1. Product:
 1. Fisher & Paykel, Model: HC0PCHTX1
 2. Fan Ratings:
 1. Max 812m³/hr
 2. Max 65dBA
 3. 3 Fan Speeds
 4. Centrifugal Fan
 3. Dimensions (DxHxW): 450 mm x 648 - 1068 mm x 599 mm
 4. Color: Stainless Steel
6. Clothes Washer
 1. Product: WA55T56GW1
 1. Fisher & Paykel, Model WA55T56GW1
 2. Capacity: 5.5kg
 3. Color: White

3. EXECUTION

1. INSTALLATION

1. Built-in Appliances: Securely anchor to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
2. Freestanding Appliances: Place in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
3. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

4. Verify that accessories required have been furnished and installed.

END OF SECTION 05 12 00

24. SECTION 12 21 23 – ROLL DOWN BLINDS**1. GENERAL****1. SECTION INCLUDES**

1. 12 21 00 A3 – Concealed Window Roller Blind
2. 12 21 00 A1 - Skylight Blind

2. SECTION REQUIREMENTS

1. Product Submittals – refer Appendices for Manufacturers Data

2. PRODUCTS**1. PRODUCTS**

1. Window Treatments - Block Out Roller Blind
2. Reflex Roll Skylight Blind – motorised, with Solstis Low E fabric

3. EXECUTION**1. INSTALLATION**

1. Install blinds level and plumb
2. Adjust blinds to operate smoothly and easily throughout entire operational range

END OF SECTION 05 12 00

25. SECTION 21 10 00 – WATER-BASED FIRE-SUPPRESSION SYSTEMS**GENERAL****SECTION INCLUDES**

1. 21 13 13 A1 - Recessed Sprinkler Head
2. 21 13 13 A2 - EQ DHF 460 Fire Suppression Pressure Pump
3. 21 13 13 A3 - Blazestop Sprinkler Control Box
4. 21 13 13 A4 - 22mm Polybutylene Sprinkler Piping

SECTION REQUIREMENTS

Submittals: Product Data for valves, sprinklers, specialties, and alarms.

Submit sprinkler system drawings identified as "working plans" and calculations according to NFPA 13.

Submit required number of sets to authorities having jurisdiction for review, comment, and approval. Include system hydraulic calculations.

Submit test reports and certificates as described in NFPA 13.

Design and Installation Approval: Acceptable to authorities having jurisdiction.

Hydraulically design sprinkler systems according to NFPA 13.

Comply with NFPA 13R and NFPA 70.

UL-listed and -labeled and FM-approved pipe and fittings.

REFERENCES

Manufacturer's documents

The following LEAP Australasia Ltd documents relate to work in this section are:

Guide to the design and installation of Blazestop home sprinkler systems

Copies of the above literature are available from:

Web: www.leapltd.co.nz

Email: info@leapltd.co.nz

Telephone: 0800 246 810

Facsimile: 04 568 9423

REQUIREMENTS

General design requirements

The house to be protected shall have sprinklers fitted in every room except in the areas listed below for which protection is optional:

Voids below floors.

Lofts or space above ceilings.

Toilets and bathrooms.

Cupboards, pantries, wardrobes less than 5 m².

Open external balconies, porches, walkways or stairs.

Bay windows and planter box windows.

Detached or fire-separated garages/out buildings unless used for sleeping purposes.

PRODUCTS**MATERIALS**

Pipework

Blazestop Hep₂O polybutylene piping incorporating a high integrity grab wedge and pre-lubricated O ring.

Sprinkler heads

The sprinkler head components used in the installation Blazestop model, rating and limitations published on an approved list. Three types of sprinkler heads are available:

Concealed sprinkler head.

Horizontal side - wall sprinkler head.

Pendant sprinkler head.

Pressure pump

Self-priming multistage centrifugal pump complete with pressure switch, electrical connections, fittings and any other separate item so that it's a plug and pump installation.

PRODUCTS

Blazestop sprinkler system

Location: As per the Design Layout plan

Pipes: 22mm dia Blazestop Hep₂O polybutylene

Sprinklers: Concealed Sprinkler head

Sprinkler spares: Two per type used

5. Pressure Pump

1. Wallace Pumps, Model: EQ-DHF
2. Variable speed controlled pressure booster pump
3. Integral pressure tank
4. Built in controller with pressure sensing operation

EXECUTION

CONDITIONS

Delivery

Take delivery of pipes and all accessories in good condition. Reject any damaged materials.

Storage

Store materials and accessories on a level, firm base, in dry conditions, out of direct sunlight and completely protected from weather and damage. Ensure storage areas are away from current work areas. Cover to keep dry until installed.

Building structure

Do not commence work until the building structure is of the standard required by the LEAP accredited installer for the installation of the pipework.

Protect

Protect surfaces, cabinetwork, fittings, equipment and finishes already in place from the possibility of damage during the installation process.

Confirm layout

Before commencing work confirm the proposed layout of pipe runs and positions of valves pumps and tanks.

Co-ordinate services

Co-ordinate and co-operate with other sub-trades to avoid any conflict with the installation of the system with other subcontractors work.

Water supplies

Water pressure at the supply point must be measured for the purpose of calculating the pressures and flows for the sprinkler system. If the pressure is not adequate the system may be designed as a separate branch from the domestic supply with an automatic residential shut off valve. Where permitted by the Local Authority and if metered the connection should be 25mm, to limit the pressure loss as far as possible.

Where town supply is not available, or there is insufficient pressure at the supply, the water supply for the combination system can be boosted by means of a pump. If the supply is drawn off a tank

supply, adequate water must be available in storage at all times to allow the design pressures and flows for the sprinklers, for a minimum of 10 minutes.

APPLICATION

Layout of pipework and water reticulation

Piping layout to be designed to minimise dead-legs to sprinklers and fixed directly behind the sprinkler heads. To ensure that adequate pressure is available at the required flow rate to the MHD sprinkler it is imperative that the available pressure to the MHD sprinkler exceeds the required pressure at the MHD sprinkler.

Holes should be drilled through joists of sufficient diameter to allow the pipes to slide freely. Support Blazestop pipes with nail or screw type clips (code HEP65).to the manufacturers recommended spacings. Sleeve the Blazestop pipe where it passes through brickwork, block work or concrete. When running Blazestop adjacent to or through metalwork ensure the pipe cannot make contact with metal. Preventive measures are; passing the pipe through a resilient grommet, fix an extruded flexible profile to the metalwork, provide sufficient pipe clippings to prevent contact between the pipe and metalwork, or run the pipe in a conduit.

The installer must follow the design and not make any alterations to pipe material, pipe length, pipe size, number and type of fittings and the number and position of sprinklers without consulting the designer of the system. Any variation will require the design to be recalculated and resubmitted to the BCA.

Isolation valves

Fit the isolating valve in an accessible location adjacent to the water supply authority water meter. Install the isolation valve that is part of the system, secured in the open position and clearly identified by a label bearing the words "FIRE SPRINKLER SYSTEM - CLOSURE WILL REMOVE SPRINKLER PROTECTION".

Installing backflow prevention device

Provide and install backflow prevention device as near as practicable to the potential source of contamination, and in an accessible position for maintenance and testing.

Sprinkler heads

Automatic Sprinklers: With heat-responsive element complying with the following:

UL 199, for applications except residential.

UL 1626, for residential applications.

UL 1767, for early-suppression, fast-response applications.

All sprinklers within the design must be supplied from the same manufacturer to ensure compatibility.

Manufacturer's data for the sprinklers selected must be obtained for use during hydraulic calculations. Install the selected sprinklers in the rooms as shown on the layout plan. Place

sprinkler within a room to cause the spray pattern to strike the wall surfaces no more than 700mm below the ceiling. The minimum spacing between sprinklers within a room is 2400mm. The maximum spacing will depend on the coverage of the sprinkler chosen and is listed in the sprinkler data sheet. Projections from walls and ceilings less than 200mm are to be treated as a single room. For sloping ceilings, the sprinkler needs to be located within 900mm (vertically) of the highest point of the ceiling.

Concealed sprinkler heads are mounted above the ceiling line with only the decorative cover visible.

The deflector and heat sensors are concealed by a flat or domed decorative cover.

Horizontal side - wall sprinkler heads are mounted high on a wall instead of a ceiling.

Pendant sprinkler heads are hung directly from the ceiling, with the deflector placed within 100mm below the ceiling line.

Two spare sprinkler heads of each type used in the system are to be installed in a permanent bracket or labelled spares box.

Pressure pump

Install self-priming multistage centrifugal pump by securely bolting the base of the pump to the structure in the position as shown on the layout drawings. Ensure the pump is protected from sediment and debris by use of suitable in line filters. Connect up the water supply to the pump. Plug into the electrical socket and test run the pump.

Elevated or pressure tank

Install tank in location as shown on the layout drawings.

Thermal insulation

Fit over pipes where freezing is likely to occur, preformed polyurethane foam pipe insulation securely taped into position.

COMMISSIONING

Post installation testing

Flush, test, and inspect sprinkler piping systems according to NFPA 13

The completed system to be fully tested and commissioned in accordance with Blazestop recommendations and as necessary to ensure the system is complete.

Testing to include:

Pressure test to ensure any non Blazestop components in the system will withstand the test pressure.

MHD Verification tests conducted to ensure that the designed pressure and flow are achieved at each of the MHD multiple or single sprinkler heads.

Rectify any sub-standard items and re-test.

Final inspection

Upon completion and passing of the MHD verification tests the sprinklers may be fitted to the outlets in accordance with Blazestop's instructions. All sprinklers are to be inspected at the completion of the building contract to ensure that no sprinkler has been damaged or altered in any way.

COMPLETION

Cleaning

Remove debris, unused materials and elements from the site. Clean soiled or marked work. Replace damaged, cracked or marked elements. Leave the whole of this work to the standard required by following procedures.

Protect

Protect new work from damage.

Spares

6. Two spare sprinkler heads of each type must be mounted at a convenient location for quick reinstallation after a fire to allow for continued protection to be provided immediately after the fire.

END OF SECTION 05 12 00

26. SECTION 22 05 00 – COMMON WORK RESULTS FOR PLUMBING**1. GENERAL****1. SECTION REQUIREMENTS**

1. Submittals: Product Data

2. SECTION INCLUDES

1. 22 05 29 A1 – Unistrut Basket Tray
2. 22 05 29 A2 – Moulded PVC pipe clips
3. 22 05 53 A1 – Self adhesive piping labels

2. PRODUCTS**HANGERS AND SUPPORTS**

1. Unistrut Basket tray: 200mm x 30mm. Suspended on braided steel cable. Fixed using proprietary fixing clips
2. Moulded PVC pipe clips: Size determined by pipe size

2. IDENTIFICATION LABELS FOR PLUMBING PIPING AND EQUIPMENT

1. Self adhesive piping identification labels

3. EXECUTION**GENERAL PIPING INSTALLATIONS**

1. Install piping free of sags and bends.
2. Install fittings for changes in direction and branch connections.
3. Install sleeves for pipes passing through walls and concrete floor and roof slabs.
4. Exterior Wall, Pipe Penetrations: Mechanical sleeve seals installed in steel or cast-iron pipes for wall sleeves.
5. Install unions at final connection to each piece of equipment.

2. GENERAL EQUIPMENT INSTALLATIONS

1. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.
2. Install equipment level and plumb, parallel and perpendicular to other building systems and components, unless otherwise indicated.
3. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
4. Install equipment to allow right of way for piping installed at required slope.

3. BASES, SUPPORTS, AND ANCHORAGES

1. Anchor equipment to base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 1. Construct bases of dimensions indicated, but not less than 100 mm larger in both directions than supported unit.
 2. Install dowel rods on 450-mm centers around the full perimeter of the base to connect base to floor.
 3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. HANGERS AND SUPPORTS

1. Comply with MSS SP-69 and MSS SP-89. Install building attachments to structural members.
2. Install hangers and supports to allow controlled thermal and seismic movement of piping systems.
3. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
4. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 1. Pipe Hangers (MSS Type 5): For suspension of pipes, DN 15 to DN 100, to allow off-center closure for hanger installation before pipe erection.
 2. (MSS Type 10): For suspension of non-insulated stationary pipes, DN 15 to DN 50.
5. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 1. Extension Pipe or Riser Clamps (MSS Type8): For support of pipe risers, DN20 to DN500.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type42): For support of pipe risers, DN20 to DN500, if longer ends are required for riser clamps.

5. GENERAL METERS AND GAUGES INSTALLATIONS

1. General: Comply with the PHCC National Standard Plumbing Code and manufacturers' recommendations.

6. CLEANING

1. Clean interior and exterior of all systems including strainers.

7. PROTECTION

1. Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION 22 05 00

27. SECTION 22 07 19 – PLUMBING PIPING INSULATION**1. GENERAL****1. SECTION INCLUDES**

1. 22 07 19 A1 Closed cell foam plumbing piping insulatio

2. REFERENCES

1. ASTM C 534 Type 1 (Tubing), Grade 1
2. ASTM D 1056-00-2C1
3. New York City MEA 186-86-M Vol. IV
4. USDA Requirements
5. ASTM E 84 1-1/2" 25/50-tested
6. UL 723 and NFPA 255
7. CAN/ULC S102-03
8. FMRC 2006 Approval Guide
9. Chapter 14 Pipe Insulation
10. NFPA No. 101 Class A Rating

3. SECTION REQUIREMENTS

1. Submittals: Product Data.
2. Quality Assurance: Labeled with maximum flame-spread index of 25 and maximum smoke-developed index of 50 according to ASTM E 84.

2. PRODUCTS**1. INSULATION MATERIALS**

1. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials, 1 inch wall thickness.

3. EXECUTION**1. INSTALLATION**

1. Flexible Elastomeric Insulation Installation:
 1. Seal longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
 2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

END OF SECTION 05 12 00

28. SECTION 22 11 16 – DOMESTIC WATER PIPING**1. GENERAL****SECTION REQUIREMENTS**

1. Comply with NSF 14 for plastic, potable domestic water piping and components.
2. Comply with NSF 61 for potable domestic water piping and components.

SECTION INCLUDES

3. 22 11 16 A1 – 25mm Polybutylene main water supply line
4. 22 11 16 A2 – 15mm Polybutylene cold water distribution line
5. 22 11 16 A3 – 15mm Polybutylene hot water distribution line
6. 22 11 16 A4 - 22mm Polybutylene recycled rainwater line
7. 22 11 16 A5 - 15mm Polybutylene recycled rainwater line
8. 22 11 16 B1 – 15mm Copper solar fluid circulation line
9. 22 11 16 C1 – Polybutylene piping push-fit connection fittings
10. 22 11 16 C2 – “Maniflow” Hot water manifold

REFERENCES

Manufacturer's documents

The following LEAP Australasia Ltd documents relating to work in this section are:

HEP²O: Pipes and Fittings Installation Manual

MANIFLOW: Manifold plumbing installation Manual

Copies of the above literature are available from Leap Australasia Ltd

Web: <http://www.leapltd.co.nz/>

Email: info@leapltd.co.nz

Telephone: +64 4 568 9424

PERFORMANCE

Testing

Confirm the timing before carrying out any tests. Supply potable water and the apparatus needed.

Slowly fill service pipes with water to exclude air. Apply test pressure of a 90 metre head or a maximum working pressure plus 50%, whichever is the greater. Ensure there is no measurable loss of pressure for a minimum of 30 minutes. Slowly fill distribution pipes with water to exclude air. Ensure that with draw-off taps closed the system must remain water-tight. Ensure that mixers and other fittings that have pressure limits are protected during testing.

PRODUCTS

MATERIALS

11. Hard Copper Tubing: ASTM B 88, Types L and M (ASTM B 88M, Types B and C), water tube, drawn temper with wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 1. Copper Unions: Cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
 2. Joining Materials: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder.
12. Soft Copper Tubing: ASTM B 88, Types K and L (ASTM B 88M, Types A and B), water tube, annealed temper with copper pressure fittings, cast-copper-alloy or wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 1. Joining Materials: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder.
13. PEX Tube and Fittings: ASTM F 877, SDR 9 PEX tubing and ASTM F 1807, metal insert-type fittings with copper or stainless-steel crimp rings.
14. Manifold: ASTM F 877 plastic or corrosion-resistant-metal assembly, with a plastic or corrosion-resistant-metal valve for each outlet.

2. PRODUCTS

1. Polybutylene pipe
 1. Manufacturer: Leap Australasia Ltd
 2. Product: HEP²O
 3. Material: Polybutylene (PB)
 4. Colour: Pale Blue
 5. 25mm, 22mm, and 15mm nominal diameter
2. Polybutylene Rainwater pipe
 1. Manufacturer: Leap Australasia Ltd
 2. Product: HEP²O
 3. Material: Polybutylene (PB)

4. Colour: Grey
5. 22mm and 15mm nominal diameter

3. Copper Tubing
 1. 15mm nominal diameter

4. Push fit polybutylene connectors
 1. Manufacturer: Leap Australasia Ltd
 2. Product: HEP²O
 3. Demountable & re usable push fit pipe connection fitting

5. Hot water manifold
 1. Manufacturer: Leap Australasia Ltd
 2. Product: Manifold
 3. 5 port polybutylene manifold

EXECUTION

INSTALLATION

Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for basic piping installation requirements.

Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for wall penetration systems.

Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

Install domestic water piping with 0.25 percent slope downward toward drain for horizontal piping and plumb for vertical piping.

Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

Soldered Joints: Comply with procedures in ASTM B 828 unless otherwise indicated.

Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for pipe hanger and support devices.

Support vertical piping at each floor.

Install flexible connectors in suction and discharge piping connections to each domestic water pump

INSPECTING AND CLEANING

Inspect and test piping systems as follows:

Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

Clean and disinfect potable domestic water piping by filling system with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

END OF SECTION 05 12 00

29. SECTION 22 11 23 – DOMESTIC WATER PUMPS**1. GENERAL****1. SECTION INCLUDES**

1. 22 11 23 A1 - HJ30P Hydrojet water supply pump

2. REFERENCES

1. UL 778 - Motor-operated water pumps.

3. SECTION REQUIREMENTS

1. Submittals: Product Data. Include certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. PRODUCTS**1. DOMESTIC WATER PUMPS**

1. Fully Automatic 30 LPM peripheral turbine all brass domestic water pump
Wallace Pumps, Hydrojet HJ30P
Casing material: Brass
Impeller material: Brass
Operation: Presscontrol
Run dry Protection: Yes
Pump type: Peripheral Turbine
Motor: 0.58 kW
FLC Amps: 2.8
Outlet BSP: 1 inch
Maximum suction lift: 16 foot 5 inches
Maximum flow rate: 30 LPM
Dimensions (H x W x L): 15.75" x 11.25" x 10.8"
Weight 13.23 lbs

3. EXECUTION**1. INSTALLATION**

1. Comply with HI 1.4.

2. Install pumps with access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.
3. Support pumps and piping so weight of piping is not supported by pump volute.
4. Install electrical connections for power, controls, and devices.
5. Suspend in-line pumps independent from piping. Use continuous-thread hanger rods and vibration isolation hangers. Fabricate brackets or supports as required for pumps.
6. Install vertical in-line pumps on concrete bases.
7. Connect piping with valves that are at least the same size as piping connecting to pumps.
8. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
9. Install shutoff valve and strainer on suction side of pumps.
10. Install non-slam check valve and throttling valve on discharge side of pumps.
11. Install thermostats in hot-water return piping.
12. Install pressure gages on suction and discharge of each pump. Install at integral pressure gage tapings where provided.

END OF SECTION 05 12 00

30. SECTION 22 12 00 – FACILITY POTABLE WATER STORAGE TANKS**1. GENERAL****1. SECTION INCLUDES**

1. 22 12 00 A1 – Water storage bladder supply tank

2. SECTION REQUIREMENTS

1. Submittals: Product Data

2. PRODUCTS**1. WATER STORAGE BLADDER SUPPLY TANK**

1. 1x 'Wet Earth' PVC flexible bladder tank
 1. Capacity 870 Gallons / 3295 Litres
 2. Connection: 100mm. Note that this connection is a customs design and differs from the manufacturers specification in the appendices.
 3. 900 gsm reinforced flexible PVC
 4. Dimensions: 6100 x 1800 x 300mm

2. DISTRIBUTION PIPES AND FITTINGS

1. PB Pipes and Fittings: Refer to Section 22 11 16 – DOMESTIC WATER PUMPS.

3. EXECUTION**1. INSTALLATION**

1. Install potable-water storage tanks level.
2. Ensure water tanks are not in contact with the ground below so as to avoid damage to the grass.
3. Install PVC potable-water storage tanks according to manufactures guidelines. Refer Appendices for manufacturers installation guide.
 1. Accessibility, ease of maintenance, and removal should be taken into consideration when installing tanks.
 2. Adequately support all pipes and valves. Do not apply excess weight on water tanks.
 3. Tanks are not designed for storage of fluid in vacuum conditions or higher pressure above atmospheric.

4. Use caution when handling all tanks.

4. Fill potable-water storage tank with water.

END OF SECTION 05 12 00

31. SECTION 22 13 16 – SANITARY WASTE AND VENT PIPING**GENERAL****SECTION INCLUDES**

1. 22 13 16 A1 – 80mm PVC Waste Pipe
2. 22 13 16 A2 – 65mm PVC Waste Pipe
3. 22 13 16 A3 – 40mm PVC Waste Pipe
4. 22 13 16 B1 – 65mm PVC Vent pipe

2. SECTION REQUIREMENTS

1. Minimum Pressure Requirement for Soil, Waste, and Vent: 10-foot head of water (30 kPa).
2. Comply with NSF 14, "Plastic Piping Components and Related Materials," for plastic piping components.

PRODUCTS**PIPES AND FITTINGS**

PVC Plastic, DWV Pipe and Fittings: ASTM D 2665, plain ends with PVC socket-type, DWV pipe fittings.
Nominal diameters of 80mm, 65mm, and 40mm

EXECUTION**PIPING INSTALLATION**

Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for basic piping installation requirements.

Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for wall penetration systems.

Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper

size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

- Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller;
1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
- Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
- Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

Install underground PVC soil and waste drainage piping according to ASTM D 2321.

Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

3. Comply with requirements in Division 22 Section "Common Work Results for Plumbing" for pipe hanger and support devices.

END OF SECTION 05 12 00

32. SECTION 22 13 63 – FACILITY GREY WATER STORAGE TANKS**1. GENERAL****1. SECTION INCLUDES**

1. 22 13 63 A1 – 264 Gallon grey water storage bladder tank

2. SECTION REQUIREMENTS

1. Submittals: Product Data

2. PRODUCTS**1. WATER STORAGE BLADDER SUPPLY TANK**

1. 3x 'Wet Earth' PVC flexible bladder tank
 1. Capacity 203 Gallons / 768 Litres
 2. Connection: 100mm. Note that this connection is a customs design and differs from the manufacturers specification in the appendices.
 3. 900 gsm reinforced flexible PVC
 4. Dimensions: 1600 x 1600 x 300mm

2. DISTRIBUTION PIPES AND FITTINGS

1. PB Pipes and Fittings: Refer to section 22 11 16.

3. EXECUTION**1. INSTALLATION**

1. Install potable-water storage tanks level.
2. Ensure water tanks are not in contact with the ground below so as to avoid damage to the grass.
3. Install PVC grey water storage tanks according to manufactures guidelines. Refer Appendices for manufacturers installation guidelines.
 1. Accessibility, ease of maintenance, and removal should be taken into consideration when installing tanks.
 2. Adequately support all pipes and valves. Do not apply excess weight on water tanks.
 3. Tanks are not designed for storage of fluid in vacuum conditions or higher pressure above atmospheric.

4. Use caution when handling all tanks.

END OF SECTION 05 12 00

33. SECTION 22 14 13 – FACILITY STORM DRAINAGE PIPING**1. GENERAL****SECTION INCLUDES**

Rainwater Disposal Systems, including:

1. 22 14 13.A1 - METALCRAFT 55X75MM RECTANGULAR COLORSTEEL DOWNPIPE
2. 22 14 13.A2 - 55X75MM RECTANGULAR COLORSTEEL DOWNPIPE CONCEALED IN WALL CAVITY

RELATED SECTIONS

2. Section 22 12 00 – Facility Potable Water Storage Tanks
3. Section 22 41 00 – Plumbing Fixtures

REFERENCES

4. ASTM D2665-10 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain
5. ASTM D3311-09 – Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
6. NSF/ANSI 14-2010 – Plastics Piping System Components and Related Materials

QUALITY ASSURANCE

Work to be carried out by tradesmen experienced, competent and familiar with the materials and techniques specified.

WARRANTIES

7. Include coverage for weatherproofing by substandard workmanship for three (3) years from date of installation.
8. Include coverage for failure of coating adhesion for ten (10) years.
9. Include coverage for weatherproofing by material penetration for ten (10) years.

DELIVERY, HANDLING AND STORAGE

10. Handle and store downpipes, spouting and accessories to avoid damage. Store on site under cover, on a clean level area, stacked to eliminate movement and away from work in progress. Avoid exposure to sunlight if strippable film is still on the product.

PERFORMANCE

Test the completed rainwater disposal system with water to ensure spoutings are laid to correct falls, that both spouting and downpipes are unobstructed and that no ponding occurs in spoutings.

PRODUCTS**MATERIALS**

Downpipes: Metalcraft, coated zinc aluminium steel sheet. Sized 55 x 75mm, 0.55mm thickness. "Iron sands" colour finish.

11. Downpipe brackets: Metalcraft, , coated zinc aluminium steel sheet. Screw fixed. Colour finish to match

Concealed fascia/barge spouting system: type complete with jointing, brackets, fittings and accessories, brand matched and complete to the manufacturer's requirements.

Metal droppers: compatible with spouting material and sized to fit inside the downpipe.

Fasteners: Minimum Class 4 durability and not less than the roofing material being fixed.

Rivets: Sealed aluminium, minimum diameter 4mm.

Sealant: MS Polymer sealant.

EXECUTION**2. EXAMINATION**

Check that fascias, barges or cladding are level and true to line and face and will allow work of the required standard without distortion to the product alignment. Do not proceed until they are up to standard.

Make adequate provision in the fixing and jointing of the spouting for thermal movement in the length of the spouting. Provide an expansion joint in spouting over 59 feet in length for steel gutter.

Separate metals subject to electrolytic action from each other and from treated timber, concrete and other lime substances by space, painting of surfaces, taping, or separator strips. Do not allow copper downpipes to discharge onto lower galvanized or zinc aluminium coated steel roofs.

INSTALLATION

Attach valley gutters to valley boards by clips allowing for thermal movement. Separate valley gutter from valley boards with a layer of bituminous building paper.

Install concealed gutters to fall allowing for thermal movement. Rivet and seal joints with MS Polymer sealant.

Establish minimum falls necessary (minimum 1:500, 5/64 inch in 1 foot) to outlets to prevent ponding and screw fix brackets, true to line at 30 inch centres maximum for external gutters less than 175mm wide and at 600mm centres maximum for gutters 7.5 to 11.5 inches wide. In areas where snow fall is possible the centres should be reduced to 24 inch maximum. Lap spouting joints a minimum of 1.5 inches, silicone seal between surfaces and pop rivet to the manufacturer's recommendations. Ensure the joint is fixed over its full girth. Cut out neatly for and fit the pre-formed downpipe dropper and rivet and seal around the joint.

Install one (1) or two (2) outlet(s) and an overflow to each spouting section. Cut out neatly for and fit the pre-formed downpipe dropper and rivet and seal around the joint.

Form downpipes complete with angle bends as needed with joints lapped and sealed. Screw fix with pipe clips to rigidly stand off the wall plumb and discharging into stormwater gully or inlet pipe.

COMPLETION

Replace damaged or marked elements.

Leave the whole of this work discharging completely and freely into the stormwater system and free of all debris.

1. Remove debris, unused materials and elements from the site.

END OF SECTION 05 12 00

34. SECTION 22 33 30 – RESIDENTIAL, ELECTRIC DOMESTIC WATER HEATER**1. GENERAL****1. SECTION INCLUDES**

1. 22 33 30 A1 360 Litre Insulated Stainless Steel Hot Water Cylinder with Overflow Tray

2. SECTION REQUIREMENTS

1. Submittals: Product Data
2. Comply with requirements of applicable NSF, AWWA, or FDA and EPA regulatory standards for tasteless and odorless, potable-water-tank linings.

3. RELATED SECTIONS

1. This specification is to be read in conjunction with the following sections:
 1. 22 05 00 Common Work Results for Plumbing
 2. 23 56 13 Solar Evacuated Tube Collectors

2. PRODUCTS**1. SOLARMASTER 'COMBO' HOT WATER CYLINDER**

1. Capacity 360 Litres, Stainless Steel, 230V, 50kHz, Limiting Valve Pressure 500 kPa, Relief Valve Pressure 850kPa.
2. Insulation: Integral insulation suitable for operating temperature and required insulating value. Include insulation material that surrounds entire tank except connections and controls.
3. Overflow to integral stainless steel tray with waste outlet

3. EXECUTION**1. INSTALLATION**

1. Install hot water cylinder level.
2. Install hot water cylinder according to manufactures guidelines. Refer Appendices for manufacturers installation guide.

1. Accessibility, ease of maintenance, and removal should be taken into consideration when installing tanks.
 2. Adequately support all pipes and valves. Do not apply excess weight on water tanks.
 3. Tanks are not designed for storage of fluid in vacuum conditions or higher pressure above atmospheric.
 4. Use caution when handling all tanks.
3. Fill hot water cylinder with water.

END OF SECTION 05 12 00

35. SECTION 22 41 00 – PLUMBING FIXTURES

1. GENERAL

SECTION INCLUDES

This section relates to the supply and installation of sanitary fixtures, faucets and sanitary accessories.

RELATED SECTIONS

Section 08 80 00 – Glazing

Section 26 05 19 – Wiring

Section 22 11 16 – Domestic Water Piping

Section 22 13 16 – Sanitary Waste and Vent Piping

REFERENCES

ICC A117.1-2009 – Accessible and Usable Buildings and Facilities

NSF/ANSI 61 – Drinking Water System Components – Health Effects

ASME – A112.18.1 CSA B125.1– Plumbing Supply Fittings

ANSI Z124.1.2 – Plastic Bathtub and Shower Units

Public Law 102-486 – Energy Policy Act

Public Law 90-480 – Architectural Barriers Act

Manufacturer's documents

The following **LEAP Australasia Ltd** documents relating to work in this section are:

Plumbquick System Installation Manual

Copies of the above literature are available from:

Web: www.leapltd.co.nz

Email: info@leapltd.co.nz

Telephone: 0800 246 810

Facsimile: 04 568 9423

REQUIREMENTS

Plumbers to be experienced competent workers, familiar with the materials and the techniques specified.

A specialist in the supply of fixtures, and employing experienced architectural representatives available to assist during the course of the installation.

SUBMITTALS

1. Product Data for each type of plumbing fixture, including trim, fittings, accessories, appliances, appurtenances, equipment, and supports.
2. **DELIVERY, STORAGE, AND HANDLING**
 1. Only deliver to the site fixtures or fittings that can be immediately unloaded into suitable storage or be placed for direct installation.
 2. Take delivery of and store components complete with protective casings and coverings in areas that are enclosed, clean and dry and where no work is being done. Remove protection only to the extent that will allow installation.
 3. Store faucet packages in a shelved, dry and securely locked area. Provide supervision when the secure area is unlocked and packages and cartons are being distributed; signing off each package from the schedule as released.
 4. Package fixtures, fittings and hardware units required in clear plastic and label each to match the drawings and the submitted schedule. Place packages in cartons selected for 'level', 'location', and/or 'sector' and label the packages and the cartons similarly.

PRODUCTS

BATHROOM MATERIALS

5. Water Closet
 1. Vitreous-China Water Closet: Round front, siphon-jet type, floor-mounted, back outlet with close-coupled, gravity-type tank.
 1. IMEX Arco back to wall toilet pan
 2. Design Consumption: 1 gal./flush (3.8 L/flush)
 2. Toilet Seat: Round front, solid plastic soft closing cover with bumpers and hardware, Residential class.
 3. In wall fully framed cistern
6. Lavatory
 1. Vitreous-China Lavatory: semi-recessed counter mounting
 2. Faucets: ASME A112.18.1; solid brass
 1. Type: Center set with central inlets

2. Finish: Polished chrome-plate
 3. Handle: Single-lever toggle
 4. Maximum Flow Rate: 2.2 gpm (8.3 L/min)
 3. Drain: Pop up with NPS 1-1/4 (DN 32) tailpiece, included with faucet.
 4. Trap: Plastic tubular fittings with slip-joint inlet and wall flange.
 5. Supply and Drain Insulation: Soft-plastic covering; removable at stops.
 6. Fixture Support: Concealed arm for wall-mounting, lavatory-type fixture.
7. Shower
1. Shower Base Receptor: Three part custom Mercer stainless steel shower tray under timber duckboard system (refer to drawings for details).
 2. Shower Head: Methven Slide rail shower head.
 3. Mixing-Valve Faucet and Miscellaneous Fittings: Single-lever, thermostatic and pressure-balance antiscald-type faucet; maximum 2.5-gpm (0.16-L/s) flow rate.
 1. Basis-of-Design Product: Insert manufacturer's name; product name.
 2. Include ball, gate, or globe valves on supplies if check stops are not included with faucet.
 3. Body Material: Solid brass
 4. Finish: [Polished chrome-plate
 5. Shower Arm, Flow-Control Fitting: 1-1/2 gpm (0.1 L/s)

KITCHEN MATERIALS

8. Sink
1. Stainless-Steel Lavatory: Counter mounting, self-rimming
 1. Basis-of-Design Product: custom formed in benchtop
 2. Faucets: ASME A112.18.1; solid brass
 1. Basis-of-Design Product: Methven sink mixer
 2. Type: Center set with central inlets
 3. Finish: Polished chrome-plate
 4. Handle: Single-lever toggle
 5. Maximum Flow Rate: 2.2 gpm (8.3 L/min)
 3. Drain: Grid strainer with NPS 1-1/4 (DN 32) tailpiece
 4. Trap: Plastic tubular fittings with slip-joint inlet and wall flange.
 5. Supply and Drain Insulation: Soft-plastic covering; removable at stops.

EXECUTION

EXAMINATION

Ensure substrate and fixings will allow work of the specified standard.

Do not proceed if the points of supply and drainage services do not match the points of the fixtures without force or distortion.

Confirm fixing points needed for each unit and provide solid noggling at each fixing bracket location.

Retain faucet and faucet accessories in the manufacturer's original packaging and ensure that units are complete with fixings and installation instructions. Label each unit separately with its fitting name and space number.

Retain fixtures, fittings and hardware in the manufacturer's original packaging and ensure that units are complete with associated fixings and installation instructions. Label each unit separately to match the submitted and approved schedule.

Before starting the installation of proprietary items, check relevant spaces and wall and floor finishes for any condition that would not allow the proper installation of any unit. Do not proceed until such conditions have been remedied.

INSTALLATION

Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

9. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.
10. Install water-supply stop valves in accessible locations.
11. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant colour to fixture colour.

Installing vitreous china fixtures: Carry out preparatory and assembly work, including connections to supply and drainage services and the application of slurries and sealants in sequence. Fit the toilet pan in position, plumb, level, flush and rigid without stressing the attachment points of the component.

Installing shower enclosures and wall linings: Install to the enclosure manufacturer's details and requirements.

Sanitary accessories: Fit specified fittings firmly in place at required dimensions relative to floor and adjoining sanitary fittings, all plumb and level.

Where cutting and fitting of the substrate is necessary for installing any unit, carry out this work before the painting or finishing of that surface. Remove any hardware when required for painting, placing it in the packaging or carton originally supplied and returning it to the secure store until ready for re-installation.

Install each unit in accordance with the proprietary fixture manufacturer's requirements, using the templates and tools supplied or recommended by them. Set units level, plumb and true to line and required location, with moving parts and actions freely and easily operating. Do not make any modifications to supplied units.

COMPLETION

Leave fixtures, fittings and accessories clean and unblemished with stickers and protective coatings removed, with supply and drainage connections and all parts fully operating and working. Leave the whole of this work free of blemishes, undamaged and to the standard of finish required for following work.

12. Remove debris, unused materials and elements from the site.

END OF SECTION 05 12 00

36. SECTION 23 07 19 – HVAC PIPING INSULATION**1. GENERAL****1. SECTION REQUIREMENTS**

1. Submittals: Product Data.
2. Quality Assurance: Labeled with maximum flame-spread index of 25 and maximum smoke-developed index of 50 according to ASTM E 84.
3. Comply with
 1. ASTM C 534 Type 1 (Tubing), Grade 1
 2. ASTM D 1056-00-2C1
 3. New York City MEA 186-86-M Vol. IV
 4. USDA Requirements
 5. ASTM E 84 1-1/2" 25/50-tested
 6. UL 723 and NFPA 255
 7. CAN/ULC S102-03
 8. FMRC 2006 Approval Guide
 9. Chapter 14 Pipe Insulation
 10. NFPA No. 101 Class A Rating

2. SECTION INCLUDES

1. 23 07 19 A1 Closed cell foam HVAC piping insulation

2. PRODUCTS**1. INSULATION MATERIALS**

1. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials.
 1. To be confirmed

3. EXECUTION**1. INSTALLATION**

1. Flexible Elastomeric Insulation Installation:
 1. Seal longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

END OF SECTION 05 12 00

37. SECTION 23 09 00 – INSTRUMENTATION AND CONTROL FOR HVAC**1. GENERAL****1. SECTION INCLUDES**

1. 23 09 33 A1 - Schneider Electric Magelis HMI Controller
2. 23 09 33 B1 - Siemens LOGO ladder logic controller
3. 23 09 33 C1 - Campbell Scientific CR 1000 Data Logger
4. 23 09 13 A2 - HMP-60 temperature & humidity sensor
5. 23 09 13 B2 - 107-L temperature sensor
6. 23 09 13 C2 - Mitsubishi Electric Remote temperature sensor
7. 23 09 13 A3 – Siemens GQD 321 air damper actuator

2. SECTION REQUIREMENTS

1. Provide regulations and information for constructing a digitally controlled HVAC system.
2. This includes instrumentation, controllers, and devices to supply power to the controllers, controller containment devices, and controllable valves.

2. PRODUCTS**1. ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC**

1. Schneider Electric Magelis HMI Controller
 1. Building Management System controller
 2. Model: HMI STU 855
 3. 320 x 240 touch screen
 4. Modbus RS-485 Master
2. Siemens LOGO ladder logic controller
 1. Control unit for hydronic dryer
3. Campbell Scientific Data Logger
 1. CR 1000

2. SENSORS AND TRANSMITTERS FOR HVAC

1. Campbell Scientific temperature & humidity sensor
 1. Model: HMP-60
2. Campbell Scientific temperature sensor
 1. Model: 107-L
3. Mitsubishi Electric Remote temperature sensor
 1. Model: PAC-SE41TS-E

3. ACTUATORS AND OPERSTORS FOR HVAC

1. Siemens air damper actuator
 1. Model: GQD 321
 1. 230V supply
 2. Power on, spring return close
 3. 2 Nm nominal torque

3. EXECUTION**1. INSTALLATION**

1. All installations are to comply with manufacturer directions.
2. Install control wiring concealed, except in mechanical rooms, and according to requirements specified in Division 26 Sections.

END OF SECTION 05 12 00

38. SECTION 23 21 23 – HYDRONIC PUMPS**1. GENERAL****1. SECTION INCLUDES**

1. 23 21 23 A1 - Laing E series solar fluid circulation pump
2. 23 21 23 A2 - Laing E series hydronic dryer circulation pump

2. SECTION REQUIREMENTS

1. Submittals: Product Data. Include certified pump-performance curves, furnished specialties, motor horsepower and electrical characteristics.
2. Comply with UL 778 for motor-operated water pumps.

2. PRODUCTS**1. HYDRONIC PUMPS**

1. Laing E series solar fluid circulation pump
 1. Permanent Magnet inline Centrifugal Pump
 1. Laing, E-series
2. Laing E series hydronic dryer circulation pump
 1. Permanent Magnet inline Centrifugal Pump
 1. Laing, E-series

3. EXECUTION**1. INSTALLATION**

1. Install pumps with access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.
2. Support pumps and piping so weight of piping is not supported by pump volute.
3. Install electrical connections for power, controls, and devices.
4. Suspend in-line pumps independent from piping. Use continuous-thread hanger rods and vibration isolation hangers. Fabricate brackets or supports as required for pumps.

5. Install vertical in-line pumps on concrete bases.
6. Connect piping with valves that are at least the same size as piping connecting to pumps.
7. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
8. Install shutoff valve and strainer on suction side of pumps.
9. Install non slam check valve and throttling valve on discharge side of pumps.

END OF SECTION 23 21 23

39. SECTION 23 31 00 – HVAC DUCTS AND CASINGS**1. GENERAL****1. SECTION INCLUDES**

1. 23 31 13 A1 - SPIROSET SEMI-FLEXIBLE ROUND METAL DUCT
2. 23 31 16 A1 - PREMIER FOAMBOARD DUCTING
3. 23 31 16 A2 - FLEXIBLE ROUND DUCT

2. SECTION REQUIREMENTS

1. Submittals: Product Data
2. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
3. Comply with UL 181 for ducts and closures.

2. PRODUCTS**1. METAL DUCTS**

1. Semi-Flexible Ducts
 1. Corrugated aluminium complying with UL 181, Class 1.
 2. Round
 3. Nominal Diameters 100mm, 150mm, 200mm

2. NON-METAL DUCTS

1. Fibrous-Glass Duct Board
 1. Comply with UL 181, Class 1, 1-inch- (25-mm-) thick, fibrous glass with fire-resistant, reinforced foil-scrim-kraft barrier, and having the air-side surface treated to prevent erosion.
 2. Rectangular duct, size as per drawing dimensions
2. Flexible Ducts
 1. Spiral-wound steel spring with flameproof vinyl sheathing complying with UL 181, Class 1.
 2. Nominal Diameters of 100mm, 150mm and 200mm
3. Joint and Seam Tape, and Sealant: Comply with UL 181A.

3. EXECUTION**1. INSTALLATION**

1. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
2. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 1. Outdoor, Supply-Air Ducts: Seal Class A.
 2. Outdoor, Exhaust Ducts: Seal Class C.
 3. Outdoor, Return-Air Ducts: Seal Class C.
 4. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class A.
 6. Unconditioned Space, Exhaust Ducts: Seal Class C.
 7. Unconditioned Space, Return-Air Ducts: Seal Class B.
 8. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.
 9. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
 10. Conditioned Space, Exhaust Ducts: Seal Class B.
 11. Conditioned Space, Return-Air Ducts: Seal Class C.
3. Conceal ducts from view in finished and occupied spaces.
4. Avoid passing through electrical equipment spaces and enclosures.
5. Support ducts to comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Hangers and Supports."
6. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
7. Install volume and control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.
8. Clean duct system(s) before testing, adjusting, and balancing.

2. TESTING, ADJUSTING, AND BALANCING

1. Balance airflow within distribution systems, including submains, branches, and terminals to indicated quantities.

END OF SECTION 05 12 00

40. SECTION 23 33 13 – DAMPERS**1. GENERAL****1. SECTION INCLUDES**

1. 23 33 13 A1 – HCD 75 150 x 150 Bathroom exhaust shut off damper
2. 23 33 13 A2 – HCD 75 150 x 150 Kitchen exhaust shut off damper
3. 23 33 13 B1 - HCD 75 200 x 200 HVAC external exhaust shut off damper
4. 23 33 13 B2 - HCD 75 200 x 200 HVAC outside air supply shut off damper

2. SECTION REQUIREMENTS

1. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
2. Comply with UL 181 for ducts and closures.

2. PRODUCTS**1. DAMPERS**

1. Bathroom exhaust shut off damper:
 1. 6 inch x 6 inch airflow size
 2. Volume and pressure control device
 3. Extremely low leakage
 4. 3 inch blade width
 5. 1 inch flange duct fitting
 6. Opposed blade operation
 7. Extruded aluminium construction of frame and blades
 8. Cast zinc drive shaft & linkages
 9. Actuator operated: Siemens GQD 321 (refer to SECTION 23 09 13)
2. Kitchen exhaust shut off damper
 1. 6 inch x 6 inch airflow size
 2. Volume and pressure control device
 3. Extremely low leakage
 4. 3 inch blade width
 5. Flange duct fitting

6. Opposed blade operation
 7. Extruded aluminium construction of frame and blades
 8. Cast zinc drive shaft & linkages
 9. Actuator operated: Siemens GQD 321 (refer to SECTION 23 09 13)
3. HVAC external exhaust shut off damper
 1. 8inch x 8inch airflow size
 2. Volume and pressure control device
 3. Extremely low leakage
 4. 3 inch blade width
 5. Flange duct fitting
 6. Opposed blade operation
 7. Extruded aluminium construction of frame and blades
 8. Cast zinc drive shaft & linkages
 9. Actuator operated: Siemens GQD 321 (refer to SECTION 23 09 13)
4. HVAC outside air supply shut off damper
 1. 200mm x 200mm airflow size
 2. Volume and pressure control device
 3. Extremely low leakage
 4. 75mm blade width
 5. Flange duct fitting
 6. Opposed blade operation
 7. Extruded aluminium construction of frame and blades
 8. Cast zinc drive shaft & linkages
 9. Actuator operated: Siemens GQD 321 (refer to SECTION 23 09 13)

3. EXECUTION

1. INSTALLATION

1. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
2. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 1. Outdoor, Supply-Air Ducts: Seal Class A.
 2. Outdoor, Exhaust Ducts: Seal Class C.
 3. Outdoor, Return-Air Ducts: Seal Class C.
 4. Unconditioned Space, Supply-Air Ducts in Pressure Classes 500 Pa and Lower: Seal Class B.
 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 500 Pa: Seal Class A.

6. Unconditioned Space, Exhaust Ducts: Seal Class C.
 7. Unconditioned Space, Return-Air Ducts: Seal Class B.
 8. Conditioned Space, Supply-Air Ducts in Pressure Classes 500 Pa and Lower: Seal Class C.
 9. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 500 Pa: Seal Class B.
 10. Conditioned Space, Exhaust Ducts: Seal Class B.
 11. Conditioned Space, Return-Air Ducts: Seal Class C.
3. Conceal ducts from view in finished and occupied spaces.
 4. Avoid passing through electrical equipment spaces and enclosures.
 5. Support ducts to comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Hangers and Supports."
 6. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
 7. Install fusible links in fire dampers.
 8. Clean new duct system(s) before testing, adjusting, and balancing.

END OF SECTION 05 12 00

41. SECTION 23 37 13 – DIFFUSERS, REGISTERS AND GRILLES**1. GENERAL****1. SECTION REQUIREMENTS**

1. Submittals: Product Data and colour charts for factory finishes.

2. SECTION INCLUDES

1. 23 37 13 A1 - Supply air linear diffusers
2. 23 37 13 A2 – Return air egg-crate Grille

2. PRODUCTS**1. SUPPLY**

1. Linear Diffuser Grilles
 1. Product:
 1. Holyoake, PMF-LD-SD-615
 2. Aluminium, with powder coated finish
 3. 15° deflection – front blades
 4. 0° - 45° deflection – rear blades
 5. 6.35 mm spacing
 6. 3.25 mm louver
 7. 75mm Nominal Height
 8. Width: as per drawings
 9. Colour: to be confirmed
 10. Flangeless grilles shall be of extruded aluminium construction with a flange of no greater than 6mm. Flangeless grilles are to be supplied with the Plaster Mounting Frame, also of aluminium construction. The Grille shall have blades notched into mullions spaced at no greater than 300 mm and is to have a second row of adjustable blades as specified.

2. RETURN

1. “Egg-crate” return air grille
 1. Product:
 1. Holyoake, EC 125
 2. Aluminium, with powder coated finish
 3. 12.5 x 12.5 x 12.5mm Aluminium corer

3. EXECUTION**1. INSTALLATION**

1. Install diffusers, registers, and grilles level and plumb.
2. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 05 12 00

42. SECTION 23 56 13 – HEATING SOLAR EVACUATED TUBE COLLECTORS**1. GENERAL****1. SECTION INCLUDES**

1. 23 56 13 A1 - 20 Tube Evacuated Tube Solar Hot Water Collectors

2. RELATED SECTIONS

1. This specification is to be read in conjunction with the following sections
 1. 22 11 16 – Domestic Water Piping
 2. 23 21 23 – Hydronic Pumps

3. SECTION REQUIREMENTS

1. Submittals: Product Data.
2. All collector data and specifications per ASHRAE standard testing conditions.

4. REFERENCES

1. Manufacturer's documents
 1. The following LEAP Australasia Ltd documents relating to work in this section are:
 1. SOLARGENIUS: Solar Hot Water System Installation Manual
 2. Copies of the above literature are available from: Leap Australasia Ltd
 1. Web: www.leapltd.co.nz
 2. Email: info@leapltd.co.nz
 3. Telephone: 0800 246 810
 4. Facsimile: 04 568 9423

5. REQUIREMENTS

1. Substitutions
 1. Solargenius evacuated tube collector may be substituted with similar, locally available product.

2. PRODUCTS**1. EVACUATED TUBE COLLECTORS**

1. 20 Tube Evacuated Tube Solar Hot Water Collectors

1. Manufacturer: Leap Australasia Ltd
2. Product: Solar Genius ET
3. Dimensions: 2000 mm x 1940 mm
4. Absorber area: 2.07 m²
5. Manifold insulation: Rockwool
6. Anodised aluminium frame and manifold casings
7. Weight: 91kg
8. Maximum efficiency: 73.64 %
9. Heat Loss Coefficient: 0.42637

3. EXECUTION

1. INSTALLATION

1. Solar Thermal collectors are to be installed as per manufacturer's instructions.

2. CONDITIONS

1. Delivery
 1. Take delivery of SOLARGENIUS ET hot water system and all accessories. Reject any damaged components.
2. Storage
 1. Store materials and accessories on a level, firm base, in dry conditions, out of direct sunlight and completely protected from weather and damage. Ensure storage areas are away from current work areas. Cover to keep dry until installed.
3. Building structure
 1. Confirm the building structure is to the standard required by the LEAP accredited installer for the installation of the solar hot water system. Install the collector on a roof area that is capable to take the filled weight of the collector.
4. Confirm layout
 1. Before commencing work confirm the proposed location of SOLARGENIUS ET components and lay out of pipe runs.
5. Co-ordinate services
 1. Co-ordinate and co-operate with other sub-trades to avoid any conflict with the installation of the system with other subcontractors work.
6. Protect surfaces

1. Protect surfaces, equipment and finishes already in place from the possibility of damage during the installation process.

3. APPLICATION

1. Positioning of collector
 1. Locate the SOLARGENIUS ET hot water collector as per the drawings
2. Mounting of collector
 1. Install the SOLARGENIUS ET collector as per the installation manual. In cyclonic locations use brackets that comply with AS/NZS 1170.2 Structural design actions - Wind actions.
3. Plumbing connections
 1. Plumbing connections are to be carried out by a registered plumber and are to comply with the relevant regulations. Materials and products, and the SOLARGENIUS ET installation manual.

4. COMMISSIONING

1. Post installation testing
 1. Test and commission the completed system to SOLARGENIUS ET installation manual.

5. COMPLETION

1. Cleaning
 1. Remove debris, unused materials and elements from the site. Clean soiled or marked work. Replace damaged, cracked or marked elements. Leave the whole of this work to the standard required by following procedures.

END OF SECTION 05 12 00

43. SECTION 23 81 26 – SPLIT SYSTEM AIR CONDITIONERS**1. GENERAL****1. SECTION INCLUDES**

1. 23 81 26 A1 - Mitsubishi Electric PEA-RP71EA Heat Pump Indoor Unit
2. 23 81 26 A2 - Mitsubishi Electric PUAH-RP71VHA2 Heat Pump Outdoor Unit
3. 23 81 26 A3 - Mitsubishi Electric PAR-21MAA Wired Controller

2. SECTION REQUIREMENTS

1. Submittals: Product Data
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Comply with ASHRAE 15 and ASHRAE 90.1.
4. Comply with safety requirements in UL 484 and UL 1995.

3. SYSTEM DESCRIPTION

1. The heat pump air conditioning system shall be a Mitsubishi Electric SEZ Series variable capacity mini-split type. The system shall consist of a combination of a low-profile ducted indoor units with a wired, wall mounted remote controller connected to a compact horizontal discharge outdoor unit which shall be of an inverter driven heat pump design.
2. Indoor unit model number shall be:
 1. Ducted; PEA-RP71EA
3. Outdoor unit model numbers shall be:
 1. PUAH-RP71VHA2

4. QUALITY ASSURANCE

1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
2. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.

3. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 240 and bear the AHRI Certification label.
4. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
5. A dry air holding charge shall be provided in the indoor section.
6. System efficiency shall meet or exceed 15.5 SEER when part of a 1:1 (indoor/outdoor) system.
7. Delivery, Storage and Handling
 1. Unit shall be stored and handled according to the manufacturer's recommendations.
 2. The wireless controller shall be shipped inside the carton with the indoor unit and able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

5. WARRANTY

1. The units shall have a manufacturer's parts and defects warranty for a period five (5) years from date of installation. The compressor shall have a warranty of seven (7) years from the same date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

2. PRODUCTS

1. INDOOR UNIT

1. General:
 2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, control circuit board, fan and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. The indoor unit shall be charged with dry air before shipment from factory.
3. Unit Cabinet:
 1. The cabinet shall be galvanized steel construction, low profile, horizontal ducted fan coil not to exceed 7-7/8" in depth and equipped with four corner mounting brackets.
4. Fan:
 1. The indoor unit fan shall be an assembly with Sirocco blowers.
 2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of three (3) speeds, High, Mid, and Low plus Auto Fan Mode
 4. The indoor unit shall have a ducted air outlet system and ducted return air system.
 5. Filter:
 1. Return air shall be filtered by means of a standard factory installed return air filter.
 2. Option: An FBL1 external filter box made of galvanized steel with flange connections to the indoor unit shall be furnished and equipped with one inch thick filters having a minimum MERV rating of 8.0.
 6. Coil:
 1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
 2. The tubing shall have inner grooves for high efficiency heat exchange.
 3. All tube joints shall be brazed with phos-copper or silver alloy.
 4. The coils shall be pressure tested at the factory.
 5. A condensate pan and drain shall be provided under the coil.
 6. The unit shall be provided with an integral condensate lift mechanism able to raise drain water 21 inches above the condensate pan.
 7. Both refrigerant lines to the indoor units shall be fully insulated.
 7. Electrical:
 1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
 2. The system shall be equipped with A-Control – a system directing that the indoor unit be powered directly from the outdoor unit using a 3-wire, 14 ga. AWG connection plus ground.
 3. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 2. CONTROLS:**
1. The unit shall have a multi-function, hard-wired, wall mounted remote controller to perform input functions necessary to operate the system. Controller shall be a PAR-21MAA Deluxe MA type remote controller.
 2. The controller shall have a Power On/Off switch, Mode Selector – Cool, Dry, Heat, Auto Modes - Temperature Setting, Timer Control, Fan Speed Select and Auto Fan Mode.
 3. The indoor unit shall perform Self-diagnostic Function and Check Mode switching.
 4. Temperature changes shall be by 1°F increments with a range of 59 - 89°F.
 5. The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the wireless or a wired controller, providing emergency operation and controlling the outdoor unit.

6. The system shall be capable of automatically restarting and operating at the previously selected conditions when the power is restored after power interruption.

3. OUTDOOR UNIT

1. The PUHZ-RP71VHA2 Series horizontal discharge outdoor units shall be specifically designed to perform and communicate with the PEA-RP Series, low profile, horizontal ducted indoor units. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.
2. Unit Cabinet:
 1. The casing shall be fabricated of galvanized steel, bonderized, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection. Assembly hardware shall be cadmium plated for weather resistance.
 2. Cabinet color shall be Munsell 3Y 7.8/1.1.
 3. Two (2) mild steel mounting feet, traverse mounted across the cabinet base pan, welded mount, providing four (4) slotted mounting holes shall be furnished. Assembly shall withstand lateral wind gust up to 249.45 km/h to meet applicable weather codes.
3. Fan:
 1. The unit shall be furnished with a direct drive, high performance propeller type fan.
 2. The condenser fan motor shall be a variable speed, direct current (DC) motor and shall have permanently lubricated bearings.
 3. Fan speed shall be switch automatically according to the number of operating indoor units and the compressor operating frequency.
 4. The fan motor shall be mounted with vibration isolation for quiet operation.
 5. The fan shall be provided with a raised guard to prevent contact with moving parts.
 6. The outdoor unit shall have horizontal discharge airflow.
 7. Outdoor unit sound level shall not exceed:
 1. Cooling:46dBA
 2. Heating:50dBA
4. Coil:
 1. The outdoor unit coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
 2. The coil shall be protected with an integral guard.
 3. Refrigerant flow from the outdoor unit to the indoor units shall be controlled by means of an electronic linear expansion valve located in the outdoor unit.
 4. Outdoor unit shall be pre-charged with sufficient R-410a refrigerant for up to twenty-five (25) feet (7.6 Meters) of refrigerant piping.
 5. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated as per section 23 07 19.
 6. All refrigerant connections between outdoor and indoor units shall be flare type.

5. Compressor:
 1. The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type manufactured by Mitsubishi Electric Corporation.
 2. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package.
 3. The outdoor unit shall be equipped with a suction side refrigerant accumulator.
 4. The compressor will be equipped with an internal thermal overload.
 5. The outdoor unit must have the ability to operate over the full capacity range with a maximum height difference of 40 feet (12 meters) for 9,000, 12,000, and 15,000 BTU/h and 50 feet (15 meters) for 18,000 BTU/h models and have refrigerant tubing length of up to 65 feet (20 meters) for 9,000, 12,000, and 15,000 BTU/h and 100 feet (30 meters) for 18,000 BTU/h units between the indoor and outdoor units.
 6. There shall be no need for line size changes, filters, sight glasses, and traps shall not be used, and no additional refrigerant oil shall be required.
 7. The compressor shall be mounted so as to avoid the transmission of vibration.
6. Electrical:
 1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 2. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.
 3. The outdoor unit shall be controlled by the microprocessors located in the indoor unit and in the outdoor unit communicating system status, operation, and instructions digitally over A-Control – a system directing that the indoor unit be powered directly from the outdoor unit using a 3-wire, 14 ga. AWG connection plus ground. A 12 to 24 volt DC data stream shall communicate between the units providing all necessary information for full function control.
 4. The outdoor unit shall be equipped with Pulse Amplitude Modulation (PAM) compressor inverter drive control for maximum efficiency with minimum power consumption.
 5. In addition to the above all electrical components shall comply with the requirements set forth in Division 26.

3. EXECUTION

1. INSTALLATION

1. Unit shall be installed as per the manufacturer instructions, and the relevant drawings in the set.

END OF SECTION 05 12 00

44. SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL**1. GENERAL****1. SECTION INCLUDES**

1. 26 05 36 A1 – 8 inch x 1.5 inch Unistrut basket tray

2. SECTION REQUIREMENTS

1. Seismic-Restraint Loading:
 1. Site Class as Defined in the IBC: D.
 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.
 1. Component Importance Factor: 1.0
 2. Component Response Modification Factor: 4.5.
 3. Component Amplification Factor: 1.3.
 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 1.000G.
 4. Design Spectral Response Acceleration at 1.0 Second Period: .400G.
2. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Comply with NFPA 70.

2. PRODUCTS**1. SUPPORT AND ANCHORAGE COMPONENTS**

1. Unistrut Basket tray: 8 inch x 1.5 inch. Suspended on braided steel cable. Fixed using proprietary fixing clips
2. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly, and provide finish suitable for the environment in which installed. Channel Dimensions: Selected for structural loading.

3. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and fittings.
4. Mounting, Anchoring, and Attachment Components:
 1. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 2. Through Bolts: Structural type, hex head, high strength; complying with ASTM A 325.
 3. Toggle Bolts: All-steel springhead type.
 4. Hanger Rods: Threaded steel.

2. CONDUCTORS AND CABLES

1. Conductors:
 1. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.
 2. Conductors, Larger Than No. 10 AWG: Stranded copper.
 3. Insulation: Thermoplastic, rated at 75 deg C minimum.
 4. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.
2. Cable Type NM-B Cable: Comply with UL 719 with Type THHN/THWN conductors complying with UL 83.
3. Cable Type SEU: Comply with UL 854 with Type THHN/THWN conductors complying with UL 83
4. Cable Type UF-B: Comply with UL 493 with Type THHN/THWN conductors complying with UL 83.

3. GROUNDING MATERIALS

1. Conductors: Solid for No. 8 AWG and smaller, and stranded for No. 6 AWG and larger unless otherwise indicated.
 1. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
 2. Bare, Solid-Copper Conductors: Comply with ASTM B 3.
 3. Bare, Stranded-Copper Conductors: Comply with ASTM B 8.
2. Ground Rods: Copper-clad steel, sectional type; 0.6inch by 94.5 inch in diameter.
3. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts with clamp-type pipe connectors sized for pipe.

4. ELECTRICAL IDENTIFICATION MATERIALS

1. Conductor Identification Materials: Color-Coding Conductor Tape: Self-adhesive vinyl tape 1 inch to 2 inch wide.

2. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with circuit identification legend machine printed by thermal transfer or equivalent process.
3. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
4. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 1.0-mm galvanized-steel backing; and with colors, legend, and size required for application.
5. Equipment Identification Labels: Engraved, laminated acrylic or melamine label; punched or drilled for screw mounting. White letters on a dark-gray background; red letters for emergency systems.
6. Fasteners: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

5. SEISMIC-RESTRAINT COMPONENTS

1. Rated strengths, features, and application requirements shall be as defined in reports by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.
 1. Structural Safety Factor: Strength in tension, shear, and pullout force of components used shall be at least 2.5 times the maximum seismic forces to which they will be subjected.
2. Angle and Channel-Type Brace Assemblies: Steel angles or steel slotted-support-system components; with accessories for attachment to braced component at one end and to building structure at the other end.

3. EXECUTION

1. GENERAL ELECTRICAL EQUIPMENT INSTALLATION REQUIREMENTS

1. Install electrical equipment to allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. Install electrical equipment to provide for ease of disconnecting the equipment with minimum interference to other installations.
3. Install electrical equipment to allow right of way for piping and conduit installed at required slope.
4. Install electrical equipment to ensure that connecting raceways, cables, wireways, cable trays, and busways are clear of obstructions and of the working and access space of other equipment.

5. Install required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
6. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Comply with requirements in Division 08 Section "Access Doors and Frames."
7. Install sleeve and sleeve seals of type and number required for sealing electrical service penetrations of exterior walls.
8. Comply with NECA 1.

2. WIRING METHODS

1. Service Entrance: Type THHN-THW, single conductors in conduit.
2. Exposed Feeders, Branch Circuits, and Class 1 Control Circuits, Including in Crawlspace: Nonmetallic-sheathed cable, Type NM.
3. Feeders and Branch Circuits Concealed in Ceilings, Walls, Partitions, and Crawlspace: Nonmetallic-sheathed cable, Type NM.

3. GROUNDING

1. Underground Grounding Conductors: Install bare copper conductor, No. #6 AWG minimum. Bury at least 600 mm below grade.
2. Pipe and Equipment Grounding Conductor Terminations: Bolted.
3. Connections to Structural Steel: Bolted.
4. Install grounding conductors routed along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
5. Install ground rods driven into ground until tops are 50 mm below finished floor or final grade unless otherwise indicated.
6. Make connections without exposing steel or damaging coating if any.
7. Install bonding straps and jumpers in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
8. Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

9. Bond to equipment mounted on vibration isolation hangers and supports so vibration is not transmitted to rigidly mounted equipment.
10. Grounding and Bonding for Piping:
 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
11. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
 1. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 2. Perform tests by fall-of-potential method according to IEEE 81.
 3. Report measured ground resistances that exceed the following values:
 1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
 3. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
 4. 10 ohms.
 4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

4. IDENTIFICATION

1. Accessible Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive color coding tape-in bands.
2. Power-Circuit Conductor Identification: For No. 3 AWG conductors and larger, at each location where observable, identify phase using color-coding conductor tape.
3. Warning Labels for Enclosures for Power and Lighting: Comply with 29 CFR 1910.145; identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
4. Equipment Identification Labels:
 1. Labeling Instructions:
 1. Indoor Equipment: Adhesive film label with clear protective overlay or Self-adhesive, engraved, laminated acrylic or melamine label. Provide a single line of text with 0.5 inch-

- high letters on 1.5 inch- high label; where two lines of text are required, use labels 2 inch high.
2. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
 3. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.
2. Equipment to Be Labeled:
1. Panelboards, electrical cabinets, and enclosures.
 2. Electrical switchgear and switchboards.
 3. Transformers.
 4. Motor-control centers.
 5. Disconnect switches.
 6. Enclosed circuit breakers.
 7. Inverter
 8. Motor starters.
 9. Push-button stations.
 10. Power transfer equipment.
 11. Contactors.
 12. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.
5. Verify identity of each item before installing identification products.
 6. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
 7. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
 8. Install system identification color banding for cables at 50 foot maximum intervals in straight runs, and at 25 feet maximum intervals in congested areas.
 9. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Ungrounded service feeder and branch-circuit conductors.
 10. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points.
- 5. INSTALLATION OF HANGERS AND SUPPORTS**
1. Fasten hangers and supports securely in place, with provisions for thermal and structural movement. Install with concealed fasteners unless otherwise indicated.

2. Separate dissimilar metals and metal products from contact with wood or cementitious materials, by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.
3. Multiple Raceways or Cables: Install on trapeze-type supports fabricated with steel slotted channel.
4. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 90 kg.
5. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods, unless otherwise indicated or required by Code:
 1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. To Light Steel: Sheet metal screws.
 6. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.

6. SEISMIC REQUIREMENTS

1. Install seismic-restraint components using methods approved by the evaluation service providing required submittals for component.
2. Install bushing assemblies for anchor bolts for wall- and floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in substrate.
3. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, upper truss chords of bar joists, or at concrete members.
4. Accommodation of Differential Seismic Motion: Make flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross expansion and seismic-control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to electrical equipment that is anchored to a different structural element than the one supporting them as they approach equipment.

7. FIRESTOPPING

1. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Comply with requirements in Division 07 Section "Penetration Firestopping."

END OF SECTION 05 12 00

45. SECTION 26 05 19 – WIRING**1. GENERAL****1. SECTION INCLUDES**

1. 26 05 19 A1 – AWG #14 25 core Oflex 130H multi-core cable
2. 26 05 19 A2 – 19 pin Socapex male connectors
3. 26 05 19 A3 – 19 pin Socapex female connectors
4. 26 05 19 B1 – AWG #10 THWN-2
5. 26 05 19 B2 – AWG #3 THWN-2
6. 26 05 19 C1 – AWG #10 USE-2/RHW-2
7. 26 05 19 C2 – AWG #10 USE-2/RHW-2 equipment grounding conductors
8. 26 05 19 D1 – AWG #14 three core TPS
9. 26 05 19 D2 – AWG #10 three core TPS

2. RELATED SECTIONS

1. Section 26 05 00 – Common Work Results for Electrical

2. PRODUCTS**1. MATERIALS**

1. Multi Core Cable: Oflex, 25 cores. AWG# 14 conductor size, UL Listed
2. Socapex connectors: 19 pin. Male Lead from services shed, Female Socket in module. Brass construction, Solder connections.
3. THWN-2 Cable. AWG # 3 and 10 conductor size, Main AC Cables.
4. USE-2/RHW-2 Cable. AWG # 10 conductor size, DC cable.
5. TPS cable. AWG # 10 and 14. Flat three core. All internal wiring within modules

3. EXECUTION**1. INSTALLATION**

1. Safety and Implementation

1. THWN-2 Wiring AWG #8, #6, #10 and Brass Copper Wiring AWG #10

1. Cables may be used for underground feeder or branch-circuit wiring for installation above or below ground, including direct burial, and in wet or corrosive locations.
2. Cables may also be used for exposed or concealed interior wiring in wet, dry or corrosive locations and in cable trays.
3. Multi-conductor cables are assembled flat parallel. For cables with ground, the ground wire is placed between two of the insulated conductors
4. Cables have polyvinyl chloride (PVC) insulation and a sunlight-resistant PVC overall jacket, and single conductor cables having a sunlight-resistant PVC insulation.

2. Romex Wiring

1. Maybe be used for both exposed and concealed work in normal dry locations at temperatures not exceeding 90°C.
2. Primarily used in residential wiring as branch circuits for outlets, switches, and other loads.
3. May be run in air voids of masonry block or tile walls where such walls are not subject to excessive moisture or dampness.
4. Copper conductors are annealed copper.
5. Stranded conductors are compressed stranded.

END OF SECTION 05 12 00

46. SECTION 26 05 33 – CONDUIT**1. GENERAL****1. SECTION INCLUDES**

1. 26 05 33 A1 Rigid PVC Conduit
2. 26 05 33 A2 Flexible PVC Conduit
3. 26 05 33 B1 Metal Conduit

2. RELATED SECTIONS

1. Section 26 05 19 – WIRING

2. PRODUCTS**1. PVC CONDUIT**

1. Rigid PVC conduit: High impact resistant conduit pipe. U-PVC, 1 inch O.D.
2. Flexible PVC conduit: U-PVC, 1 inch O.D.

2. METAL CONDUIT

1. Rigid Galvanised steel conduit: 1 inch O.D.

3. EXECUTION**1. INSTALLATION**

1. Safety and Implementation
 1. Flexible Steel Conduit
 2. Coiled
 3. Wires not included
 4. Resists nail penetration
 5. Galvanized steel
 6. High-grade galvanized steel or aluminum alloy strip of uniform gauge for an excellent combination of strength and durability
 7. Interlocking design formed from continuous metal strip for integrity and flexibility
 8. Reduced wall conduits 40% lighter (steel) than heavy-gauge steel
 9. Interior surface allows easy wire fishing

10. Galvanized steel for superior corrosion resistance
11. U.L. conduits with 2-hour (aluminum) and 3-hour (steel) through-penetration Fire Wall classification
12. Applications: residential, commercial, industrial, etc

END OF SECTION 05 12 00

47. SECTION 26 09 13 – ELECTRICAL POWER MONITORING AND CONTROL**1. GENERAL****1. SECTION INCLUDES**

1. 26 09 13 A1 – Branch Circuit Power Meter

2. SECTION REQUIREMENTS

1. Submittals: Product Data.
2. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. PRODUCTS**1. POWER MONITERING DEVICES**

1. Branch Circuit Power Monitoring: Schneider Electric, Model- BCPMSCA. Monitoring up to 42 Branch circuits: Voltage, Current, Power. Modbus RS-485 communications connection

3. EXECUTION**1. INSTALLATION**

- A. Install branch circuit monitors according to product manual and by certified electrician.

END OF SECTION 05 12 00

48. SECTION 26 24 16 – PANELBOARDS**1. GENERAL****1. SECTION REQUIREMENTS**

1. Submittals:
 1. Product Data.
2. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Seismic Performance: Circuit Breakers shall withstand the effects of earthquake motions determined according to 2003 IBC, NFPA 5000, ASCE/SE17.

2. SECTION INCLUDES

1. 26 24 16 A1 Prisma Plus 5 Row 120 Way Wall Mounted Panel Board

2. PRODUCTS

1. Panel Boards
 1. Manufacturer: Schneider Electric
 2. Model: Prisma Plus 5 Row 120 Way Wall Mounted Panel Board
 3. Glass door

3. EXECUTION**1. INSTALLATION**

- 1.

END OF SECTION 05 12 00

49. SECTION 26 27 13 – ELECTRICITY METERING**1. GENERAL****1. SECTION REQUIREMENTS**

1. Submittals: Product Data and Shop Drawings.
2. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Coordinate with utility companies for services and components they furnish.

2. PRODUCTS**1. EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY**

1. Meters will be furnished by Solar Decathlon organisers. To be standard 4-jaw, ringless, round utility-grade socket meter for use with 240/120V services. Refer to organisers for technical specification of meter.
2. Current-Transformer Cabinets: Flush/In-wall installation as detailed on drawings.
3. Meter box cabinets to be visible from exterior of house at all times, at a height of between 50-65 inches above grade.
4. Physical Protection: Meter housing is to be constructed of galvanised steel, powdercoated. Acrylic window for visibility of meters.

3. EXECUTION**1. INSTALLATION**

1. Comply with equipment installation requirements in NECA 1.
2. Install equipment for metering. Provide empty conduits for metering leads and extend grounding connections as required by organisers.

END OF SECTION 05 12 00

50. SECTION 26 27 26 – WIRING DEVICES**1. GENERAL****1. SECTION INCLUDES**

1. Receptacles
 1. 26 27 26 A1 - PDL 800 Series 10A 240V Horizontal Integrally Switched Single Receptacle
 2. 26 27 26 A2 - PDL 800 Series 10A 240V Horizontal Integrally Switched Double Receptacle
 3. 26 27 26 B1 - PDL 800 Series 10A 240V Vertical Integrally Switched Single Receptacle
 4. 26 27 26 B2 - PDL 800 Series 10A 240V Vertical Integrally Switched Double Receptacle
 5. 26 27 26 C1 - PDL 800 Series 16A 240V Horizontal Switched Permanent Connection Unit
 6. 26 27 26 F1 – PDL 56 16A 240V Series Switched Outdoor Receptacle
2. Push Button Switches
 1. 26 27 26 D1 - Horizontal one gang push button switch
 2. 26 27 26 D2 - Horizontal two gang push button switch
 3. 26 27 26 D3 - Horizontal three gang push button switch
 4. 26 27 26 E1 - Vertical one gang push button switch
 5. 26 27 26 E2 - Vertical three gang push button switch
 6. 26 27 26 E3 - Vertical four gang push button switch

2. SECTION REQUIREMENTS

1. Submittals: Product Data.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Comply with NFPA 70.

2. PRODUCTS**1. RECEPTACLES**

1. Horizontal Single Receptacle
 1. Manufacturer: Schneider Electric
 2. Model: PDL 800 series
 3. Rated Current: 10 Amps
 4. Nominal Voltage: 240 Volts
 5. Orientation: Horizontal
 6. Integrally switched

7. GFCI protection at panel board
2. Horizontal Double Receptacle
 1. Manufacturer: Schneider Electric
 2. Model: PDL 800 series
 3. Rated Current: 10 Amps
 4. Nominal Voltage: 240 Volts
 5. Orientation: Horizontal
 6. Integrally switched
 7. GFCI protection at panel board
3. Vertical Single Receptacle
 1. Manufacturer: Schneider Electric
 2. Model: PDL 800 series
 3. Rated Current: 10 Amps
 4. Nominal Voltage: 240 Volts
 5. Orientation: Vertical
 6. Integrally switched
 7. GFCI protection at panel board
4. Vertical Double Receptacle
 1. Manufacturer: Schneider Electric
 2. Model: PDL 800 series
 3. Rated Current: 10 Amps
 4. Nominal Voltage: 240 Volts
 5. Orientation: Vertical
 6. Integrally switched
 7. GFCI protection at panel board
2. **PUSH BUTTON SWITCHES**
 1. Horizontal one gang push button switch
 1. Manufacturer: Schneider Electric
 2. Model: PDL 800 series
 3. Rated Current: 10 Amps
 4. Nominal Voltage: 240 Volts
 5. Orientation: Horizontal
 6. Module configuration:
 1. 1 x Momentary, single 10A pushbutton switch module
 2. 2x Standard blank module

2. Horizontal two gang push button switch
 1. Manufacturer: Schneider Electric
 2. Model: PDL 800 series
 3. Rated Current: 10 Amps
 4. Nominal Voltage: 240 Volts
 5. Orientation: Horizontal
 6. Module configuration:
 1. 1 x Momentary, double 10A pushbutton switch module
 2. 2x Standard blank module

3. Horizontal two gang push button switch
 1. Manufacturer: Schneider Electric
 2. Model: PDL 800 series
 3. Rated Current: 10 Amps
 4. Nominal Voltage: 240 Volts
 5. Orientation: Horizontal
 6. Module configuration:
 1. 3 x Momentary, single 10A pushbutton switch module

4. Vertical one gang push button switch
 1. Manufacturer: Schneider Electric
 2. Model: PDL 800 series
 3. Rated Current: 10 Amps
 4. Nominal Voltage: 240 Volts
 5. Orientation: vertical
 6. Module configuration:
 1. 1 x Momentary, single 10A pushbutton switch module
 2. 2 x half standard blank module

5. Vertical three gang push button switch
 1. Manufacturer: Schneider Electric
 2. Model: PDL 800 series
 3. Rated Current: 10 Amps
 4. Nominal Voltage: 240 Volts
 5. Orientation: vertical
 6. Module configuration:
 1. 1 x Momentary, single 10A pushbutton switch module
 2. 1 x Momentary, double 10A pushbutton switch module

6. Vertical four gang push button switch
 1. Manufacturer: Schneider Electric

2. Model: PDL 800 series
3. Rated Current: 10 Amps
4. Nominal Voltage: 240 Volts
5. Orientation: vertical
6. Module configuration:
 1. 2 x Momentary, double 10A pushbutton switch module
 2. 1 x Momentary, double 10A pushbutton switch module

3. EXECUTION

1. INSTALLATION

1. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
2. Install devices and assemblies plumb, level, and square with building lines.
3. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
4. Mount devices flush, and grounding terminal of receptacles on bottom unless otherwise indicated. Group adjacent devices under single, multigang wall plates.

END OF SECTION 05 12 00

51. SECTION 26 28 16 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS**1. GENERAL****1. SECTION INCLUDES**

1. 26 28 16 A1 - 10A RCBO
2. 26 28 16 A2 - 16A RCBO
3. 26 28 16 A3 - 20A RCBO
4. 26 28 16 A4 - 32A RCBO
5. 26 28 16 B1 - Impulse relay with central control
6. 26 28 16 C1 - 100A MCB
7. 26 28 16 D1 - 100A Surge arrestor

2. SECTION REQUIREMENTS

1. Submittals: Product Data.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. PRODUCTS**1. CIRCUIT BREAKERS AND SWITCH GEAR**

1. Residual current operated circuit breaker with over current protection (RCBO)
 1. Manufacturer: Schneider Electric
 2. Model: DPN Vigi
 3. Number of poles: 1+N
 4. Sensitivity: 30mA
 5. Current Rating: 10, 16, 20, and 32 Amps
2. Impulse relay with central control
 1. Manufacturer: Schneider Electric
 2. Model: TLc 16A
 3. Remote operation of relay by impulse signal

4. Current rating 16A
 5. Central control for "all off" switch
3. Main Circuit Breaker
 1. Manufacturer: Schneider Electric
 2. Model: C120N
 3. Number of poles: 1+N
 4. Current Rating: 100 Amps

3. EXECUTION

1. CONDITIONS

1. INSTALLATION

1. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
2. Comply with mounting and anchoring requirements specified in Division 26 Sections "Common work Results for Electrical."
3. Install fuses in fusible devices.
4. Comply with NECA 1.

2. FIELD QUALITY CONTROL

1. Perform the following field tests and inspections and prepare test reports:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

END OF SECTION 05 12 00

52. SECTION 26 31 00 – PHOTOVOLTAIC GENERATION**1. GENERAL****1. SECTION INCLUDES**

1. 48 31 00 A1 – 225 W Mitsubishi Photovoltaic Collectors

2. RELATED SECTIONS

1. Section 48 14 00 – Solar Energy Electrical Power Generation Equipment
2. Section 48 19 16 – Electrical Power Generation Inverters

3. REFERENCES

1. ASTM E1038-Standard Test Method for Determining Resistance of Photovoltaic Modules to Hail by Impact with Propelled Ice Balls
2. ASTM E1171- Standard Test Method for Photovoltaic Modules in Cyclic Temperature and Humidity Environments
3. ASTM E1596- Standard Test Methods for Solar Radiation Weathering of Photo voltaic Modules
4. ASTM E1597- Standard Test Method for Saltwater Pressure Immersion and Temperature Testing of Photovoltaic Modules for Marine Environments
5. ASTM E1802-Standard Test Methods for Wet Insulation Integrity Testing of Photovoltaic Modules
6. ASTM E2047- Standard Test Method for Wet Insulation Integrity Testing of Photovoltaic Arrays
7. ASTM E1830- Standard Test Methods for Determining Mechanical Integrity of Photovoltaic Modules
8. ASTM E781- Standard Practice for Evaluating Absorptive Solar Receiver Materials When Exposed to Conditions Simulating Stagnation in Solar Collectors With Cover Plates
9. ASTM E782- Standard Practice for Exposure of Cover Materials for Solar Collectors to Natural Weathering Under Conditions Simulating Operational Mode
10. ASTM E823- Standard Practice for Nonoperational Exposure and Inspection of a Solar Collector
11. ASTM E881- Standard Practice for Exposure of Solar Collector Cover Materials to Natural Weathering Under Conditions Simulating Stagnation Mode

12. ASTM E1039- Standard Test Method for Calibration of Silicon Non-Concentrator Photovoltaic Primary Reference Cells Under Global Irradiation
13. ASTM E1362- Standard Test Method for Calibration of Non-Concentrator Photovoltaic Secondary Reference Cells
14. ASTM E948- Standard Test Method for Electrical Performance of Photovoltaic Cells Using Reference Cells Under Simulated Sunlight
15. ASTM E1021- Standard Test Methods for Measuring Spectral Response of Photovoltaic Cells
16. ASTM E903- Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
17. ASTM E1040- Standard Specification for Physical Characteristics of Non-concentrator Terrestrial Photovoltaic Reference Cells
18. ASTM E1462- Standard Test Methods for Insulation Integrity and Ground Path Continuity of Photovoltaic Modules

2. PRODUCTS

1. MANUFACTURERS

1. Mitsubishi Electric

2. MATERIALS

1. Mitsubishi Electric photovoltaic panels model: PV-UJ225GA6

1. Product Data:

1. Electrical Data

1. Peak Power (Pmax): 225 Wp
2. Warranted Minimum Pmax: 218.3 Wp
3. PV USA test condition rating (PTC): 203.2
4. Open Circuit Voltage: 36.4 V
5. Short Circuit Current: 8.3 A
6. Maximum power voltage: 30.0 V
7. Maximum power current: 7.50 A
8. Maximum system Voltage (DC): 600 V
9. Series Fuse Rating: 15 A
10. Module Efficiency: 13.7%
11. Power tolerance of +3/- 3%

2. Mechanical Data

1. 60 Solar Cells in series, Polycrystalline Silicon, 156 mm x 156 mm
2. 4 Bus bar cell design, solder less contacts
3. Tempered front glass
4. Back film and high-transmittance glass for increased light absorption
5. Static load test passed: 5.4 kPa
6. Four layer junction box is IP-65 rated with bypass diode
7. Output Cables 40.33 inch length cable/ multi-contact connectors
8. Frame Anodized aluminium alloy
9. ISO 14001 certified manufacturing process
10. Weight 20 kg

3. EXECUTION**1. INSTALLATION**

1. Cover all modules in the PV array with an opaque cloth or material before making or breaking electrical connections.
2. All installations must be performed in compliance with the National Electrical Code (NEC) and any applicable local codes.
3. There are no user serviceable parts within the module. Do not attempt to repair any part of the module.
4. Installation should be performed only by authorized personnel.
5. Remove all metallic jewellery prior to installing this product to reduce the chance of accidental exposure to live circuits.
6. Use insulated tools to reduce your risk of electric shock.
7. Do not stand on, drop, scratch, or allow objects to fall on modules.
8. If the front glass is broken, or the back sheet is torn, contact with any module surface or module frame can cause electric shock.
9. Do not install or handle the modules when they are wet or during periods of high wind.

2. IMPLIMENTAION

1. To reduce the possibility of electrical shock, ground the frame of the module or array before wiring the circuit using a grounding method that meets NEC requirements for grounding solar electrical systems.

2. In order to install in accordance with the UL listing of this product, Mitsubishi Electric modules shall be grounded using grounding hardware that have been UL certified to meet requirements for grounding systems in UL467, UL1703, or UL1741 on anodized aluminium frames. Must be grounded to perform optimally.
3. Array can be connected in parallel or series to increase either desired voltage or current.
4. Mounting

3. EFFICIENCY TESTING

1. Energy Efficiency: Verify equipment is properly installed, connected, and adjusted. Verify that equipment is operating as specified.
2. Renewable Energy: Verify proper operation in all modes of system operation by testing. Verify proper operation under a wide range of conditions to verify energy delivery as calculated for those conditions.
3. Solar Energy Systems: Comply with ASTM E1799- Standard Practice for Visual Inspections of Photovoltaic Modules.

END OF SECTION 05 12 00

53. SECTION 26 31 00 – PHOTOVOLTAIC COLLECTORS**1. GENERAL****1. SECTION INCLUDES**

1. 48 31 00 A1 – 225 W Mitsubishi Photovoltaic Collectors

2. REFERENCES

1. ASTM E1038-Standard Test Method for Determining Resistance of Photovoltaic Modules to Hail by Impact with Propelled Ice Balls
2. ASTM E1171- Standard Test Method for Photovoltaic Modules in Cyclic Temperature and Humidity Environments
3. ASTM E1596- Standard Test Methods for Solar Radiation Weathering of Photo voltaic Modules
4. ASTM E1597- Standard Test Method for Saltwater Pressure Immersion and Temperature Testing of Photovoltaic Modules for Marine Environments
5. ASTM E1802-Standard Test Methods for Wet Insulation Integrity Testing of Photovoltaic Modules
6. ASTM E2047- Standard Test Method for Wet Insulation Integrity Testing of Photovoltaic Arrays
7. ASTM E1830- Standard Test Methods for Determining Mechanical Integrity of Photovoltaic Modules
8. ASTM E781- Standard Practice for Evaluating Absorptive Solar Receiver Materials When Exposed to Conditions Simulating Stagnation in Solar Collectors With Cover Plates
9. ASTM E782- Standard Practice for Exposure of Cover Materials for Solar Collectors to Natural Weathering Under Conditions Simulating Operational Mode
10. ASTM E823- Standard Practice for Nonoperational Exposure and Inspection of a Solar Collector
11. ASTM E881- Standard Practice for Exposure of Solar Collector Cover Materials to Natural Weathering Under Conditions Simulating Stagnation Mode
12. ASTM E1039- Standard Test Method for Calibration of Silicon Non-Concentrator Photovoltaic Primary Reference Cells Under Global Irradiation
13. ASTM E1362- Standard Test Method for Calibration of Non-Concentrator Photovoltaic Secondary Reference Cells

14. ASTM E948- Standard Test Method for Electrical Performance of Photovoltaic Cells Using Reference Cells Under Simulated Sunlight
15. ASTM E1021- Standard Test Methods for Measuring Spectral Response of Photovoltaic Cells
16. ASTM E903- Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
17. ASTM E1040- Standard Specification for Physical Characteristics of Non-concentrator Terrestrial Photovoltaic Reference Cells
18. ASTM E1462- Standard Test Methods for Insulation Integrity and Ground Path Continuity of Photovoltaic Modules

3. RELATED SECTIONS

1. Section 48 14 00 – Solar Energy Electrical Power Generation Equipment
2. Section 48 19 16 – Electrical Power Generation Inverters

2. PRODUCTS

1. MANUFACTURERS

1. Mitsubishi Electric

2. MATERIALS

1. Mitsubishi Electric photovoltaic panels model: PV-UJ225GA6
 1. Electrical Data
 1. Peak Power (Pmax): 225 Wp
 2. Warranted Minimum Pmax: 218.3 Wp
 3. PV USA test condition rating (PTC): 203.2
 4. Open Circuit Voltage: 36.4 V
 5. Short Circuit Current: 8.3 A
 6. Maximum power voltage: 30.0 V
 7. Maximum power current: 7.50 A
 8. Maximum system Voltage (DC): 600 V
 9. Series Fuse Rating: 15 A
 10. Module Efficiency: 13.7%
 11. Power tolerance of +3/- 3%
 2. Mechanical Data

1. 60 Solar Cells in series, Polycrystalline Silicon, 6 inch x 6 inch
2. 4 Bus bar cell design, solder less contacts
3. Tempered front glass
4. Back film and high-transmittance glass for increased light absorption
5. Static load test passed: 5.4 kPa
6. Four layer junction box is IP-65 rated with bypass diode
7. Output Cables 40.33 inch length cable/ multi-contact connectors
8. Frame Anodized aluminium alloy
9. ISO 14001 certified manufacturing process
10. Weight 44lbs.

3. EXECUTION

1. INSTALLATION

1. Safety

1. Cover all modules in the PV array with an opaque cloth or material before making or breaking electrical connections.
2. All installations must be performed in compliance with the National Electrical Code (NEC) and any applicable local codes.
3. There are no user serviceable parts within the module. Do not attempt to repair any part of the module.
4. Installation should be performed only by authorized personnel.
5. Remove all metallic jewellery prior to installing this product to reduce the chance of accidental exposure to live circuits.
6. Use insulated tools to reduce your risk of electric shock.
7. Do not stand on, drop, scratch, or allow objects to fall on modules.
8. If the front glass is broken, or the back sheet is torn, contact with any module surface or module frame can cause electric shock.
9. Do not install or handle the modules when they are wet or during periods of high wind.

2. Implementation

1. To reduce the possibility of electrical shock, ground the frame of the module or array before wiring the circuit using a grounding method that meets NEC requirements for grounding solar electrical systems.
2. In order to install in accordance with the UL listing of this product, Mitsubishi Electric modules shall be grounded using grounding hardware that have been UL certified to meet requirements for grounding systems in UL467, UL1703, or UL1741 on anodized aluminium frames. Must be grounded to perform optimally.
3. Array can be connected in parallel or series to increase either desired voltage or current.

4. Mounting

2. EFFICIENCY TESTING

1. Energy Efficiency: Verify equipment is properly installed, connected, and adjusted. Verify that equipment is operating as specified.
2. Renewable Energy: Verify proper operation in all modes of system operation by testing. Verify proper operation under a wide range of conditions to verify energy delivery as calculated for those conditions.
3. Solar Energy Systems: Comply with ASTM E1799- Standard Practice for Visual Inspections of Photovoltaic Modules.

END OF SECTION 05 12 00

54. SECTION 26 50 00 – LIGHTING**1. GENERAL****1. SECTION REQUIREMENTS**

1. Submittals: Product Data for each luminaries, including lamps. Refer Appendices.
2. Fixtures, Emergency Lighting Units, Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Comply with IEEE C2, "National Electrical Safety Code."
4. Coordinate ceiling-mounted luminaries with ceiling construction, mechanical work, and security and fire-prevention features mounted in ceiling space and on ceiling.

2. SECTION INCLUDES

1. 26 51 00 A1 - 2.3 Watt Wide Beam LED recessed cabinet light
2. 26 51 00 A2 – 8 Watt edison screw LED bulb in standard lampshade
3. 26 51 00 A3 - 12 Watt LED downlight
4. 26 51 00 A4 - Flexible LED Strip Light
5. 26 56 00 A1 - 1 Watt mini LED spotlight

2. PRODUCTS**1. LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS**

1. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
2. LED Fixtures: Comply with UL 8750 (in development).
3. Exterior Luminaries: Comply with UL 1598 and listed and labelled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
4. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaries.
5. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

2. REQUIREMENTS FOR INDIVIDUAL LIGHTING FIXTURES

1. 1 Watt mini LED spotlight
 1. Type: Spot
 2. Size: Dia. 20 x 13mm
 3. Material: Anodised Aluminium
 4. Power: 1W
 5. Colour Temp: 3000K

2. 2.3 Watt Wide Beam LED recessed cabinet light
 1. Type: Wide Beam cabinet light
 2. Size: Dia. 48 x 14mm
 3. Material: Aluminium
 4. Power: 2.3 W
 5. Colour Temp: 2800K

3. 12 Watt LED downlight
 1. Type: Downlight
 2. Size: 100 x 100mm
 3. Material: Anodised aluminium
 4. Power: 12 W
 5. Colour Temp: 3000K

4. Flexible LED Strip Light
 1. Type: Flexible Strip
 2. Size: 8mm w x 3mm h. Length in multiples of 50mm
 3. Material: Flexible ribbon
 4. Power: 4.8W/metre (0.24W/50mm)
 5. Colour Temp: 3000K

3. DRIVERS & TRANSFORMERS

1. 1 – 12VA 350 or 700mA Driver
 1. Mains Driver
 2. 240V / 50Hz input voltage
 3. Size: 99 x 39 x 23.5mm

2. 12 – 24V DC input 700mA Driver
 1. 12 – 24 V DC Driver
 2. 12 – 24 V DC input voltage
 3. Size: 22 x 12 x 5mm
 4. IP67 rating

3. 12 – 24 V Transformer
 1. Details to be confirmed

4. LAMPS

1. All light fixtures in section 2.2 above are supplied with integral Lamps
2. 8 Watt edison screw LED bulb
 1. All freestanding light fixtures to use this lamp
 2. 8 watt
 3. E-27 edison screw fitting

5. CONTROLLING DEVICES

1. All lighting to be controlled by momentary on push button switches linked to impulse relays at the panel board.
 1. Impulse Relays
 1. Refer to SECTION 26

3. EXECUTION

1. INSTALLATION

1. Set units level, plumb, and square with ceiling, walls, and ground surface, and secure.
2. Support for Recessed and Semi recessed Grid-Type Fixtures:
 1. Install ceiling support system wires at a minimum of four wires for each fixture, located not more than 150 mm from fixture corners.
 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Adjust aimable lighting fixtures to provide required light intensities.
4. Lamping: Where specific lamp designations are not indicated, lamp units according to manufacturer's written instructions.

END OF SECTION 05 12 00

55. SECTION 27 10 13 – RESIDENTIAL STRUCTURED CABLING**GENERAL****SECTION INCLUDES**

This section relates to generic structured communications cabling systems for residential projects.

REFERENCES

1. CSA-C22.2 No. 214, Communications Cables (Bi-National standard with UL 444).
2. TIA/EIA-568, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
3. TIA/EIA-568, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.
4. TIA/EIA-606, Administration Standard for the Commercial Telecommunications Infrastructure.

QUALITY ASSURANCE

Comply

Comply with the manufacturer's requirements. Arrange for the required manufacturer's inspections of the listed work.

Qualifications

Communications cabling installation to be carried out by competent workers experienced with the materials and in the techniques specified and accredited to work on the proposed manufacturer's system.

WARRANTIES

Warranty

Warrant this part of the work under normal environmental and use conditions against failure of materials and execution.

1 years: Warranty period

Refer to general section warranty agreement for the required format and details of when completed warranty must be submitted.

PRODUCTS**MATERIALS**

All system components (distributors, cabling and outlets), where possible, to be of a common manufacturer and every component to meet the required level of performance.

External termination point: Comply with Telecommunication Service Provider's requirements.

Cables: Schneider Electric, Lexicon

Four-pair 100 ohm balanced twisted pair cable: Flame test classification to: CSA-C22.2 No. 214, Category 6 to: TIA/EIA-568.

Four-pair 100 ohm screened twisted pair cable: Flame test classification to: CSA-C22.2 No. 214, Category 7 to: TIA/EIA-568.

Outlets: Schneider Electric, 800 Series/ Slimline Series, white (to match electrical outlets)

ICT outlets: Four-pair 100 ohm balanced Category 6 - multiple outlets on common faceplates.

BCT outlets: Four-pair 100 ohm screened balanced Category 7 or coaxial (type 9.52 or type F) outlets - multiple outlets on common faceplates.

Outlet plates: To match electrical socket outlet faceplates. Refer to SELECTIONS.

EXECUTION**CONDITIONS**

Arrange for Telecommunication Service Provider to supply conduit for lead-in cable. Install conduit to location nominated by the Service Provider. Arrange for the Service Provider to install and terminate the lead-in cable.

Distributors: Install to the Service Provider's and manufacturer's requirements.

Cables: Install to the Service Provider's and manufacturer's requirements. Size tie cables to suit the installation requirements plus 30% spare.

Network Access cable: From ETP to distributor. Three 4 pair 100 ohm balanced Category 6 or higher performance cables.

Telecommunications outlet cable: 4 pair 100 ohm balanced Category 6, terminate 4 pair per line.

Broadcast outlet cable: 4 pair 100 ohm screened Category 7, terminate 4 pair per line.

INSTALLATION**5. Cables**

Conceal all cables.

Support all cables clear of hot and sharp surfaces without placing unnecessary strain on the cables or terminations.

Grounded or insulated high tensile catenaries or cable trays in ceiling/floor cavities.

Keep cable trays for greater than 24 cables in a common route.

Cables to run parallel to power cables separated by 300mm and cross at right angles with segregation.

Do not share cable supports or penetrations with other services.

Joining cables is not permitted - replace any damaged or short cables.

Outlets

Allow to move up to 2 metres prior to installation.

Confirm all locations prior to installation.

Mount at 300mm above finished floor level unless noted otherwise.

Mount aligned with electrical socket outlets where present, separated at 100mm centres.

TV aerial and cabling

Fix aerial, and ensure the system is suitable for high quality reception of all VHF, UHF, digital and satellite channels - Sky satellite TV installation practices minimum.

Test to ensure adequate TV/video at every outlet with a RF field strength meter.

Cable penetrations through the cladding to be weatherproofed.

COMPLETION

At completion test system and provide a certified copy of the results. Correct or replace any sub-standard items and re-test.

Common and consistent labelling on each outlet and at the Distributor.

Machine made permanent labels.

Arrange numbering sequentially by floor, then by room and then around the walls of each room.

CLEANING

Replace damaged, cracked or marked elements.

Leave work clean, undamaged, in full working.

Remove debris, unused materials and elements from inside frames and from the rest of the site.

END OF SECTION 05 12 00

56. SECTION 27 21 00 – DATA COMMUNICATIONS NETWORK EQUIPMENT**1. GENERAL****1. SECTION INCLUDES**

1. 27 20 00.A1 – Lexcom 22” Home Network Distribution Cabinet
2. 27 20 00.A2 – Data Outlet
3. 27 21 23.A1 – AV Modulator

2. QUALITY ASSURANCE

1. Electrical Components, Devices, and Accessories Listed and labelled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. Comply with NFPA 70.

3. COORDINATION

1. Coordinate layout and installation of conduit and boxes with other construction that penetrates walls or is supported by them.

2. PRODUCTS**1. MATERIALS**

Refer to Appendix B for manufacturers technical specification data for items listed below.

1. Lexcom 22” Home Network Distribution Cabinet
2. Data Module
3. Telephone Module
4. TV Amplifier Module
5. AV Combiner
6. AV Modulator
7. Infrared link

8. Patch Leads
9. Network Cable
10. Modular Connection Jack
11. Outlets

3. EXECUTION**1. INSTALLATION**

1. Install as per manufacturers specifications. Refer Appendix B for details.

END OF SECTION 27 21 00

57. SECTION 28 31 00 – FIRE DETECTION AND ALARM**1. GENERAL****1. SECTION INCLUDES**

1. 21 10 00 – Centrally linked smoke alarms

2. RELATED SECTIONS

1. This specification is to be read in conjunction with the following sections:
 1. 21 10 00 Water based Fire Suppression Systems

2. PRODUCTS**1. PRODUCTS**

1. 230V centrally linked smoke alarm, as per IRC requirements. Battery backup to be provided. Model TBC

3. EXECUTION**1. INSTALLATION**

1. Install in locations indicated on drawings.

END OF SECTION 05 12 00

58. SECTION 32 93 00 – PLANTS**1. GENERAL****1. SECTION REQUIREMENTS**

1. Submittals: Product Data.
2. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
3. Maintain ground covers and plants until established, but not less than six months.

2. PRODUCTS**1. PLANTS**

1. *Carex testacea*: Size 0.5 gal
2. *Phormium cookianum*: Size 0.5 gal
3. *Pseudopanax crassifolius*: Size 5 gal
4. *Coprosma virescens*: Size 3 gal
5. *Libertia grandiflora*: Size 3 gal
6. *Astelia chathamica*: Size 5 gal
7. *Clematis forsteri*: Size 1 gal
8. *Astelia nervosa* 'westland': Size 3 gal
9. *Hebe* 'Karo Golden Esk': Size 1 gal
10. *Aceana inermis* 'purpurea': Size 0.5 gal
11. *Chionochloa flavicans*: Size 1.5 gal
12. *Asplenium oblongifolium*: Size 0.5 gal
13. *Asplenium* 'Maori Princess': Size 0.5 gal
14. *Blechnum novae-zealandiae*: Size 0.5 gal

15. *Cyathea medullaris*: Size 5 gal

2. PLANTING SOIL MIX

Potting Mix: Composted Bark Fines 0-0.5inch with Pumice and various slow release fertilisers.

Bark Mulch: A mix of shredded bark and white wood

1. Crushed Shell: Light coloured seashells crushed to a consistent size 0.25-0.5 inch
2. Bluestone: Pebbles in a variety of colours (including Blue and Teal with white streaks) and an average size 0.5-0.75 inch wide
3. White Chip: 0.25-0.7 inch
4. Gold Garden Pebble: 0.5-0.66 inch wide

3. EXECUTION

1. PREPARATION

1. Planting Bed Establishment: Loosen subgrade to a depth of 4 inches. Remove stones sticks, roots, and rubbish. Spread planting soil mixture to a depth of 4inches, but not less than required to meet finish grades. Work first layer into top of loosened subgrade.
2. Trees and Shrubs: Excavate pits with sides sloped inward and with bottom of excavation slightly raised at center to assist drainage. Excavate approximately three times as wide as ball diameter. Scarify sides of plant pit smeared or smoothed during excavation.
 1. Set trees and shrubs plumb and in center of pit with top of ball flush with adjacent finish grades.
 2. Remove burlap and wire baskets from tops of balls and partially from sides, but do not remove from under balls. Carefully remove root balls from containers without damaging root ball or plant. Do not use planting stock if ball is cracked or broken before or during planting operation.
 3. Place planting soil mix around ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Water again after placing and tamping final layer of planting soil mix.
 4. Prune, thin, and shape trees and shrubs after planting.
3. Plant ground cover and plants 12 inches apart. Dig holes large enough to allow root spread. Plant stock working soil around roots and leave a slight saucer around plants to hold water. Water after planting. Do not cover plant crowns with wet soil.
4. Edgings: Install edgings and anchor with stakes driven below top elevation of edging.

5. Tree and Shrub Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, adjusting and repairing, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

6. Ground Cover and Plant Maintenance: Maintain and establish plantings by watering, weeding, fertilizing, mulching, and other operations as required to establish healthy, viable plantings.

END OF SECTION 05 12 00

59. SECTION 33 79 83 – SITE GROUNDING CONDUCTORS**1. GENERAL****1. SECTION INCLUDES**

1. 26 05 26. A1 – Organiser supplied grounding electrodes

2. PERFORMANCE

1. The electrode plates shall be bonded to each other with an uninsulated 4 AWG minimum solid copper conductor attached to the grounding plate rod with a listed connection device (clamp) or via exothermic weld. Such bonding conductors should be in contact with the ground and placed in a location where they will not be a tripping hazard for personnel.

2. PRODUCTS**1. MATERIALS**

1. 2 of Grounding electrodes : 12' x 12' x 0.25' copper plate, with 0.625' diameter hole in the centre for 0.625' ground rod. Ground rod extends 18 inches below plate and 2 inches above plate.
2. Grounding rod permanently attached to the plate electrode by exothermic means.

3. EXECUTION**1. INSTALLATION**

1. Installation location to be confirmed onsite by qualified utilities person. Indicative location shown on drawings.
2. Ensure location of grounding rods are not in a location where they will become a trip hazard.
3. Grounding electrodes installed at 45 degree angle.

END OF SECTION 05 12 00

60. SECTION 41 22 13 – MOBILE CRANE**PART 1 - GENERAL****9.1.1 1.1 SUMMARY****A. Section includes:**

1. This specification includes the requirements, terms of use, and product data of a mobile crane used to unload and load the modules of the house for the competition.

PART 2 - PRODUCTS**2.1 MANUFACTURERS****A. Liebherr****2.2 MODEL****A. LTM 1100/2 Mobile Crane****2.3 GENERAL NOTES**

- A. Rated loads as shown on Lift Charts pertain to this machine as originally manufactured and equipped. Modifications to the machine or use of optional equipment other than that specified can result in a reduction of capacity.
- B. Construction equipment can be hazardous if improperly operated or maintained. Operation and maintenance of this machine shall be in compliance with the information in the Operator's, Parts and Safety Manuals supplied with this machine. If these manuals are missing, order replacements from the manufacturer through your distributor.
- C. These warnings do not constitute all of the operating conditions for the crane. The operator and job site supervision must read the operators manual, CIMA safety manual, applicable OSHA regulations, and ASME safety standards for cranes.

D. This crane and its load ratings are in accordance with power crane & shovel association, standard no. 4, sae crane load stability testcode J765A, sae method of test for crane structure J1063 and applicable safety code for cranes, derricks and hoists, ASME/ANSI B30.5

2.4 CAPACITIES

- 1.) Maximum Lifting Capacity: 100 t at 3m radius
- 2.) Telescopic Boom: 11.5 – 60m
- 3.) Lattice Gib: 10.8 – 33m
- 7.) Drive/Steer: 8 X 8 X 8
- 8.) Carrier Engine: Liebherr, 6 Cylinder Turbo-Diesel, 350kW
- 9.) Crane Engine: Liebherr, 4 Cylinder Turbo-Diesel, 129kW
- 10.) Max Speed: 80 km/h
- 12.) Overall Length: 13.503m
- 13.) Overall Width: 7.0m
- 14.) Overall Height: 4.0m (in closed position)
- 15.) Operational Weight: 48 t
- 16.) Total Counterweight: 28.2 t

2.5 MANUFACTURERS SPECIFICATION:

Refer Attached Appendices

PART 3 – EXECUTION

3.1 SETUP

1. Crane load ratings are based on the crane being levelled and standing on a firm, uniform supporting surface.
2. Crane load ratings on outriggers are based on all outrigger beams being fully extended or in the case of partial extension ratings mechanically pinned in the appropriate position, and the tires free of the supporting surface.
3. Crane load ratings on tires depend on appropriate inflation pressure and the tire conditions. Caution must be exercised when increasing air pressures in tires. Consult Operator's Manual for precautions.
4. Use of gibs, lattice-type boom extensions, or fourth section pullouts extended is not permitted for pick and carry operations.
5. Consult appropriate section of the Operator's and Service Manual for more exact description of hoist line reeving.

6. The use of more parts of line than required by the load may result in having insufficient rope to allow the hook block to reach the ground.
7. Properly maintained wire rope is essential for safe crane operation. Consult Operator's Manual for proper maintenance and inspection requirements.
8. When spin-resistant wire rope is used, the allowable rope loading shall be the breaking strength divided by five (5), unless otherwise specified by the wire rope manufacturer.
9. Do not elevate the boom above 60° unless the boom is positioned in-line with the crane's chassis or the outriggers are extended. Failure to observe this warning may result in loss of stability.

3.2 OPERATION

1. Crane load ratings must not be exceeded. Do not attempt to top the crane to determine allowable loads.
2. When either radius or boom length, or both, are between listed values, the smaller of the two listed load ratings shall be used.
3. Do not operate at longer radii than those listed on the applicable load rating chart
4. The boom angles shown on the Capacity Chart give an approximation of the operating radius for a specified boom length. The boom angle, before loading, should be greater to account for boom deflection. It may be necessary to retract the boom if maximum boom angle is insufficient to maintain rated radius.
5. Power telescoping boom sections must be extended equally.
6. Rated loads include the weight of hook block, slings, and auxiliary lifting devices. Their weights shall be subtracted from the listed rated load to obtain the net load that can be lifted. When lifting over the jib the weight of any hook block, slings, and auxiliary lifting devices at the boom head must be added to the load. When jibs are erected but unused add two (2) times the weight of any hook block, slings, and auxiliary lifting devices at the jib head to the load.
7. Rated loads do not exceed 85% on outriggers or 75% on tires, of the tipping load as determined by SAE Crane Stability Test Code J765a.
8. Rated loads are based on freely suspended loads. No attempt shall be made to drag a load horizontally on the ground in any direction.
9. The user shall operate at reduced ratings to allow for adverse job conditions, such as: Soft or uneven ground, out of level conditions, high winds, side loads, pendulum action, jerking or sudden stopping of loads, hazardous conditions, experience of personnel, two machine lifts, travelling with loads, electric wires, etc., (side pull on boom or jib is hazardous). Derating of the cranes lifting capacity is required when wind speed exceeds 20 MPH. the center of the lifted load must never be allowed to move more than 3 feet off the center line of the base boom section due to the effects of wind, inertia, or any combination of the two. Use 2 feet off the center line of the base boom for a two section boom, 3 feet for a three section boom, or 4 feet for a four section boom.

10. The maximum load which can be telescoped is not definable, because of variations in loadings and crane maintenance, but it is permissible to attempt retraction and extension if load ratings are not exceeded.
11. Load ratings are dependent upon the crane being maintained according to manufacturer's specifications.
12. It is recommended that load handling devices, including hooks, and hook blocks, be kept away from boom head at all times.
13. 360° capacities apply only to machines equipped with a front outrigger jack and all five (5) out-rigger jacks properly set. If the front (5th) outrigger jack is not properly set, the work area is restricted to the over side and over rear areas as shown on the Crane Working Positions diagram. Use the 360° load ratings in the overside work areas.
14. Do not lift with outrigger beams positioned between the fully extended and intermediate (pinned) positions.
15. Truck Cranes not equipped with equalizing (bogie) beams between the rear axles may not be used for lifting "on tires". Truck Cranes equipped with equalizing beams and rear air suspension should "dump" the air before lifting "on tires".

3.3 SPECIAL RESTRICTIONS

1. Crane may not leave access road when on the National Mall. Crane is not allowed to travel on any of the grass on the mall.
2. Crane must wait aside the National mall for Solar Decathlon Operations Director to approve site access.

END OF SECTION 41 22 13

61. SECTION 41 65 16 – MOBILE GENERATORS**1. GENERAL****1. SECTION INCLUDES**

1. Mobile Generator

2. PERFORMANCE

1. Generator required on site during the assembly and disassembly phases of the competition, and will be removed during the competition period. Generator is required to power tools and lighting during the assembly/disassembly phases.
2. Engine Generators shall meet the National Park Service (NPS) noise regulation stated in 36CFR2.12 – a maximum of 60 DB(A) at 50 ft / 15m under full load.

3. SELECTIONS

1. Mobile Generator model to be confirmed in Washington at time of hire.
2. Spill Containment Berm – sized to suit generator, exact model to be confirmed at time of Generator hire.

2. EXECUTION**1. CONDITIONS**

1. Locate generator as indicated on drawings, within Spill Containment Berm.

END OF SECTION 45 65 16

62. SECTION 48 19 16 – ELECTRICAL POWER GENERATION INVERTERS**1. GENERAL****1. SUMMARY**

1. Section Includes
 1. Inverter

2. RELATED SECTIONS

1. Section 26 31 00 – Photovoltaic Generation

2. PRODUCTS**1. MANUFACTURERS**

1. SMA

2. MATERIALS

1. SMA Sunny Boy inverter model SBA 6000 US
 1. Meets the requirements of L1741 Static Inverters and Charge Controllers for use in Photovoltaic Power Systems and UL1998 Software in Programmable Components.
 2. Product Data:
 1. Electrical Data
 1. Input Data (DC)
 1. Max Array Input: 5700 W
 2. Max DC Voltage: 600 V
 3. Peak Power Tracking Voltage: 250 – 480 V
 4. DC Max Input Current: 25 A
 5. DC Voltage Ripple < 5%
 6. Number of Fused String Inputs: 3
 7. PV Start Voltage: 300 V
 2. Output Data (AC)
 1. AC Nominal Power: 6000 W
 2. AC Maximum Output Power: 6000 W
 3. AC Maximum Output Current (@ 208, 240, 277 V): 29 A, 25 A, 22 A
 4. AC Frequency / Range 60 HZ/ 59.3 Hz– 60.5 Hz
 5. Power Factor: 0.99
 2. Mechanical Data

1. Dimensions (W x H x D in mm): 467 x 612 x 241
 2. Weight/ Shipping Weight: 64.86 kg / 69.85 kg
 3. Ambient temperature range: -25.00 °C to + 45.00 °C
 4. Power Consumption: standby / night time: < 7 W / 0.25 W
 5. To include optional RS 485 communication board
3. Specifications for Sunny Boy modules can be found at manufacturer's website:

3. EXECUTION

1. INSTALLATION

1. Safety and Implementation

1. To avoid injury, be sure to use proper lifting techniques and secure the help of someone to assist in the unpacking and installation of the inverter.
2. Do not install the Sunny Boy during periods of precipitation or high humidity (>95%).
3. Moisture trapped within the enclosure may cause corrosion and damage to the electronic components.
4. Must provide sufficient air circulation to dissipate the heat generated by the inverter.
5. To prevent electrical shock or other injury, check for existing electrical or plumbing installations in the walls before drilling mounting holes for the Sunny Boy.
6. Ensure that there are studs in the wall at the places where you intend to drill the mounting holes.
7. Always turn OFF all breakers and switches in the PV system before connecting any wires to or disconnecting any wires from the Sunny Boy.
8. Always wait a minimum of 5 minutes for stored potentials in the Sunny Boy to discharge completely before opening the enclosure.
9. Before connecting the Sunny Boy to the electrical utility grid, contact the local utility company. This connection must be made only by qualified personnel.
10. You must connect the wires that carry the AC voltage from the Sunny Boy to the utility grid in the order described in this procedure. Deviating from this procedure could expose you to lethal voltages that can cause serious injury and/ or death.
11. Verify that the DC current of your installation does not exceed the maximum values specified in the type rating label.

END OF SECTION 05 12 00

APPENDIX A: ENGINEERS CALCULATIONS & SPECIFICATION

9.2 Calculations

9.2.1 Introduction

9.2.2 Case Loadings

9.2.3 Roof Design

9.2.4 Canopy Roof Design

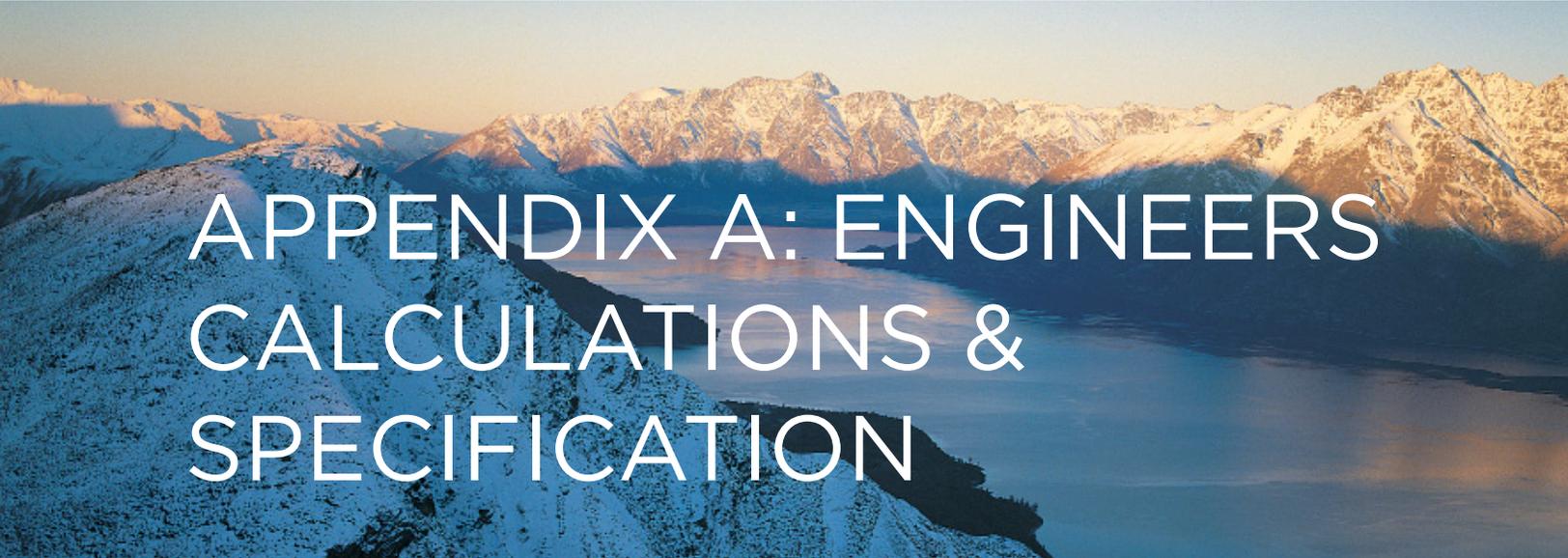
9.2.5 Floor Design

9.2.6 Bracing Design

9.3 Specification

9.3.1 Domestic Specification

9.4 Site Reports



APPENDIX A: ENGINEERS CALCULATIONS & SPECIFICATION

CALCULATIONS

FIRST LIGHT
MODULAR HOUSE
FOR THE
2011 USDE SOLAR DECATHLON
FOR
VICTORIA UNIVERSITY

JOB NO: 6751

DATE: NOV 2010



**Dunning
Thornton**
consultants

Dunning Thornton Consultants Ltd
Consulting Structural Engineers
Project & Construction Consultants





PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on the reverse side*)

ISSUED BY: **Dunning Thornton Consultants Ltd**
(Design Firm)

TO: **Victoria University**
(Owner/Developer)

TO BE SUPPLIED TO: **Wellington City Council**
(Building Consent Authority)

IN RESPECT OF: **Temporary Display House for USDE Solar Decathlon**
(Description of Building Work)

AT: **Frank Kitts Park, Wellington**
(Address)

..... **LOT**..... **DP** **SO**
We have been engaged by the owner/developer referred to above to provide **Structural Design of Specific Elements**
in respect of the requirements of Clause(s) **B1 – Structural** of the Building Code for
(Extent of Engagement)

All or Part only (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

Compliance Documents issued by Department of Building & Housing **B1/VM1**
(verification method / acceptable solution)

..... or

Alternative solution as per the attached schedule.....

The proposed building work covered by this producer statement is described on the drawings titled **VUW Solar Decathlon 2011** and numbered **6751** together with the specification, and other documents set out in the schedule attached to this statement.

On behalf of the Design Firm, and subject to:

- (i) Site verification of the following design assumptions ... **Adequate Bearing**
- (ii) All proprietary products meeting their performance specification requirements;

I **believe on reasonable grounds** the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code.

I, **Alistair Cattanach**.....am: CPEng **168031**.....#
(Name of Design Professional)

Reg Arch #

I am a Member of: IPENZ NZIA and hold the following qualifications:... **BE (HONS)**.....

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than \$200,000*.

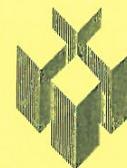
The Design Firm is a member of ACENZ

SIGNED BY **Alistair Cattanach** ON BEHALF OF **Dunning Thornton Consultants Ltd**
(Design Firm)

Date.....03 November 2011..... (signature)

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of \$200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.



Quality Plan Checklist - Calculations

Job No. 6751	PS1 to be issued? (Y)N	FILE COPY TO REMAIN IN COMMISSION FILE
---------------------	-------------------------------	--

Building Consent Authority

DTC Contact Name

Other Engineers (Name / Initials)

WCC	
RYAN CLARKE	RGC
AUSTAIR CATTANACH	AGC

NZBC Verification Method B1/VM1 (Current Standards at time of Design Review unless noted otherwise) (√)

AS/NZS1170	Structural Design Actions	✓
Part 0	General Principles	✓
Part 1	Permanent, imposed and other actions	✓
Part 2	Wind actions	✓
Part 3	Snow and ice actions	✓
Part 5	Earthquake actions – New Zealand	✓
NZS 3101	Concrete Structures Standard	✓
NZS 3404	Steel Structures Standard	✓
NZS 3603	Timber Structures Standard	✓
NZS 4230	Design of Reinforced Concrete Masonry Structures	✓

NZBC Acceptable Solutions B1/AS1, B1/AS2 (√)

NZS 3604	Timber Framed Buildings	
NZS 4229	Concrete Masonry Buildings	
NZBC AS2	Timber Barriers	
Scope of Structural Design	Part (eg. Level 1 joists, garage roof, bracing to extension only)	Full
Bracing		✓
Foundations		✓
Floor and Deck Framing		✓
Roof and Ceiling Framing		✓
Walls and Posts		✓
Barriers/Balustrades		✓

ALL FOR TEMPORARY BUILDING
8 WEEK DURATION ONLY

Alternative Solutions to the NZBC (√)

NZSEE	Assessment & Improvement of the Structural Performance of Buildings in Earthquakes	Primary Structure %NBS =	
		Secondary Structure %NBS =	

NZBC Verification Method B1/VM4 (√)

Soil Parameter Source:	Assumption		Penetrometer Investigation		Specialist Consultant	
Site Verification by:	DTC	✓	Contractor		Specialist Consultant	

Design Review	Concept	Prelim	Detailed
Date			2/11/10
DIC / Engineer			

Site Monitoring Levels	None	CM1	CM2	CM3	CM4	CM5
Primary Structure			✓			
Proprietary Structure						



Solar Decathlon 2011
 Dunning Thornton Consultants Ltd
DOCUMENT REGISTER
 Job No. 6751



Issue Date					
03.11.2010					
AGC					

verified by

Drawing Number		Drawing Contents	Revision					
Calculation Register								
6751	A1	Introduction	-					
6751	B1-B4	Case Loadings	-					
6751	C1-C10	Roof Design	-					
6751	D1-D5	Canopy Roof Design	-					
6751	E1-E17	Floor Design	-					
6751	F1-F25	Bracing Design	-					



CALCULATIONS

JOB NAME USDE Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	A1

THE FOLLOWING CALCULATIONS ARE FOR THE DESIGN OF A MODULAR HOUSE FOR THE USDE SOLAR DECATHLON COMPETITION.

THE BUILDING WILL HAVE THREE LOCATIONS TO BE DESIGNED FOR - BUT THIS CONSENT IS ONLY FOR CASE 1

- ①, TEMPORARY DISPLAY ON WELLINGTONS WATERFRONT < 6 months, IMPORTANCE LEVEL 2. (Approx 8 week duration)
- ②, TEMPORARY DISPLAY ON THE WHITE HOUSE LAWN, WASHINGTON D.C, USA. < 6 months. DESIGN TO BE IN ACCORDANCE WITH THE SOLAR DECATHLON BUILDING CODE & THE INTERNATIONAL BUILDING CODE (ICC, IBC).
- ③, A PERMANENT LOCATION (TBC) IN NEW ZEALAND & TO BE CONSENTED BY THE APPROPRIATE LOCAL COUNCIL AT A FUTURE DATE. HOWEVER FOR THE PURPOSES OF THE STRUCTURAL DESIGN THE BUILDING WILL BE DESIGNED AS IF IT WERE IN WELLINGTON, RESIDENTIAL DWELLING, SOIL CLASS C, IMPORTANCE LEVEL 2, IN A VERY HIGH WIND ZONE.



CALCULATIONS

JOB NAME		USDE Solar Decathlon 2011	
JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	6/10	B 1

SEISMIC CO-EFFICIENTS

CASE ① $T \approx 0.95 \text{ sec}$ Soil C

$$C_h(1) = 2.36$$

$$Z = 0.4$$

$$1/100 R_u = 0.5$$

$$\therefore C_T = 2.36 \times 0.4 \times 0.5 = 0.472$$

$$C_d(t) = \frac{C_T \cdot S_P}{K_M}$$

$$\underline{\mu = 1.25} \quad K_M = \frac{0.4 \times 0.25 + 1}{0.7} = 1.14$$

$$S_P = 1.3 - (0.3 \times 1.25) = 0.925 \quad 6.2$$

$$\therefore C_d(t)_{\mu=1.25} = 0.472 \times 0.925 / 1.14 = 0.38g \quad 0.29$$

$$\underline{\mu = 3} \quad K_M = \frac{0.4 \times 2 + 1}{0.7} = 2.14$$

$$S_P = 0.7$$

$$C_d(t) = 0.472 \times 0.7 / 2.14 = 0.154g$$

CASE ② N/A

CASE ③

$$C_T = 2.36 \times 0.4 \times 1 = 0.944$$

$$\mu = 1.0 \quad C_T = 0.944 \times 0.7 / 1 = 0.66 \quad \text{--- chord } \rightarrow \text{ with } \phi$$

$$\mu = 1.25 \quad C_T = 0.944 \times 0.7 / 1.14 = 0.58g \quad \text{--- chord fixings with } \phi$$

$$\mu = 3 \quad C_T = 0.944 \times 0.7 / 2.14 = 0.31g \quad \text{--- wall panel nailed no } \phi$$

$$\mu = 0.24g$$



CALCULATIONS

JOB NAME USDE Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	P02

WIND LOADING

CASE ① Region W : < 6 months :

$$V_{25} (1/100) = 47 \text{ m/s}$$

$$V_{25} (1/25) = 43 \text{ m/s}$$

Category: sheltered from harbour - below cat 2 & Cat 3
 $= M_{2 \text{ cat}} = 0.91 + 0.83/2 = 0.87$

$$h_t = 3.5 \text{ m}$$

$$\therefore V_{0.1} = 47 \times 0.87 = 40.9 \text{ m/s}$$

$$\therefore V_{0.5} = 43 \times 0.87 = 37.4 \text{ m/s}$$

$$\therefore q_u = 1 \text{ kPa}$$

$$q_s = 0.84 \text{ kPa}$$

CASE ② USA:

FROM THE SOLAR DECATHLON BUILDING CODE $V_b = 26.8 \text{ m/s}$

cat C
or 60 mph

$$\therefore q = 0.00256 V^2$$

$$= 0.00256 \times 60^2 = 9.2 \text{ psf}$$

$$1 \text{ psf} = 47.88 \text{ Pa}$$

$$= 9.2 \times \frac{47.88}{1000}$$

$$= 0.44 \text{ kPa}$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	B3

CASE (3)

VERY HIGH wind zone category of NZS 3604
Region W.

$$V = 50 \text{ m/s}$$

$$\therefore q_u = 1.5 \text{ kPa}$$

$$q_s = 1.5 \times \frac{93^2}{51^2} = 1.07 \text{ kPa}$$

$$\therefore \text{USE } q_u = 1.5 \text{ kPa}$$
$$q_s = 1.1 \text{ kPa}$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	B4

WIND WADS

ROOF

CASE ① = 0.25

CASE ② = 0.958 kPa (20 psf)

CASE ③ = 0.25 kPa

FLOOR (DECK)

CASE ① = Temp situation is 'OPEN HOME'
TAKE 3 kPa

CASE ② = 2.39 kPa (50 psf)

CASE ③ = 1.5 kPa Domestic dwelling



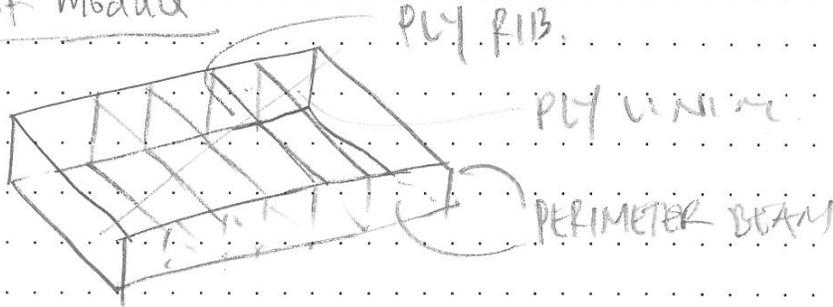
CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	C 1

ROOF DESIGN

Typical Roof Module



LOADS

GRAVITY

NZ: CASE ①/③

$$Q = 0.75 \text{ kPa} \quad 1.2G + 1.5Q = 0.975 \text{ kPa}$$

$$G = 0.5$$

USA: CASE ②

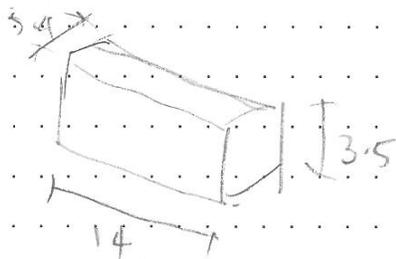
$$\text{DEAD} = D = 0.5 \text{ kPa}$$

$$\text{LIVE} = L_r = 0.958 \text{ kPa}$$

$$1.2D + 1.6L_r = 1.2 \times 0.5 + 1.6 \times 0.958$$

$$= 2.13 \text{ kPa} \rightarrow \text{CRITICAL}$$

WIND



NZ: CASE ①/③



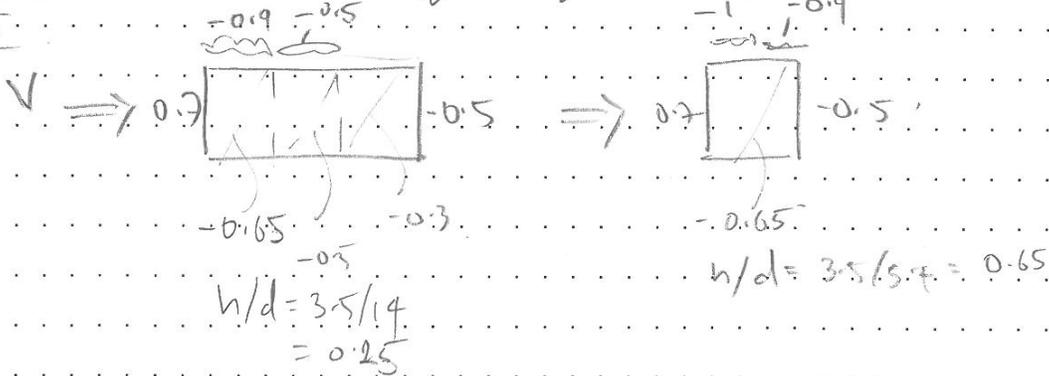
CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	C2

NZ: CASE ①/③ $(q_u = 1.5, q_s = 1.11 \text{ kPa})$

CPE



CPI = -0.3 / 0.0

USA - CASE ② $q_u = 0.44 \text{ kPa}$

TABLE 1609.6.2(2) IBC slope < 10° Cnet fact = -1.09

By inspection NZ / WELLINGTON WIND LOADS GOVERN

RIB DESIGN

WIND
 $a = 5.4 \times 0.2 = 1.1 \text{ m} \therefore K_z = 1.5$

$\therefore P_u = -1 \times 1.5 \times 1.5 = -2.25 \text{ kPa}$

$P_s = -(1 \times 1.1) = -1.11 \text{ kPa}$

$0.9G + W_u = (0.9 \times 0.5 - 2.25) \times 0.4 = -0.72 \text{ kN/m}$

$1.2D + 1.6W_s = 2.15 \times 0.4 = 0.852 \text{ kN/m}$

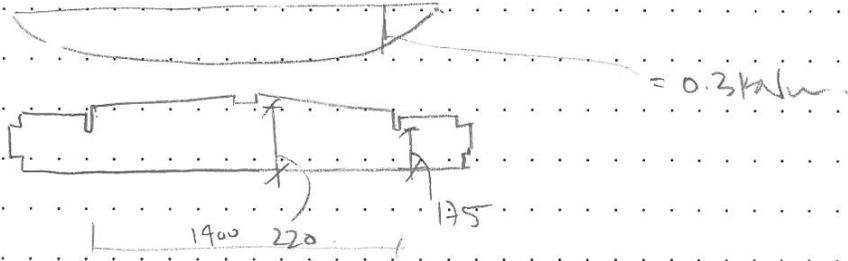


CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	C3

$$M^* = 0.852 \times 2.15^2 / 8 = 0.49 \text{ kNm}$$

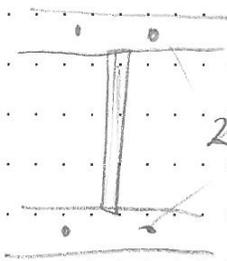
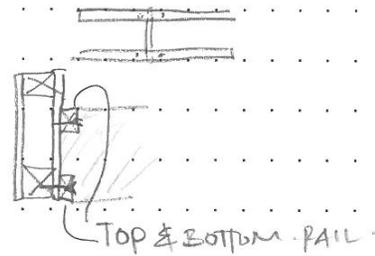


FS. ply. $f_b = 25 \text{ MPa}$

$$\phi M_n = 0.9 \times \left(\frac{220^2 \times 21 \times 5}{6} \times \frac{5}{7} \right) \times 25 = 2.72 \text{ kNm} \quad 1 \text{ of}$$

$$V^* = 0.852 \times 2.15 / 2 = 0.92 \text{ kN}$$

2 - 6g screws $\phi Q_k = 0.7 \times 0.854 \times 2 = 1.2 \text{ kN} \quad 70.92 \text{ of}$



2 - 6g screws to rib to perimeter beam
TOP & BOTTOM



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	w/10	C4

Perimeter beam

$$1.2 D + 1.6 W = \frac{2.13 \times 2.2}{2} = 2.34 \text{ kN/m}$$

$$0.9 G + W_u = \frac{(0.9 \times 0.5) - (1.5 \times -1) \times 2.2}{2} = -1.16 \text{ kN/m}$$

$$M^* = 2.34 \times 5.3^2 / 8 = 8.22 \text{ kNm}$$



$$\text{Flange force} = \frac{8.22 \times 10^6}{315 \times 0.8 \times 0.9} = 36.2 \text{ kN}$$

Tension LVL $f_t = 33 \text{ MPa}$
 $f_c = 45 \text{ MPa}$

$$\text{Tension flange} = 33 \times 45 \times 63 = 93.6 \text{ kN} > 36.2 \checkmark$$

Compression flange:

$$k_8: I_x = 0.5 B (D-T)^2 T = 0.5 \times 63 (360-45)^2 \times 45 = 141 \times 10^6 \text{ mm}^4$$

$$I_y = 0.5 D_{\text{eff}} b^2 = 0.5 \times 360 \times (12 \times \frac{3}{5}) \times 45^2 = 2.62 \times 10^6 \text{ mm}^4$$

$$D_0 = D - T = 360 - 45 = 315 \text{ mm}$$

if $I_x / I_y > 70 D / LAY$ then $k_8 = 1.0$

$$141 / 2.62 = 53.8; 70 \times 360 / 5400 = 4.67 = k_8 = 1.0$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	C5

Full compression strength design = ϕ_c

Web shear

$$V^* = \frac{234 \times 5.3}{2} = 6.2 \text{ kN}$$

Panel shear $V_p = 4.7$

$$\phi V_n = [360 \times 12 \times \frac{2}{3} \times 4.7 \times 0.9 \times 0.8]$$

$$= 9.7 \text{ kN} \quad \checkmark$$

NAIL CONNECTION

$$\phi 2.5 \text{ mm} \quad \phi Q_k = 0.7 \times 0.8 \times 407 \times 1.4 = 0.319 \text{ kN/nail}$$

$$s = \frac{0.319}{(6.2 / (5.3 / 2))} = 0.136 \text{ m}$$

NAIL @ 125 c/s ϕ

2.5 ϕ flat head
Nails



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	C6

Deflection

→ GRAVITY
CASE ② USA

$L_R = 0.958 \text{ kPa}$ but short duration
so no creep factor

Case ③ NZ

$$G + 0.4Q$$

$$= 0.5 + 0.4 \times 0.25 = 0.6 \text{ kPa}$$

+ creep factor
say 1.5
for WL impl

WIND

CASE ①/③ NZ (AVE uplift)

$$W_s = 1.11 \times -0.95 = -1.05 \text{ kPa}$$

$$\Delta_{req} = L/360 \rightarrow \text{N/CMP}$$

Worst case is wind case ①/③

as $0.6 \times 1.5 = 0.9 < 1.05$

$$\Delta = \Delta_b + \Delta_s + \Delta_n$$

$$\Delta_b = \frac{5}{384} \times \left(\frac{1.05 \times 2.2}{2} \right) \times 5300^4 / (10 \times 10^3 \times 141 \times 10^6) = 8.4 \text{ mm}$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	19/10	C7

$$\Delta_s = M / G A_w$$

$$M = (1.1 \times 1.05) \times 5.3^2 / 8 = 4 \text{ kNm}$$

$$G = 455 \text{ wpa}$$

$$A_w = 12 \times \frac{3}{5} \times 360 \times 1.5 = 3888 \text{ mm}^2$$

2-webs, 1-loaded more than other
so use 1.5

$$\Delta_s = \frac{4 \times 10^6}{455 \times 3888} = 2.3 \text{ mm}$$

Nails slip. SAY 50% of $(\Delta_b + \Delta_s)$

$$\Delta_t = 15 \times (8.4 + 2.3) = 16 \text{ mm} = 4 / 330$$

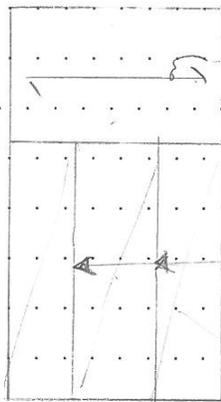


CALCULATIONS

JOB NAME *VW solar Decathlon*

JOB NO	CALC'D BY	DATE	PAGE
<i>6751</i>	<i>RGC</i>	<i>10/10</i>	<i>C8</i>

CENTRAL ROOF



posts @ 400 c/s

*Double
100x45x6 Angles*

Tripple glazed skylight

$G = 0.65$ - glazzy, 0.5 timber frame
 $Q = 1 \text{ kPa}$ case (2)

WIND: CASE (3) critical = 1.5 kPa
1.1 kPa ≤ 1.5

glazing Angles

$$1.2G + 1.5Q = (1.2 \times 0.65) + (1.5 \times 1) = 2.3 \text{ kPa}$$

$$0.9G + W_u = (0.65 \times 0.9) - (0.9 \times 1.5 \times 1.5) = -1.44$$

$$W = 1 \times 2.3 = 2.3 \text{ kN/m}$$

$$M^x = 2.3 \times \frac{3.3^2}{8} = 3.13 \text{ kNm}$$

$$\phi M_n = 2 \times 25 \cdot 2 \times 10^3 \times 0.9 \times 300 = 13.6 \text{ kNm} > 0 \text{ kNm}$$

$$\Delta_w = (1.1 \times 0.9) \times 1 \times 3300^4 / (384 \times 205 \times 10^5 \times (1.8 \times 2 \times 10^6)) = 2 \text{ mm}$$



CALCULATIONS

JOB NAME *Www Solar Deleter*

JOB NO	CALC'D BY	DATE	PAGE
<i>6751</i>	<i>RGC</i>	<i>10/10</i>	<i>C9</i>

TIMBER FRAMED:

SPAN = 3m

(USE GLAZED LOADS - conservative)

$$M = 6.4 \times 220 \times \frac{3^2}{8} = 1.04 \text{ kNm}$$

$$190 \times 95 @ 110 \rightarrow \frac{1}{m} = 0.8 \times 0.8 \times 14 \times 1.14 \times \frac{1 \times 95}{6} = 2.7 \text{ kNm}$$

$$\Delta = (0.5 \times 0.9) - (1.1 \times 0.9) \times 0.4 \times \frac{3000^{4.5} / 384 \times 90^3 \times 95 \times 6 \times 10^3}{12} = 1.5 \text{ m} \quad \checkmark - k$$



CALCULATIONS

JOB NAME <i>WVW Solar Decking</i>			
JOB NO <i>6751</i>	CALC'D BY RGC	DATE <i>10/10</i>	PAGE <i>C10</i>

CENTRAL BEARER / FRONT LINTER

$$\frac{2.3 \times 3.3 + 0.4}{2} = 4.26 \text{ kN/m}$$

$$M^* = \frac{3^2}{8} \times 4.26 = 4.8 \text{ kNm}$$

$$240 \times 45 \text{ LVL} - \text{Allow} = 0.9 \times 0.8 \times 4.8 \times \frac{240^2 \times 45}{6} = 15 \text{ kNm} \checkmark$$

$$\Delta = (0.9 \times 111) \times \frac{3.7}{2} \times 3000^4 \times 5 / 384 \times 10 \times 10^3 + \frac{240^3 \times 45}{12} = 3.8 \text{ mm} \checkmark$$

Box beam web

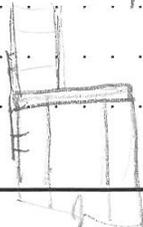
$$d = 340 \quad C \& T = 4.8 / 0.295 = 16.3 \text{ kN}$$

$$\text{STRESS} = \frac{16.3 \times 10^3}{0.8 \times 0.8 \times 90 \times 45} = 6.3 \text{ MPa}$$

USE LVL ✓

By inspection of Box beams in typical roof. 2-12m ply webs nailed @ 125 cps of J

$$\text{hold down} = -1.44 \times \frac{3.3}{2} \times \frac{3}{2} = 3.6 \text{ kN} \therefore 6 \text{ Nails top}$$





CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10	D1

Canopy Roof - Design for case 1 & 2

$G = 0.25 \text{ kPa}$

$Q = 0.25 \text{ kPa}$

← governs
Case 2 can be modified
At later date

WIND: SAY 50% OPEN

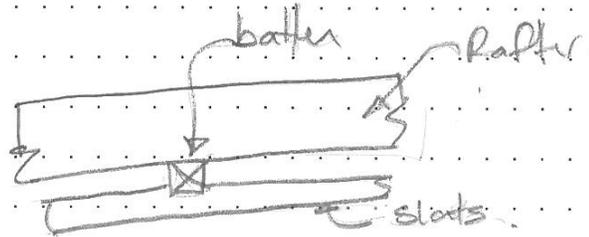
$$k_p = 1 - (1 - 0.5)^2 = 0.75$$

CASE 1

$q_u = 1$
 $q_s = 0.84$

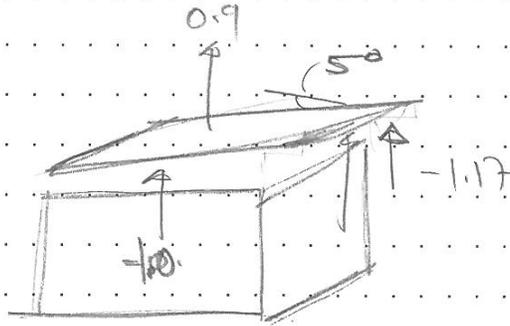
Case 2
 $q_u = 1.3$
 $q_s = 1.1$

$C_{p1} = -0.9$ - Roof



CANOPY BATTENS

Span = 900 cfs - CEDAR
Spacing = 550 cfs $N_b = 7$ wra
 $E = 7 \times 10^6 \text{ Pa}$
 $k = 2$



$W_u = 1.5 \times 0.75 \times 1.5 \times 1.17 = 1.95 \text{ kPa}$

← Design for case 2
if not easily modified

$0.9 \times -1.17 = (0.1 \times 0.9) - 1.95 = -1.86$

$W = 1.86 \times 0.55 = 1.023 \text{ kN/m}$ $M^* = 1.02 \times 0.9^2 / 10 = 0.08 \text{ kNm}$

$\phi M_n(50 \times 30) = 0.8 \times 1 \times 1.19 \times 50^2 \times 30 / 6 \times 7 = 0.08 \text{ kNm v.e/k} \therefore$



CALCULATIONS

JOB NAME

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	D2

Maximum Particle of batter

$$L = \sqrt{\frac{0.08 \times 2}{1.02}} = 0.396 \text{ say } \underline{400 \text{ mm}}$$

OR FOR CASE 1 ONLY

$$= \sqrt{\frac{0.08 \times 2}{(1.02/1.5)}}$$

$$= 0.485 \text{ m.}$$



CALCULATIONS

JOB NAME

JOB NO	CALC'D BY	DATE	PAGE
675	RGC	10/10	D3

Rafter

span = 2.2m - Continuous 1.6m Cantilever

Cantilever

$$k_L = 1.5$$

$$w_{uE} = 1 \times 1.5 \times 0.75 \times 1.17 = 1.31 \text{ kPa}$$

$$0.9G - w_u = (0.15 \times 0.9) - 1.31 = 1.18 \text{ kPa}$$

$$w = 1.18 \times 0.9 = 1.06 \text{ kN/m}$$

$$M^* = \frac{1.6^2}{2} \times 1.06 = 1.35 \text{ kNm}$$

$$140 \times 45 \text{ VEGS } \phi M = 0.8 \times 11 \times 11^2 \times \frac{140^2 \times 45}{6} = 1.5 \text{ kNm} \checkmark$$

Continuous span — by inspection this ok for wind.

$$1.26 + 1.5a = (0.1 \times 1.2 + 0.3 \times 1.5) = 0.462 \text{ kPa}$$

$$M^* = 0.468 \times 0.9 \times \frac{2.2^2}{8} = 0.25 \text{ kNm} \checkmark$$

or 5.1m beam by using dia

$$E = 10.2 \text{ GPa}$$

$$I_b = 79 \text{ m}^4 \quad \phi M = 0.6 \times 79 \times \frac{90^2 \times 40}{6} = 2.55 \text{ kNm} \checkmark$$

Deflection Detail

$$= 1600^4 \times (0.15 \times 0.9) / (8 \times 10.2 \times 10^3 \times \frac{90^3 \times 40}{12}) = 4.5 \text{ mm}$$

$$\text{Longitudinal} = 3 \times 4.5 = 13.9 \text{ mm} \quad \text{Max } \delta = 5.6 \text{ mm}$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	D9

Main beam

$$SPAN = 6.75m$$

$$w_{im} = (0.9 \times 1.0 \times 2.2) = 1.98 \text{ kN/m}$$

$$G = 0.30 \text{ kPa}$$

$$0.9G + w_{im} = (0.9 \times 0.3 \times 2.2) + 1.98 = 1.4 \text{ kN/m}$$

$$M^* = \frac{6.75^2}{8} \times 1.4 = 8 \text{ kNm}$$

$$GL10 \Rightarrow b = 22 \text{ if } b = 90 \text{ } d = 174$$

240 x 90
GL10

Deck

Deck +

$$= 0.30 \times 2.2 = 0.66 \text{ kN/m}$$

$$\Delta = \frac{0.66 \times 6.75^4 \times 5}{384 \times 10 \times 10^3 \times \frac{240^3 \times 90}{12}} = 17 \text{ mm}$$

long term = $k_2 = 3 = 51 \text{ mm}$

$$= L/132 \times$$

$$\text{wind } \Delta = \frac{(1.1 \times 0.9)}{0.62 \times 16}$$

$$= 26 \text{ mm} = L/281 \text{ } 1/16$$

$$\text{Tg } 315 \times 90 \text{ GL10 } \Delta = 51 / \left(\frac{315^3}{240^3} \right) = 22.5$$

= L/300 ✓



CALCULATIONS

JOB NAME

JOB NO

675

CALC'D BY

RGC

DATE

10/10

PAGE

DS

Entrance Canopy

Case (3)

$$q_n = 1.5 \text{ kPa}$$

$$C_{pe} = 1.5$$

1660



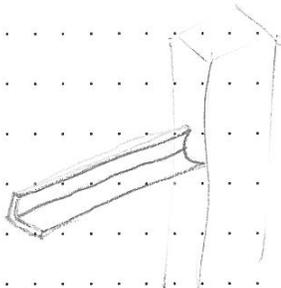
Angle: purlins
 $k_1 = 1.5$

$$w = 1.5^3 \times 0.85 = 2.9 \text{ kN/m}$$

$$M^* = 2.9 \times 2.8 / 8 = 2.8 \text{ kNm}$$

$$I_{req} = 2.8 \times 10^6 / (300 \times 10^{-9}) = 10.5 \times 10^3 \text{ m}^4$$

$$50 \times 50 \times 8 \text{ EA} \Rightarrow I = 10.5 \times 10^3 \text{ m}^4 \quad \checkmark \text{ ok}$$



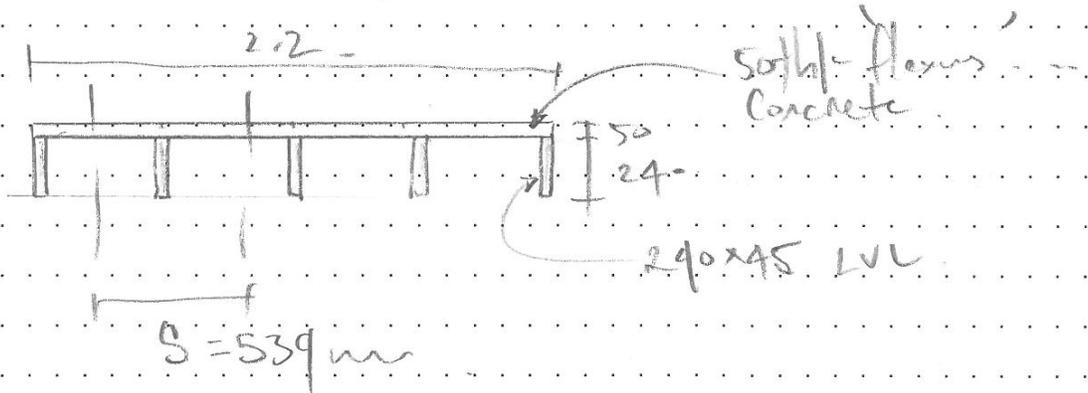


CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10	E1

Composite floor system



DEAD

$$G = 0.05 \times 23 = 1.15 \quad \text{slab}$$

$$+ \frac{0.12}{1.27} \quad \text{JOISTS}$$

$$= \frac{1.27}{0.35}$$

LIVE

Q short term = 3 kPa slow Pans
 long term < 1.5 kPa hangers

check span of topping

$$f_b = 5 \text{ MPa}$$

$$1.2G + 1.5Q = (1.27 + 1.035) \times 1.2 + (3 \times 1.5) = 6.4 \text{ kPa}$$

$$M^* = 6.4 \times 0.539^2 / 10 = 0.18 \text{ kNm/m}$$

$$d/h = 0.85 \times \frac{50^2 \times 1000}{6} \times 5 = 1.77 \text{ kNm/m}$$

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CALCULATIONS

Job Name: *** 6751

Job No. ~~MAST~~

Calc'd By ~~DNG~~
RGC

Date 2-Nov-10

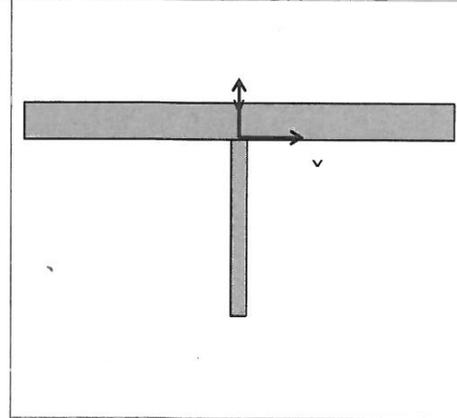
Page EZ

ELASTIC SECTION PROPERTIES

MOULD STRIPPING

Number of Rectangular Regions = 2

Region	TOP LEFT		BOTTOM RIGHT	
	x (mm)	y (mm)	x (mm)	y (mm)
1	259.5	240	279.5	0
2	0	290	539	240



Region	b (mm)	h (mm)	A (mm ²)	x _c (mm)	y _c (mm)	Ax _c (mm ³)	Ay _c (mm ³)
1	20	240	4800	270	120	1293600	576000
2	539	50	26950	270	265	7263025	7141750

SUM

31750

8556625

7717750

$$\therefore x_c = 270 \text{ mm}$$

$$y_c = 243 \text{ mm}$$

Region	x	y	I _x	I _y	Ax ²	Ay ²	J
1	0	-123	23040000	160000	0	72712206	640000
2	0	22	5614583	652461746	0	12950597	22458333

$$I_x = 114.32 \cdot 10^6 \text{ mm}^4$$

$$Z_{x,top} = 2436.37 \cdot 10^3 \text{ mm}^3$$

$$Z_{x,bottom} = 470.29 \cdot 10^3 \text{ mm}^3$$

$$J = 23098.33 \cdot 10^3 \text{ mm}^4$$

$$I_y = 652.62 \cdot 10^6 \text{ mm}^4$$

$$Z_{y,left} = 2421.60 \cdot 10^3 \text{ mm}^3$$

$$Z_{y,right} = 2421.60 \cdot 10^3 \text{ mm}^3$$

Only applies to open sections with thin-plate elements.



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

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6751	RGC	10	E4

Deflections of unit

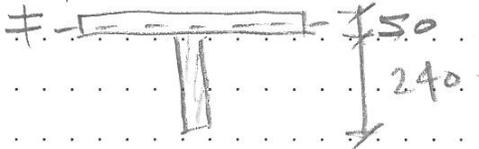
SAY 100% shear connection (Composite action @ SLS)

$$f_{cl} = 40 \text{ mpa}$$

$$E_c = 3320 \sqrt{40 + 6700} = 27900 \text{ mpa}$$

$$E_{wlc} = 10700 \text{ mpa}$$

$$j = 44 \text{ m}$$



$$\eta = \frac{10700}{27900} = 0.389$$

$$A_f = 310772 \text{ mm}^2$$

$$I_T = 101.09 \times 10^6 \text{ mm}^4$$

$$j = 44 \text{ mm}$$

$$\Delta G_{\text{bending}} = (1.27 \times 0.539) \times 5400^4 \times 5 / 384 \times 27900 \times 101 \times 10^6$$

$$= 2.7 \text{ mm}$$

$$\Delta G_{\text{shear}} = \frac{(1.27 \times 0.539) \times 5400^2}{8} \times \frac{1}{550 \times 240 \times 45}$$

$$= 0.42 \text{ mm}$$

$$\therefore \Delta G = 2.7 + 0.42 = \underline{3.12 \text{ mm}}$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

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6751	RGC	10	ES

$$SPL = \frac{0.35}{1.27} \times 3.12 = 0.86 \text{ mm}$$

$$\text{Coring hole} = \frac{(0.4 \times 1.5)}{1.27} \times 3.12 = 1.47 \text{ mm}$$

$$\therefore \text{TOTAL Deflection} = 3.12 + 0.86 + 1.47 = 5.5 \text{ mm}$$

Deflection Due to shrinkage

Say concrete shrinkage strain of 600 $\mu\text{m/m}$.

$$\text{Eccentricity} = \frac{50}{2} - 14 = 11 \text{ mm}$$

$$\text{Brn in slab} = 600 \times 10^{-6} \times 27900 \times 539 \times 50 = 451 \text{ kN}$$

$$\therefore \text{Moment due to eccentricity} = 451 \times 0.017 = 8.6 \text{ kNm}$$

Deflection

$$\Delta_{\text{shrink}} = \frac{8.6 \times 10^6 \times \left(\frac{5400}{2}\right)^2}{2 \times 27900 \times 161 \times 10^6}$$

$$= 11.1 \text{ mm}$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

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6751	RGC	10	EG

Vibration

1) 1kN point load @ mid span.

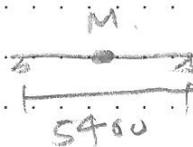


$$\Delta = \frac{1000 \times 5400^3}{48 \times 27900 \times 10 \times 10^6}$$

$$= 1.16 \text{ mm}$$

← close to limit likely to be shared by adjacent Ribs

2) simplify as SDOF oscillator



mass $M = 50\%$ of $b + g + Q$

$$M = [(1.27 + 0.35) + (0.9 \times 1.5)] \times 0.539$$

$$= 1.52 \text{ kN}$$

$$\text{or } 152 \text{ kg}$$

$$\text{stiffness} = \frac{1000}{1.16 \times 10^{-3}} = 862 \times 10^3 \frac{\text{N}}{\text{m}}$$

$$T_1 = 2\pi \sqrt{\frac{M}{F}} = 2\pi \sqrt{\frac{152}{862 \times 10^3}} = 0.083 \text{ sec}$$

$$f = \frac{1}{T_1} = \frac{1}{0.083} = 12 \text{ Hz}$$

OK >> 8 Hz



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

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6751	RGC	10	57

ULS STRESS

$$K_L = 1.5$$

$$\begin{aligned} \text{Precurse} &= (G + SDC + \gamma L Q) \times K_L + \text{shrinkage} \\ &= (5.5) \times 1.5 + 11.1 = 19.35 \text{ mm} \end{aligned}$$

Moment required to precurse fresh unit 20mm

$$\begin{aligned} E_{\text{conc}} &= 23960 \text{ MPa} \quad (\rho = 0.66 \text{ t/m}^3) \\ \nu &= 0.447 \\ f_{\text{fresh}} &= 114 \times 10^6 \end{aligned}$$

$$\Delta_{\text{final}} = \Delta_{\text{LUL}} = \Delta_{\text{fresh}}$$


$$\begin{aligned} 20 \text{ mm} &= \frac{M \times (5400/2)^2}{2 \times 10760 \times \left(\frac{240^3 \times 45}{12}\right)} - \frac{M \times (5400/2)^2}{2 \times 23960 \times 114 \times 10^6} \\ &= M (6.57 \times 10^6 - 1.33 \times 10^6) \end{aligned}$$

$$20 \text{ mm} = M \times 5.24 \times 10^6$$

$$M = 3.82 \text{ kNm}$$

STRESS ON LUL - $3.82 \times 10^6 / \frac{240^2 \times 45}{6}$

$$= 8.84 \text{ MPa} < \phi_b \sqrt{f_{ok}}$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10	E8

STRESS @ final precast

$$\sigma_{bottom} = 8.89 - \frac{3.82 \times 10^6 \times 0.497}{470.3 \times 10^3}$$

$$= 5.2 \text{ mpa}$$

$$\sigma_{top} = 8.6 - \frac{3.82 \times 10^6 \times 0.497 \times 3}{114 \times 10^6}$$

$$= 8.6 - 0.04$$

$$= 8.55 \text{ mpa}$$

$$\angle \phi_{ft} = 0.9 \times 0.8 \times 22$$

$$= 15.8 \text{ mpa}$$

stress @ ucs

$$M^* = 6.9 \times 0.539 \times 5.4^2 / 8 = 12.6 \text{ kNm}$$

(Assume full composite action) (unconservative)

$$\sigma_{bottom} = 5.2 - \frac{12.6 \times 10^6 \times 0.384}{411.5 \times 10^3}$$

$$= 5.2 - 11.8$$

$$= -6.6 \text{ mpa} < 15.8 \text{ mpa}$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10	E9

$$\begin{aligned} \sigma_{top} &= 8.55 + \frac{12.6 \times 10^6 \times 0.384 \times 4}{101 \times 10^6} \\ &= 8.55 + 0.04 \\ &= 8.7 \text{ mpa } \checkmark \end{aligned}$$

Stress in Concrete

$$\begin{aligned} \sigma_{bottom} &= -\left(\frac{0.04}{0.447} + \frac{0.04}{0.389}\right) \\ &= -0.19 \text{ mpa Tension} < 0.6 \sqrt{f_c} \\ &= 3.8 \text{ mpa } \checkmark \\ &\text{not cracked} \end{aligned}$$

$$\begin{aligned} \sigma_{top} &= \frac{3.82 \times 10^6}{2936 \times 10^3} + \frac{12.6 \times 10^6}{2280 \times 10^3} \\ &= 1.56 + 5.53 \\ &= 7.1 \text{ mpa Compression} < 0.85 f_c \end{aligned}$$

check no composite action

$$\frac{M_u}{\phi} \frac{240^2 \times 45 \times 0.9 \times 0.8 \times 42}{6} = 13 \text{ kNm} > 12 \text{ kNm } \checkmark$$

Composite action not required for ULS STATE.



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CALCULATIONS

JOB NAME:			
JOB NO: 6751	CALC'D BY: RGC	DATE:	PAGE NO. E10

SCREW CAPACITY

Three 20mm 14 gauge screws were tested at University of Canterbury and the following maximum loads were found:

18.6 kN, 15.1 kN, 16.1 kN.

All failed by the shaft pulling out of the head. The design capacity of the screws has been determined in accordance with Appendix B of NZS 1170.0.

Screw Testing at University of Canterbury
 Department of Civil and Natural Resources Engineering

Date: 11 Feb 2010
 Testing: David Carradine

Specimen	Shank Diameter (mm)	Root Diameter (mm)	Length (mm)	Initial Length (mm)	Tested Length (mm)	Elongation (mm)	Head Pull	
							Off Maximum Load (kN)	Shaft Failure Load (kN)
1	5.15	4.76	202	55.69	56.33	0.64	18.6	23.3
2	5.14	4.73	202	51.49	51.56	0.07	15.1	21.4
3	5.15	4.69	202	59.18	59.36	0.18	16.1	21.2
Mean	5.15	4.73	202.00	55.45	55.75	0.30	16.60	21.97
SD							1.80	kN
5th percentile (characteristic)							13.1	kN
CoV							11%	
k_t from 1170							1.38	
Characteristic / k_t							design capacity → 9.5	kN

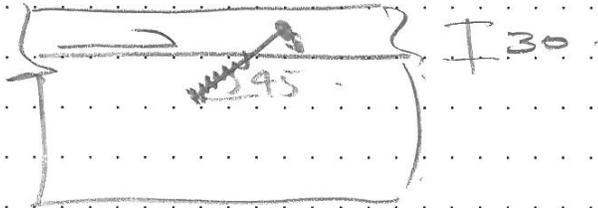


CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	11

Shear Connectors



$$V_u = \frac{(-0.19 + 7.1)}{2} \times 539 \times 50 = 93.1 \text{ kN}$$

Capacity of timber

$$\phi Q_k = 0.7 \times 0.8 \times 79.5 \times 10^7 = 4.8 \text{ kN}$$

Concrete pull out

$$\phi N_p = 0.65 \times 14 \times 8 \times 40 \times \frac{\pi}{4} (14^2 - 5^2) = 39.1 \text{ kN}$$

$$\phi N_{sb} = 0.65 \times 13.3 \times 1 \times 27.5 \sqrt{\frac{\pi}{4} (14^2 - 5^2) + 40} = 14.3 \text{ kN}$$

$$\phi V_{cb} = 0.75 \times 1 \times 1 \times 0.745 \times 1.4 \times 0.6 \left(\frac{30}{5} \right)^{0.2} \sqrt{5 \times 40 \times 100} = 9.5 \text{ kN}$$

$$V_u = \frac{V_u / 0.71}{14.3} + \frac{V_u / 0.71}{9.5} \Rightarrow V_u = 4.8 \text{ kN}$$



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	E12

SCREW Design capacity = 9.5
 Timber Design Capacity = 4.8 kN ←
 Concrete Down Capacity = 6.8 kN

Timber govern

Capacity provided by screw utilises/one

$$\phi V_{sf} = 4.8 \times \sin 45 \times 0.6 = 2.04 \text{ kN/screw}$$

$$- \text{Screw pullout} = 4.8 \times \sin 45 = 3.39 \text{ kN} = \underline{5.43 \text{ kN}}$$

$$\text{USE } 0.75 + Q \text{ as well} = 0.9 \left[(1.27 + 0.35) + 1.5 \right] \times 0.539$$

$$= 1.59 \text{ kN/m}$$

$$= 1.59 \times \frac{5.4}{2}$$

$$= 4.3 \text{ kN}$$

$$\phi V_{sf} = 4.3 \times 0.75 \times 0.6 = 1.94 \text{ kN}$$

$$\text{No. screws} = \frac{93.1 - 1.94}{5.43} = 16.8 \text{ No. per half}$$

$$\text{SAY } \frac{5400 - 250 - 250}{2 \times 168} = 145 \text{ mm}$$

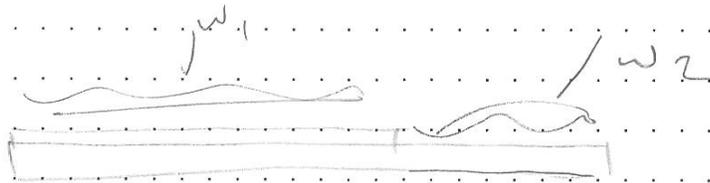


CALCULATIONS

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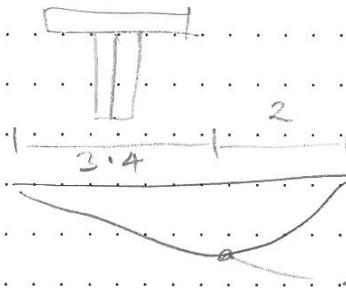
check floor where flexes slabs missing



$$w_1 = (1.2 + 1.0 \times 0.35) + (0.4 \times 1.5) = 2.72 \text{ kPa}$$

$$w_2 = (0.5 + 0.35) + (0.4 \times 1.5) = 1.45 \text{ kPa}$$

Try double 240x45 LVL



$$\Delta = 8 \text{ mm} \quad k_L = 1.5 \quad \therefore \Delta = 12 \text{ mm}$$

$$\text{say } L = 2 \times 2 = 4 \text{ m}$$

$$\therefore \Delta = 4000 / 12$$

$$= L / 333 \quad \checkmark \text{ ok}$$

Creep AS multiplied by - preamber
per other floors -



CALCULATIONS

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RGC

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12/10

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E15

CENTRAL FLOOR

$$G = 0.5$$

Q: short term = 3 kPa

← CASE ①②

long term = 1.5 kPa

← CASE ③

$$240 \times 45 \text{ JOISTS: } \phi M = 0.9 \times 0.8 \times 48 \times \frac{240^2 \times 45}{6} = 15 \text{ kNm}$$

$$126 + 1.5Q = (0.5 \times 1.5) + 3 \times 1.5 = 5.25 \text{ kPa}$$

$$\text{SAY } 400 \text{ CRS } M^+ = [5.25 \times 0.4] \times 5.9^2 / 8 = 7.65 \text{ kNm}$$

Deflection

$$\Delta = (0.5 + 1.5 \times 0.9) \times 0.4 \times 5400^4 \times 5 / 384 \times 10 \times 10^3 \times \frac{240^3 \times 45}{12} = 9.4 \text{ mm}$$

$$K_L = 1.5$$

$$\therefore \Delta_L = 9.4 \times 1.5$$

$$= 14 \text{ mm}$$

$$= L / 383 \quad \checkmark$$

check deflection when concrete table is

SAY 1.5 kPa no reduction

$$\therefore (0.5 + 1.5) \times 0.4 \times 5400^4 \times 5 / 384 \times \frac{240^3 \times 45}{12} \times 10 \times 10^3 = 19.4$$

$$\therefore S = 0.22$$

ie. Double up joists @ Table



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Floor in shed space.

$$Q = 1.5 \text{ kPa}$$

$$G = 0.25 \text{ kPa}$$

$$\text{Wall} = 0.25 \text{ kPa}, \quad \text{Spacy} = 0.5 \text{ m}$$

$$= 1.2 \text{ kPa} + 1.5 \text{ kPa} = [(1.5 \times 1.5) + (0.25 \times 1.2)] \times 0.5$$

$$+ (0.25 \times 3 \times 1.2) = 2.18 \text{ kN/m}$$

$$M^* = \frac{5 \cdot 4^2}{8} \times 2.18 = 7.9 \text{ kNm}$$

$$2 \cdot N \cdot 240 \times 45 = \frac{0.8 \times 0.8 \times 14 \times 1.4 \times 240^2 \times 9.5}{6} \times 2 = 8.8 \text{ kNm}$$

> 7.9 ✓

$$\Delta = G + Q_L = 0.25 \times 0.5 + 1.5 \times 0.5 \times 0.4 + 0.25 \times 3$$

$$= 1.175 \text{ kN/m}$$

$$\Delta = 1.175 \times 5400^4 \times 5 / (384 \times 8 \times 10^3) \times \frac{240^3 \times 45}{12} \times 2$$

$$= 15.7 \text{ mm}$$

$k_2 = 2$... $\Delta = 31.4 \text{ mm}$... too much

try LVL double 240x45 ... $\Delta = 1.5 \times \frac{8}{1015} \times 15.7 = 18 \text{ mm}$

= 4/300 ✓



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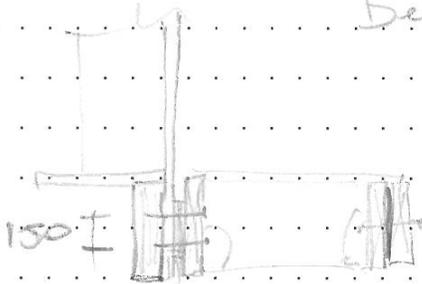
Check Rear of Store

$$290 \times 45 \text{ LVL} \cdot \frac{8 \text{ M}^2}{6} = \frac{290^2 \times 45}{6} \times 48 \times 0.8 \times 0.9 = 19.9 \text{ kNm}$$

$$\Delta = 15.7 \times 2 \times 1.5 \times \frac{8 \times 10^3}{13 \times 10^3}$$

$$= 29 \text{ mm}$$

→ Delta is high but tied into rear wall. This can carry load as deep beam



$$\downarrow V = 2.18 \text{ kN/m} \quad 14 \text{ g sapers} = 2 \times 0.7 \times 0.8 = 1.12 \text{ kN each}$$

→ Put Pairs of sapers @ 800cfs

28 ply. Panel

2- 14g + 17 sapers
 100 long @ 800cfs



CALCULATIONS

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BRACING

- WALLS OF BOX TO BE DESIGNED FOR CASE (3) - (critical case) AS STRENGTHENING LATER WOULD BE DIFFICULT.

- SUB FLOOR BRACING TO BE DESIGNED FOR TEMP CASES ONLY, WITH DIFFERENT SOLUTION FOR PERMANENT CASE LATER ON.

- CANOPY ROOF DESIGNED FOR TEMP CASES ONLY.



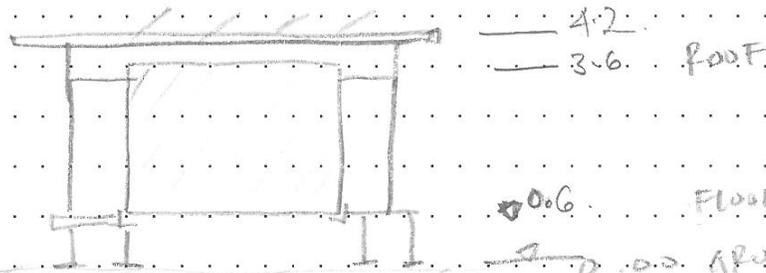
CALCULATIONS

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Seismic weight

- Sunshades / Panels = 0.25
- Roof = 0.5
- Floor flexus = 1.45 kPa
- Floor timber mid = 0.5
- Deck = 0.25
- Partitions etc = 0.35
- EXT WALLS (0.5 FACE) = 0.72 [OVER TOTAL AREA]



wt canopy roof = $0.25 \times 14.2 \times 3.75$ → $\frac{13.1}{31}$ KN

wt Roof + $0.5 \times 14 \times 5.4$ = 37.8
 + $0.35 \times 14 \times 5.4 / 2$ = 13.2
 + $0.72 \times 14 \times 5.4 / 2$ = 27.2
 Σ 78.2 KN

wt floor = $1.45 \times 48 \text{ m}^2$ = 69.6
 + $0.5 \times (14 \times 5.4 - 48)$ = 13.8
 + $0.35 \times 14 \times 5.4 / 2$ = 13.2
 + $0.72 \times 14 \times 5.4 / 2$ = 27.2
 + $0.25 \times (17 \times 3.3)$ = 14
 Σ 137.8 KN



CALCULATIONS

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Seismic LIVE LOAD

By inspection of seismic coefficients
CASE (3) NZ: GOVERNMENT
∴ LIVE = 1.5 kPa

$$A = 4.85 \times (14 - 0.48) = 65.5 \text{ m}^2$$

$$y_a = 0.3 + 3 / \sqrt{65.5} = 0.67$$

$$Q_L = 1.5 \times 0.9 \times 0.67 = 0.9 \text{ kPa}$$

$$\Rightarrow = \frac{0.4 \times 65.5}{1} = 26.4 \text{ kN}$$

$$31 + 78.2 + 137.8 + 26.4 = 273 \text{ kN}$$

LATERAL STATIC

	ht	wt	htwt	F
CANOPY ROOF	4.2	31	130.2	69
ROOF	3.6	78.2	281.5	151
FLOOR	0.6	169.2	98.5	53
		Σ 273	510.2	

Case (3)	μ	C	V_b	$\frac{F_{CR}}{F}$	$\frac{F_R}{F}$	$\frac{F_F}{F}$
$\mu = 1.25$	0.58	158	40	88	31	
$\mu = 3$	0.31	85	21	47	116	

Case (1) = 1/2 CASE (3)

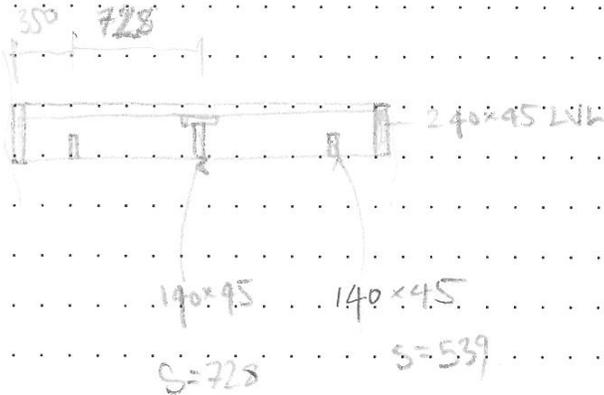


CALCULATIONS

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Studs - Wind loading



Case ③ critical

$$w_s = 1.11 \times (0.7 + 0.2) = 0.999 \text{ kPa}$$

$$\Delta_{90 \times 45} = 0.999 \times 0.728 \times 2600^4 \times 5 / 384 \times 8 \times 10^3 \times \frac{140^3 \times 45}{12}$$

$$= 5 \text{ mm} = 1/494$$

$$u_{LS} = 1.5 \times (0.7 + 0.2) = 1.35 \text{ kPa}$$

$$M^* = (1.35 \times 0.728) \times 2.6^2 / 8 = 0.83 \text{ kNm}$$

$$\phi M_u = 0.8 \times 1 \times 14 \times 140^2 \times 45 / 6 = 1.65 \text{ kNm} \checkmark$$



CALCULATIONS

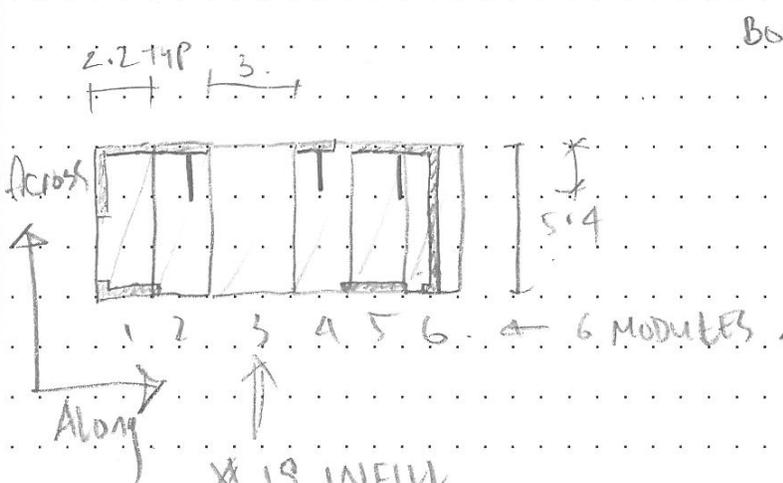
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LATERAL BRACING

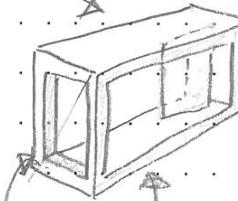
UPPER 'BOX' ACROSS

$$\begin{aligned}
 V_{\text{wind}} &= \left[(0.7 + 0.5) \times \frac{3}{2} \times 14 \right. \\
 &\quad \left. + (1.2 \times 0.5 \times 14) \right] \times 1.5 = 50.4 \text{ kN}
 \end{aligned}$$

* IS INFILL FRAMING NOT BOX MODULE

BOX MODULE (1, 2, 4, 5, 6) SIM.



EACH MODULE EXCEPT *3 HAS A BRACE WALL FOR ACROSS. SO LONG DIAPHRAGM NOT REQUIRED

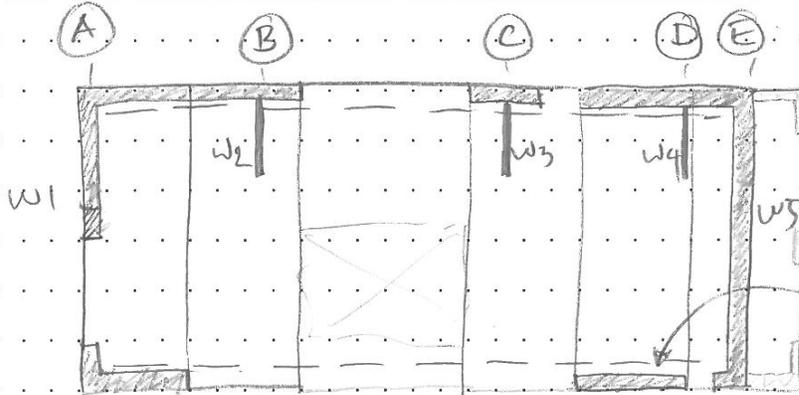
TEMPORARY (TRANSPORTATION) BRACING OF MODULE PROVIDED BY WINDOW & DOORS



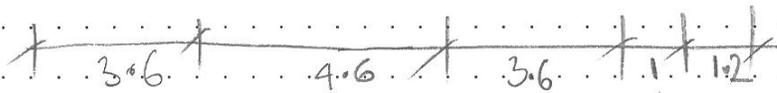
CALCULATIONS

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stainless wire
TO CLAMP MODULES
TOGETHER -



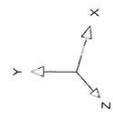
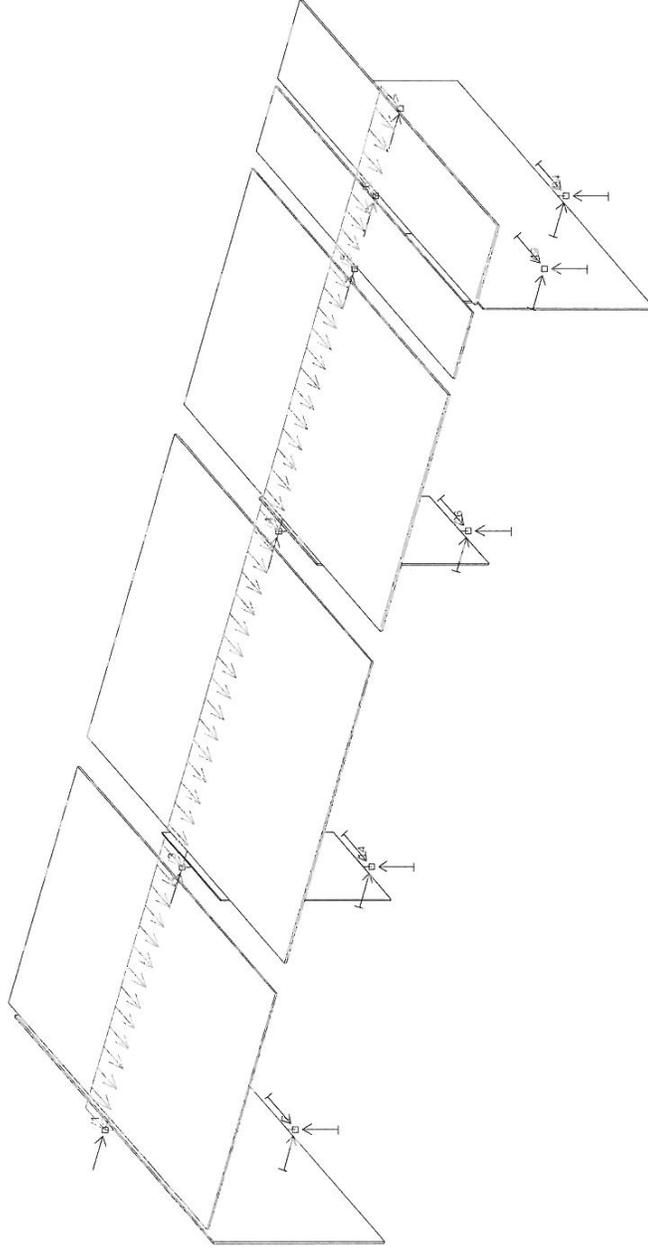
$\checkmark_{EQ} \text{ CASE 3} = 68 / 14 = 4.86 \text{ kN/m}$

$\checkmark_{\text{wind, CASE 3}} = 50.4 / 14 = 3.6 \text{ kN/m}$

USE MICRO STRAN. MODEL TO MODEL INTERACTION OF DIAPHRAGM & WALL STIFFNESS. - AS DIAPHRAGM WILL TEND TO SPAN END TO END TO STIFF WALLS RATHER THAN FROM WALL TO WALL.

DIAPHRAGM TIE PROVIDED BY STAINLESS CABLE TO CLAMP DIAPHRAGM TOGETHER TO PREVENT TENSION OCCURRING.

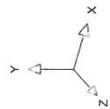
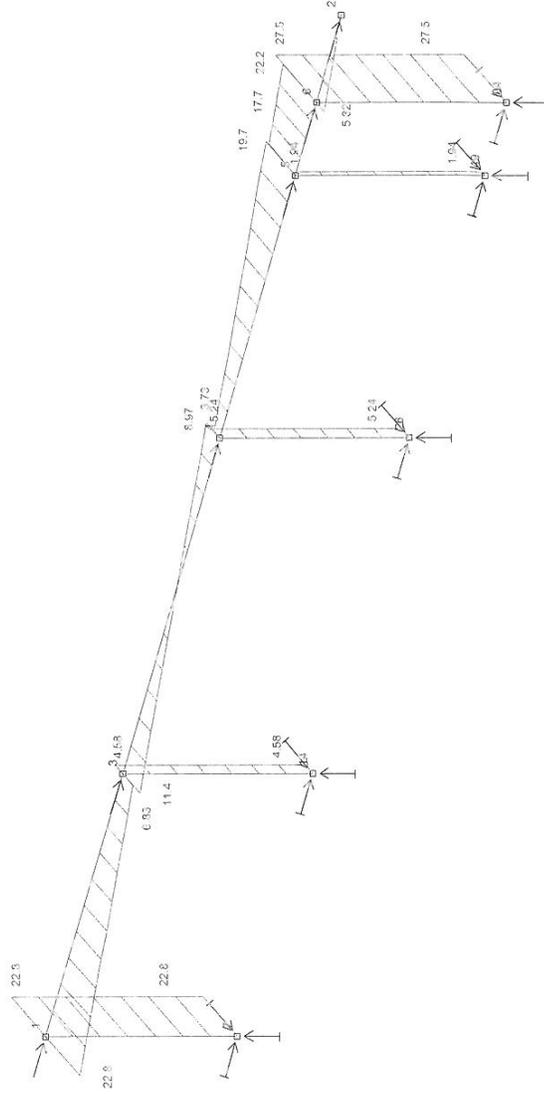
Load Cases:
—— 3 P EQ U=3



theta: 300 phi: 30

F7

Load Cases:
 ——— 3 P EQ u=3



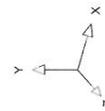
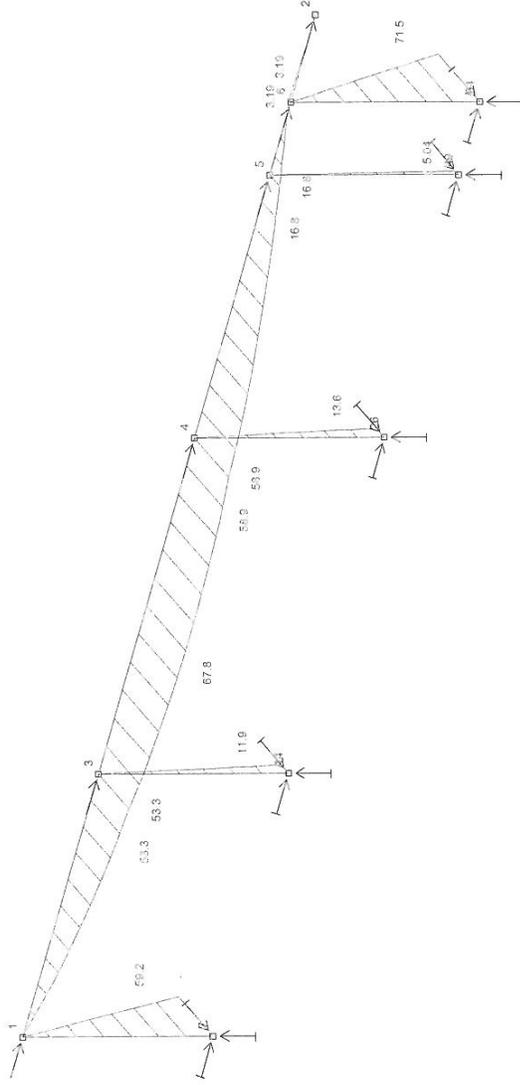
theta: 300 phi: 30

Microstian [V8.11zz]

Shear Force, Fz

G:\6751\Calcs\6751 across bracing

Load Cases:
—— 3 P EQ u=3



theta: 300 phi: 30

Microstran [V8.11zz]

Bending Moment, My

Tg

G:\6751_Calcs\6751 across bracing



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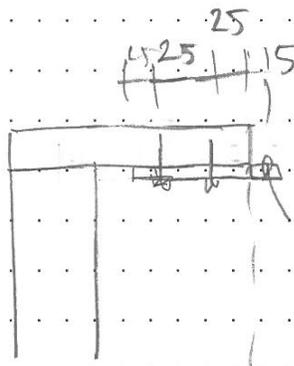
F10

Diaphragm TIE

$M = 70 \text{ kNm}$ $T = C = 70 / 4.8 = 14.6 \text{ kN}$

Wall over strength = 2 \therefore so $T = 29 \text{ kN}$

USE 12m toggle & Gunstanes cable -
min breaking load = 30 kN

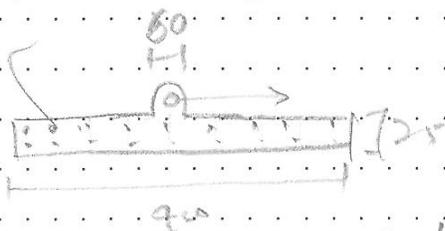


$$M = 29 \times (25 \times 1.5) + 15$$

$$= 1.52 \text{ kNm}$$

N^o screws for shear
 $= 29 / 2 \times 1.25$
 $= 11.6$ SAY 12

16 screws 19g



span = 50
 \therefore Length = 6 x 50 = 300

SAY TAKE 2 screws each end
 $M = (2 \times 2.5) \times 0.4 = 2 \text{ kNm}$

Plate if $d = 25$ $b = 1.52 \times 10^6 / \frac{300 \times 95^2}{6}$
 $= 5.4$ USE 6mm

Top plate





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Diaphragm shear

$V = 23 \text{ kN}$ max. say. Reply on peak

Nails = 0.74 kN each 2.5ϕ flat head.

$N_o = 23 / 0.74 = 31$ nails $S = \frac{5300}{31}$

$= 170 \text{ mm}$

2.5ϕ nails @ 150 c/s

check shear in hardwood spigots

$$\text{max} = \frac{(23 - 6.8)}{3.6} \times 1.4 + 6.8 = 13.1 \text{ kN}$$

3N. \circ 50 ϕ $\phi V_n = 0.7 \times 0.6 \times \left(\frac{\pi}{4} \times 50^2 \times 3 \right) \times 8$
 $= 19.8 \text{ kN}$
 $> 13.1 \text{ kN}$ ✓

min shear strength of most hardwoods.



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Design of w2, w3, w4

floor to ceiling = 2.6m

$L = 1.6m$

$V = 5.3 kN = 106 BuS$

using ECO ply Bracing values.

7m ply each side.

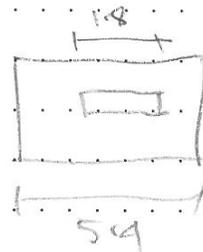
EPR

Total capacity $\Rightarrow EQ = \frac{2.4}{2.6} \times 150 \times 1.6 = 221 BuS$
 $> 106 \checkmark$
 OK

BY INSPECTION window ok.

WALL W1 (& wall w5)

$V = 22.8 kN = 456 BuS$



$L = 5.4 - (1.8) = 3.6m$

↑
 window opening - note - this is horizontal slot window so loads are able to flow round easier i.e. some coupling action of walls.

\therefore Wind ER capacity = $3.6 \times 130 \times \frac{2.4}{2.6} = 932 BuS$

EPI

ok. As redistribution to other walls possible

& certainly ok for deep case ①

by inspection used as no window present.



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long distance

by inspection EQ (3) is worst case

$$V = 68 \text{ kN} = \underline{1360 \text{ BUS}}$$

Allocate shear to 6 No 2.2m long walls

$$\begin{aligned} \text{Total capacity @ EPI} &= \frac{2.4}{2.6} \times 130 \times 6 \times 2.2 \\ &= \underline{1584 \text{ BUS def}} \end{aligned}$$

3.2 ECOPLY® & SHADOWCLAD® BRACING SPECIFICATIONS SUMMARY

Fig

Carter Holt Harvey® Woodproducts has a range of bracing specifications called the EP bracing series. The EP bracing series simplifies the design and construction of bracing elements using plywood, by itself or in conjunction with GIB® Plasterboard.

Historical Ecoply bracing elements (referred to as the SP bracing series in previous versions of Ecoply literature) can still be used in bracing design if desired and can be downloaded from www.chhwoodproducts.co.nz, however, the EP bracing series offers the following benefits:

- Higher bracing performance per metre than historical SP elements
- Reduced number of element types and simplified naming system
- Single sided and double sided bracing elements
- Special EPGs bracing element design for where plywood cladding comes to soffit line within 300 mm of top plate
- High performance bracing element utilising GIB® Standard plasterboard
- A single type, GIB Handibrac®, hold-down for all bracing elements
- Direct fix or cavity construction
- Simplified construction
- Specifications for each bracing element type

TABLE 9: SUMMARY P2I RATINGS FOR 2.4 M HIGH ECOPLY® AND SHADOWCLAD® WALL ELEMENTS

Specification No.	Minimum Wall Length	Lining Requirements	BU's/m Wind	BU's/m Earthquake
EP1	0.6 m	7 mm Ecoply or 12 mm Shadowclad® one side	130	130
EP2	0.6 m	7 mm Ecoply or 12 mm Shadowclad each side	145	150
EPG	0.4 m	7 mm Ecoply or 12 mm Shadowclad one side and 10 mm GIB® Standard plasterboard other side	120	125
	1.2 m	7 mm Ecoply or 12 mm Shadowclad one side and 10 mm GIB® Standard plasterboard other side	150	150
EPGs	0.4 m	7 mm Ecoply or 12 mm Shadowclad one side* and 10 mm GIB® Standard plasterboard other side	100	120
	1.2 m	7 mm Ecoply or 12 mm Shadowclad one side* and 10 mm GIB® Standard plasterboard other side	150	120

* Plywood side of element must be a maximum of 300 mm below top plate

Note: Bracing and other technical information has been specifically tested using Ecoply and Shadowclad branded structural plywood. This information cannot be used with any other plywood brand and bracing data must be sought directly from the specific plywood manufacturer.

More information

The following pages provide a full specification of EP bracing elements. Copies of specifications can be downloaded from www.chhwoodproducts.co.nz

NZS 3604 provides the method of calculating demand on a building and calculation sheets are available from BRANZ or GIB® EzyBrace™ software is available as a free download from www.gib.co.nz. Information is available at www.chhwoodproducts.co.nz which can be placed in the custom elements of GIB® EzyBrace™ for ease of calculation.

Ecoply® Bracing Systems are designed to meet the requirements of the NZBC and have been tested and analysed using the P2I method referenced in NZ3604 listed as an acceptable solution B1/AS1 Structure. Testing was carried out using Ecoply, Shadowclad and Laserframe MSG8 timber framing manufactured by Carter Holt Harvey Limited trading as Carter Holt Harvey Woodproducts New Zealand, and GIB® products manufactured by Winstone Wallboards Ltd. Substituting materials may compromise performance of the system. GIB® and GIB HandiBrac® are registered trade marks of Fletcher Building Holdings Ltd.



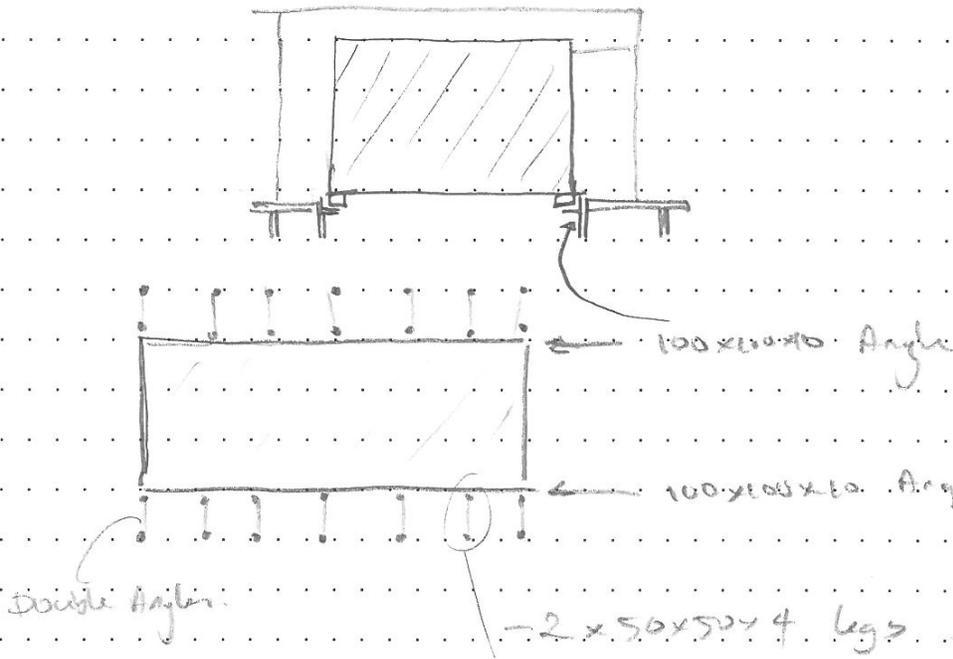
CALCULATIONS

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6751	RGC	1/10	FL5

SUB FRAME BRACING

Design for Case ①



Along direction only Angle & legs Attached to Angle form portal to resist load.

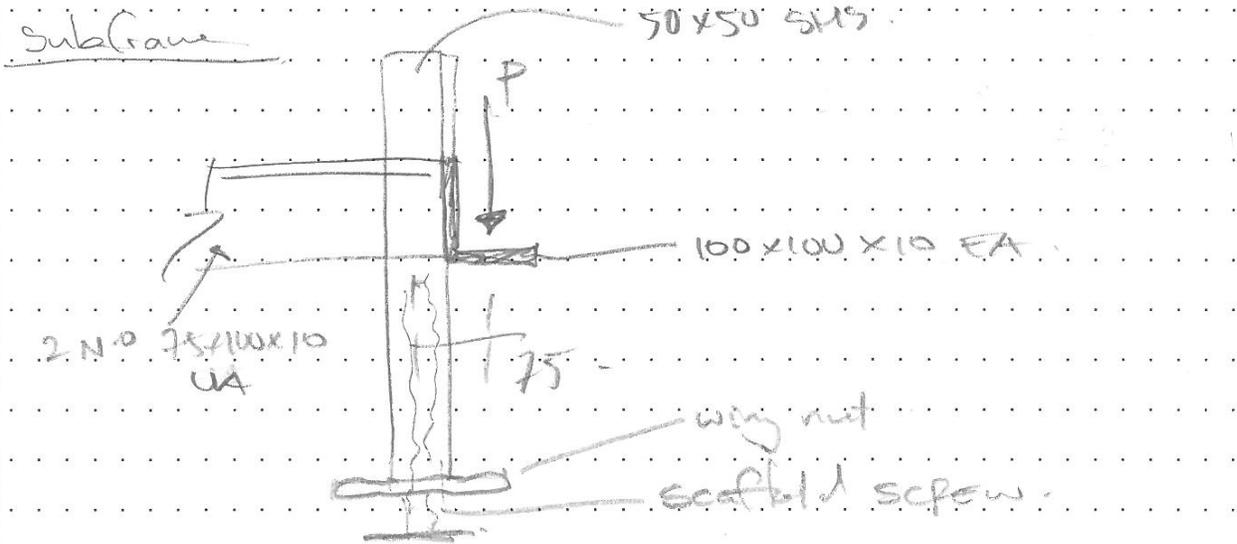
Across direction - Double Angles form portal with legs & only frames pushed in. Compression are assumed to take load.



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CASE ①

$$P = 1.28 + 1.5Q = \frac{(1.2 \times 247) + 13.5 \times 4.8 \times 0.67 \times 3 \times 1.5}{14}$$

$$= \frac{491}{14} \text{ kN}$$

$$= 35.1 \text{ kN}$$

$$P_{\text{GAL}} = \frac{273}{14} = 20 \text{ kN}$$

ANgh $M = 0.025 \times 35.1 = 0.88 \text{ kNm}$

SAY OVER WIDTH 200 $\phi M_n = 0.9 \times 300 \times 200 \times \frac{10^6}{6} = 0.9 \text{ kNm/d}$



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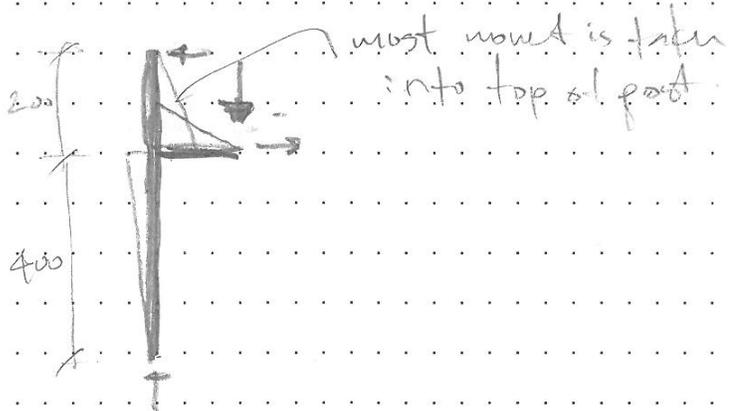
Post

$$1.26 \times 6.56$$

$$M^* = 35.1 \times 0.075$$

$$= 2.63 \text{ kNm}$$

$$N_c = 35.1 \text{ kN}$$



At QL

$$M = 20 \times 0.075$$

$$= 1.5 \text{ kNm}$$

Case ① seismic
ACROSS

$$V_b = 273 \times 0.29 = 79.2 \text{ kN}$$

$$V_{leg} = 79.2 / 14 = 5.655 = \underline{59 \text{ kN}}$$

[WIND = (3.5119 x 1 x 1.2)]

$$M_{E_{leg}} = 5.655 \times 0.14 = 2.26 \text{ kNm}$$

∴ so Along - biaxial bending, $M_x^* = 2.26$

$$M_y^* = 1.5$$

$$N_c = 20 + \frac{79.2 \times 0.14}{2} = 21 \text{ kN}$$

Across = $M_y^* = (1.5 \times 0.11) + 2.26 = 2.43 \text{ kNm}$

$$N_c = 20 + \frac{(79.2 / 2.07) \times 0.14}{1} = 22.3 \text{ kN}$$

by inspection gravity is worst case
∴ 50 x 50 x 4 SHS ok



CALCULATIONS

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6751	RGC	6/10	#18

check Double angle for beam

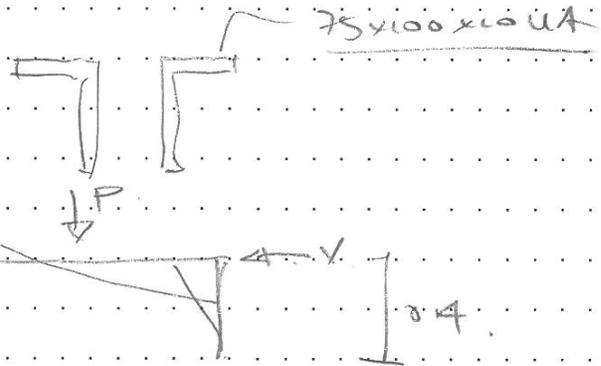
$$M^* = 2.43 + \frac{3.6 \times 1}{8}$$

$$= 2.9 \text{ kNm}$$

$$Z = 48.6 \times 10^3 \text{ mm}^3$$

$$M_n = 2 \times 48.6 \times 300 \times 0.9$$

$$= 26.2 \text{ kNm} \quad \checkmark \text{ ok}$$



P from conn. etc = 3.6 kN

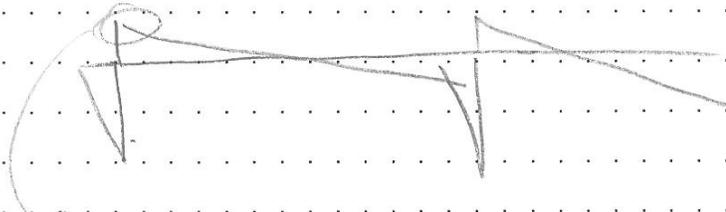


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check Angle for longitudinal screws



$$M^* = 2.26 \text{ kNm}$$

$$\phi M = 0.9 \times 350 \times 60.1 \times 10^3 = 16.2 \text{ kNm}$$

longitudinal shear into angle = $\frac{158}{2} \times \frac{1}{2} / 2 \times 1.25 \times 0.7$

check scaffold screw = $\frac{23 \text{ kN}}{14/23} = 620 \text{ mm}$

$$\phi = 35 \text{ mm}$$

$$2 \times 35^3 \pi / 32 = 4210 \text{ mm}^3$$

$$\phi M = 4210 \times 0.9 \times 250$$

$$= 0.95 \text{ kNm}$$

$$\therefore \text{max length of extrusion} = \frac{0.95}{19} = 0.16 \text{ m}$$

$$= 160 \text{ mm}$$

F20

Project : VUW Solar decathlon
Descriptn : Sub frame post

Section : 050x050x4.0 SHS Grade 450DG

Major Axis Bending

Design Action $M^*x = 2.6$ kNm
User provided value for Alpha-m = 1.00
Alpha-s = 1.03
Alpha-m Alpha-s ≥ 1.0 , => Segment Fully Restrained
 $Mbx = Msx = 5.13$ kNm
Major axis capacity Ratio = $M^*x / \Phi Mbx = 0.56$, ----- OK -----

Shear Calculations (Unstiffened web)

Design Action $V^*x = 12.0$ kN
Nominal Shear Yield capacity $Vw = 90.7$ kN
Alphav = 33.88 ≥ 1.0 => full web shear capacity
 $Vu = Vw = 90.7$ kN
Shear capacity ratio = $V^*x / \Phi Vu = 0.15$, ----- OK -----

Axial Calculations

Design Action $Nd = 35.0$ kN [Comp], $LeAxx = 0.50$ m, $LeAxy = 0.50$ m
 $= 306.5$ kN
Major axis buckling : Minor axis buckling : Minimum Capac. $Ncmin = 291.2$
Axial buckling capac. Ratio = $Nd / \Phi Ncmin = 0.134$, ----- OK -----

Combined Actions Checks

Clause 8.3.3/4 :
 $Mry = Msy (1 - (N^*/\Phi Ns)) * 1.18, \leq Msy$ [Alt. Prov. OK]
 $= 5.1$
Load / Capacity Ratio = $M^*x / (0.9 Mrx) = 0.56$, ----- OK -----
Clause 8.4.2.2 : Major : $Mix = 4.4$
Load / Capacity Ratio = $M^*m / \Phi Mi = 0.650$, ----- OK -----

===== SUMMARY =====

**** U.L.S. Capacity Check Passed, Load Cap. Ratio = 0.65 ----- OK -----

=====

F21

Project : VUW Solar decathlon
Descriptn : Sub frame post

Section : 050x050x4.0 SHS Grade 450DG

Major Axis Bending

Design Action M*x = 2.3 kNm
User provided value for Alpha-m = 1.00
Alpha-s = 1.03
Alpha-m Alpha-s >= 1.0, => Segment Fully Restrained
Mbx = Msx = 5.13 kNm
Major axis capacity Ratio = M*x / Phi Mbx
= 0.49, ---- OK ----

Minor Axis Bending

Design Action M*y = 1.5 kNm
SHS Sectn => Mby = Mbx = 5.13 kNm
Minor axis capacity ratio = M*y / Phi Mby
= 0.32, ---- OK ----

Shear Calculations (Unstiffened web)

Design Action V*x = 12.0 kN
Nominal Shear Yield capacity Vw = 90.7 kN
Alphav = 33.88 >= 1.0 => full web shear capacity
Vu = Vw = 90.7 kN
Shear capacity ratio = V*x / Phi Vu
= 0.15, ---- OK ----

Axial Calculations

Design Action Nd = 21.0 kN [Comp], LeAxx = 0.50 m, LeAxy = 0.50 m
= 306.5 kN
Major axis buckling : Minor axis buckling : Minimum Capac. Ncmin = 291.2
Axial buckling capac. Ratio = Nd / Phi Ncmin
= 0.080, ---- OK ----

Combined Actions Checks

Clause 8.3.3/4 :
Mry = Msy (1 - (N*/Phi Ns)) * 1.18, =< Msy [Alt. Prov. OK]
= 5.1

Clause 8.3.4 : Capac. Ratio using ALTERNATIVE provisions, Psi = 1.476
= (M*x/Phi Mrx)Psi + (M*y/Phi Mry)Psi
= 0.539, ---- OK ----

Clause 8.4.2.2 : Major : Mix = 4.7
Load / Capacity Ratio = M*m/Phi Mi
= 0.532 ---- OK ----

Clause 8.4.2.2 : Minor : Miy = 4.7
Load / Capacity Ratio = M*m/Phi Mi
= 0.353 ---- OK ----

Clause 8.4.5.1 :
Load / Capacity Ratio = [M*x/Phi Mcx]1.4 + (M*y/Phi/Miy)1.4
= 0.646, ---- OK ----

===== SUMMARY =====

**** U.L.S. Capacity Check Passed, Load Cap. Ratio = 0.65 ---- OK ----

=====



CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	F22

Foundation bearing

temp site on grass say 70 kPa allowable

$$\text{Load} \Rightarrow \text{Building} = 126 - 11.5 Q$$

$$= 12 (78.2 + 157.8) + (3 \times 0.65) \times 15 \times 4.8 \times 13.5$$

$$= 998 \text{ kN}$$

$$= 998 / 14 = 32 \text{ kN}$$

Allowable bear = 70 kPa

$$\text{AREA} = 32 / 70 = 0.45 \text{ m}^2$$

$$= 0.68 \times 0.68$$

$$\text{say } 700^2$$

outer foundations

Carry deck & canopy

$$\text{Canopy} = G = 31 \text{ kN}$$

$$\text{Deck} = G = 0.25$$

$$Q = 1.5 \text{ kN}$$

$$= (31 / 14) \times 1.2 + (0.25 \times 1.2 + 1.5 \times 1.5) \times \frac{1.5 \times 14}{7 \times 2}$$

$$= 6.5 \text{ kN}$$

$$\Rightarrow A = 6.5 / 70 = 0.09 \text{ m}^2 = 300^2$$

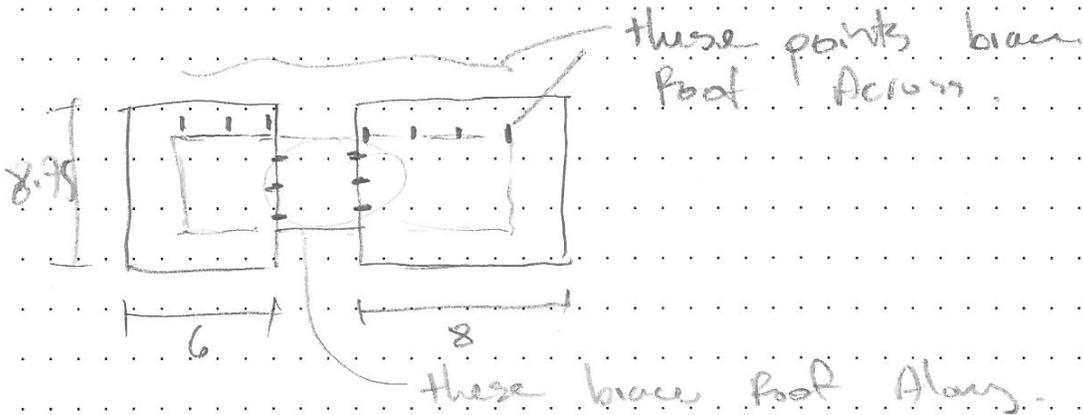


CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	F23

CANOPY BRACING



Design for case: ①

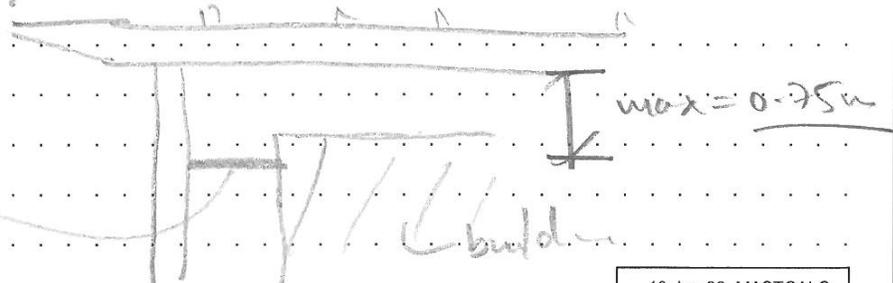
$$V_{wind} = 1.2 \times (8.75 \times 1) \times 1 = 10.5 \text{ kN} \quad (\text{per end.})$$

$$V_{eq} = \mu = 1.75 = 40 \quad \text{+ critical}$$

Across

$$V_{ps \text{ fixed}} = 40 / 7 = 5.71 \text{ kN}$$

strut/tie to
Brace post





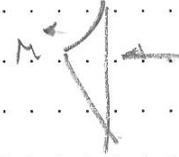
CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	F24

$$M^+_{\text{post}} = 0.75 \times 5.71$$

$$= 4.28 \text{ kNm}$$



$$\phi M_n = 0.8 \times 1 \times \frac{135^3}{6} \times 22 = 72 \text{ kNm}$$

135×175
(6210)

$> 4.28 \text{ kNm}$ ✓

Pull out: length of 14g screws

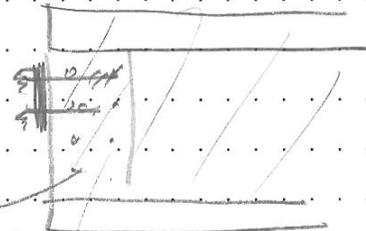
$$L = 43 / (0.7 \times 0.079)$$

$$= 77 \text{ mm}$$

— use 4 N2 T10 SCREWS

$$L_{\text{total}} = 50 \times 4 = 200 \text{ mm} \checkmark$$

into end of box beam



N. 215 nails
each side

$$V = 10 \times 2 \times 0.74 \times 0.8$$

$$= 6 \text{ kN}$$

OK > 4.28 ✓



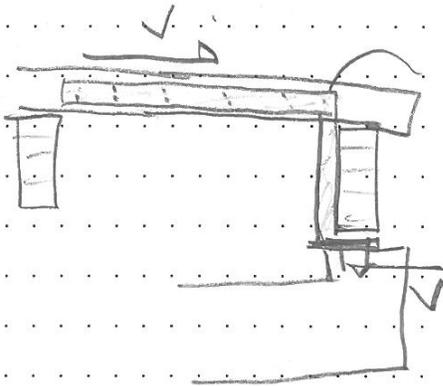
CALCULATIONS

JOB NAME VUW Module For Solar Decathlon 2011

JOB NO	CALC'D BY	DATE	PAGE
6751	RGC	10/10	F25

Alloy

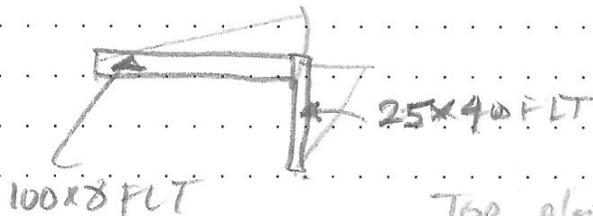
$$V_{\text{per fixer}} = \frac{40 \times 8}{14} \times \frac{1}{3} = 7.61 \text{ kN}$$



L frame to take load str.
Pool.



$$M^* = 7.61 \times 0.35 = 2.7 \text{ kNm}$$



Top plate = $\phi M = 0.9 \times 300 \times 100^2 \times 3$
 $= 3.16 \text{ kNm}$

leg = $\phi M = \frac{40^2 \times 25}{6} \times 0.9 \times 300$
 $= 1.8 \text{ kNm}$

N^o 14g screws
in shear
 $= \frac{2.6}{0.7 \times 2.1 \times 1.25}$
 $= 4 \text{ screws}$

Some directly cap
 $n = \frac{2.7}{1.8} = 1.5 \checkmark$

check weld

$$M^* = \frac{10.5}{3} \times 0.35 = 1.2 \text{ kNm} < 1.8$$

weld yield in wind ok

SPECIFICATION & SKETCHES

**FIRST LIGHT
MODULAR HOUSE
FOR THE
2011 USDE SOLAR DECATHLON
FOR
VICTORIA UNIVERSITY**

JOB NO: 6751

DATE: NOV 2010



**Dunning
Thornton**
consultants

Dunning Thornton Consultants Ltd
Consulting Structural Engineers
Project & Construction Consultants



DOMESTIC SPECIFICATION [STRUCTURAL] - DOM

DOM.1 GENERAL

All work that is not covered by specific design shall be in accordance with NZS 3604.

DOM.2 CONCRETE

Concrete To Composite floors shall be Reid Flexus Fibre reinforced concrete with a minimum compressive strength of 40Mpa and Bending Strength of 5Mpa.

Concrete construction shall be in accordance with NZS 3109.

Slab finishes shall be as follows;

Slab to take tiles – F5 (form finish)

DOM.3 STRUCTURAL STEELWORK

All steelwork to be in accordance with NZS 3404.

All welding to be carried out by certified welders.

Structural steelwork shall be to Grade BHP 300-PLUS except for RHS sections which shall be Grade 350.

All structural steelwork is to be blast cleaned to SSPC – SP10 and primed with Resene Ameron Steel Fab Primer. Steelwork in enclosed "high risk" areas where H3.2 timber is required (eg. skillion roofs) shall be primed with Resene ArmourZinc 120.

All exposed steelwork and bolts to be Hot Zinc Sprayed as follows:

Thoroughly degrease the surface to remove all contaminants as per SSPC-SPI Standard.

Remove as much loosely adhering rust etc., as is practical to allow greater effectiveness of the waterblasting stage.

Waterblast at 3000psi to remove all salts, dirt, dust and any other contaminants. Allow the surface to dry.

All sharp edges are to be removed by grinding, to provide a 2mm minimum radiused edge. All weld areas are to be carefully checked for weld "splatter".

Blast clean to SSPC-SP10. All surfaces to be coated shall be blast cleaned to a "near white" metal finish according to SSPC-SP10 (Sa 2.5 of Swedish Standard SIS 05 5900). A "near white" metal blast cleaned surface finish is defined as a surface from which all oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint or other foreign matter have been completely removed from the surface except for very slight shadows, very slight streaks or slight discoloration's caused by rust stain, mill scale, oxides or slight, light residues of paint or coating they may remain. At least 95% of each square cm of surface area shall be free of all visible residues and the remainder shall be limited to the light discoloration mentioned above. Photographic or other visual standards of surface preparation may be used if required to further define the surface if specified in the contract.

DOM.4 TIMBER FIXINGS

All external timber fixings and brackets shall be stainless steel unless notified otherwise. All internal fixings in areas requiring H3 Timber shall be as hot dipped galvanised. Refer also the specific durability requirements of NZS3604.

DOM.5 STRUCTURAL TIMBER

Glulam timber shall be GL10 Pinus Radiata Boric Treated.

Construction plywood shall be F8 Grade.

Laminated veneer lumber (LVL) shall be CHH Hyspan or equivalent as approved by the engineer.

All other timber shall be Pinus Radiata MSG8/VSG8 Framing unless specifically noted on the drawings.

DOM.6 FOUNDATIONS

Ground conditions are assumed to meet the requirements of NZS3604:1999. Penetrometer tests have not been completed to verify this. If ground conditions differ from that assumed redesign of foundations may be necessary.

Any soft ground to be brought to the attention of the Engineer.

Allow bearing capacity = 70 kPa (to be confirmed on site by Engineer).

DOM.7 TEMPORARY PROPPING

Provide temporary propping to floors and walls as necessary to allow completion of the contract works. Props shall be maintained in first rate condition and shall have rated load capacities exceeding the expected propping loads. If in doubt refer to Engineer.

DOM.8 SCHEDULE OF SITE INSPECTIONS

The Engineer is to be provided with reasonable notification of the following construction stages:

- Pre-Lining
- Site Assembly/site verification

END OF SPECIFICATION



**Dunning
Thornton**
consultants

Ph: (64 4) 385-0019
 Fax: (64 4) 385-0312
 PO Box 27 153, Wellington
 E-Mail: dtcwgtn@dunningthornton.co.nz



SITE REPORT

Job Name: Solar Decathlon 2011
 Job No.: 6751 Page: 1/2
 Date: 16/12/2010 S.R. No: SR01
 Consent Ref:

PROGRESS:

Composite floor: Change to shear connection. Clarification of fabrication methodology.

INSTRUCTIONS & COMMENTS:

- Change to knuckle plate shear connectors as per the attached sketch set out.
- To mitigate shrinkage deflection issues with floor:
 The Flexus shall contain a shrinkage reducing agent.
 As soon as practicable the units shall be lifted from the upside down cast position and Placed on a central piece of 10mm dunnage. A weight (70-100kgs) at each end of each joist may be required to ensure the tips of the joists reach the floor. The units shall be left to wet cure for a week and remain on the 10mm dunnage until they are transported to wellington. Stacking during transportation to be agreed with engineer.

CAT

Ryan Clarke

AGC 161210

Contract Interpretation Not Involving Any Variation
 Variation For Immediate Action (Price Must Be Submitted Within 28 Days)
 Variation Price Request (Price Must Be Approved Before Work Proceeds)

A
B
C

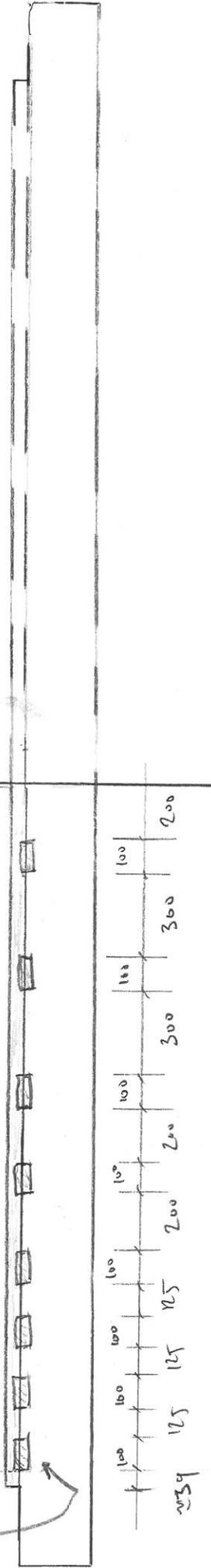
COPY/FAX/ EMAIL TO:

	Name	Organisation	Contact
Owner:			Email
Architect:	Eli Nuttall	VUW Solar Decathlon	Email Elinuttall@gmail.com
Builder:			Email

100 LONG PLYDA KNUCKLE PLATES
 3 ROWS NAILS INTO FLEXUS.
 5 ROWS NAILS INTO LVL

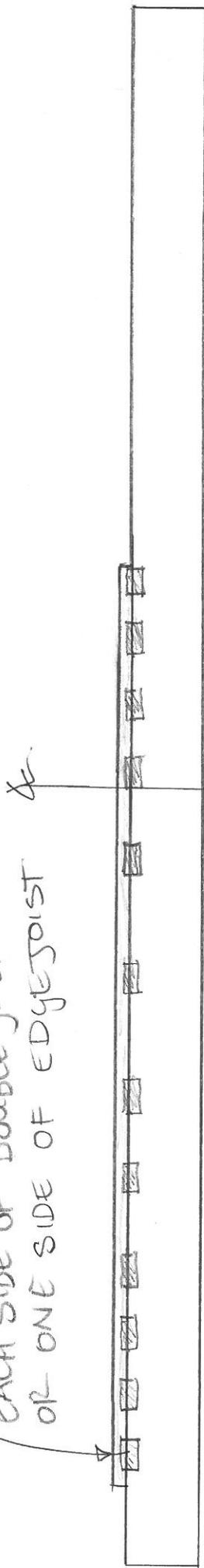
- PROVIDE EACH FOR INTERNAL JOISTS.
- PROVIDE ONE SIDE FOR EDGE JOIST

SYMMETRICAL



TYPICAL FULL COMPOSITE JOIST

KNUCKLE PUTS AS ABOVE
 EACH SIDE OF DOUBLE JOIST
 OR ONE SIDE OF EDGE JOIST



SPACING AS ABOVE

TYPICAL PART COMPOSITE JOIST

SOUAR DECAATHLON
 6751
 16/12/2010.
 SITE REPORT OF
 ATTACHMENT



**Dunning
Thornton**
consultants

Ph: (64 4) 385-0019
 Fax: (64 4) 385-0312
 PO Box 27 153, Wellington
 E-Mail: dtcwgt@DunningThornton.co.nz



SITE REPORT

Job Name: Solar Decathlon 2011
 Job No.: 6751 Page: 1/1
 Date: 26/01/2011 S.R. No: SR02
 Consent Ref:

PROGRESS:

Shop drawing review:

INSTRUCTIONS & COMMENTS:

- Please find attached our comments on the fabrication shop drawings for the steel sub-frame. We have not checked dimensions.

CAT

Ryan Clarke

AGC 250111

Contract Interpretation Not Involving Any Variation
 Variation For Immediate Action (Price Must Be Submitted Within 28 Days)
 Variation Price Request (Price Must Be Approved Before Work Proceeds)

A
B
C

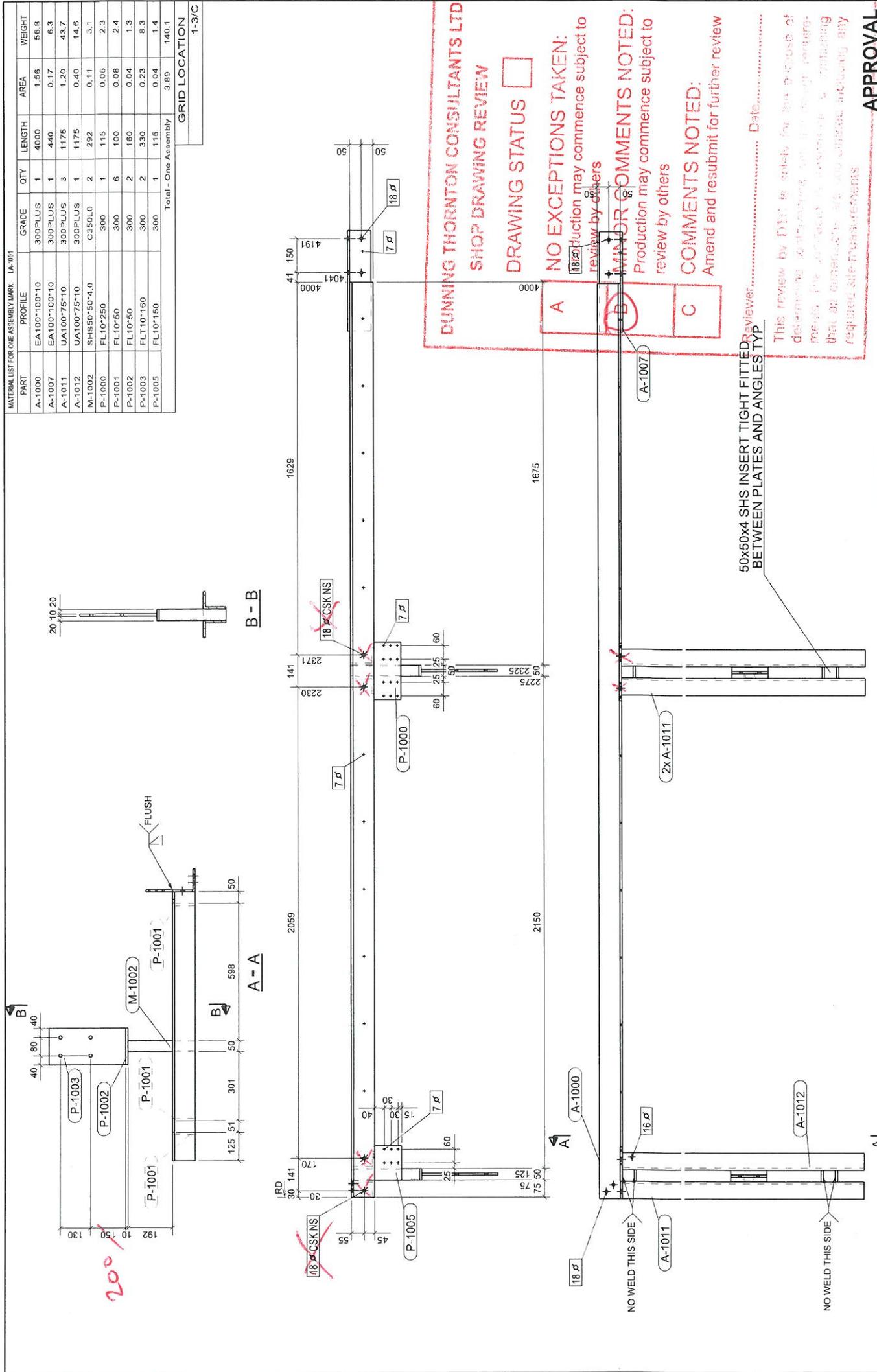
COPY/FAX/ EMAIL TO:

	Name	Organisation	Contact
Owner:			Email
Architect:	Eli Nuttall	VUW Solar Decathlon	Email Elinuttall@gmail.com
Builder:			Email

MATERIAL LIST FOR ONE ASSEMBLY MARK LA-1001

PART	PROFILE	GRADE	QTY	LENGTH	AREA	WEIGHT
A-1000	EA100*100*10	300PLUS	1	4000	1.56	56.8
A-1007	EA100*100*10	300PLUS	1	440	0.17	6.3
A-1011	UA100*75*10	300PLUS	3	1175	1.20	43.7
A-1012	UA100*75*10	300PLUS	1	1175	0.40	14.6
M-1002	SHS50*50*4.0	C350L0	2	292	0.11	3.1
P-1000	FL10*50	300	6	100	0.06	2.3
P-1001	FL10*50	300	2	160	0.04	1.3
P-1003	FLT10*160	300	2	330	0.23	8.3
P-1005	FL10*150	300	1	115	0.04	1.4
Total - One Assembly					3.89	140.1

GRID LOCATION
1-3/C



DUNNING THORNTON CONSULTANTS LTD
SHOP DRAWING REVIEW

DRAWING STATUS

NO EXCEPTIONS TAKEN:
Production may commence subject to review by others

MINOR COMMENTS NOTED:
Production may commence subject to review by others

COMMENTS NOTED:
Amend and resubmit for further review

APPROVAL

PROJECT NO.	6994FS22
PROJECT	FIRST LIGHT FOUNDATION
DRAWING TITLE	ANGLE FRAME
DATE	18/01/11
DESIGNED BY	RICIARD
CHECKED BY	MAINZEAL
CLIENT	MAINZEAL
REF NO.	LA-1001
PHASE	1
LOT	1
REV.	A
DATE	
DESCRIPTION	

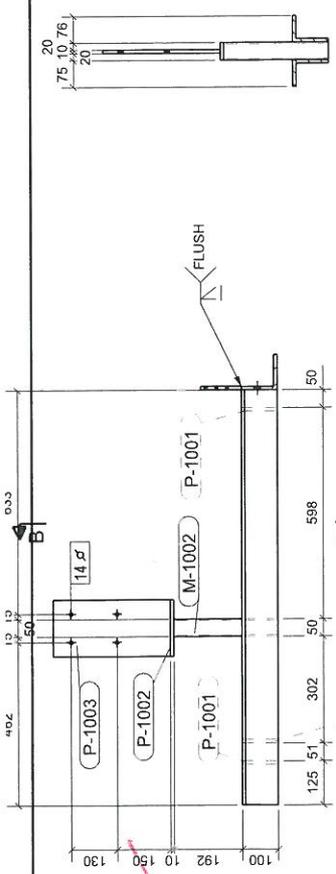
MJH
ENGINEERING LTD.
GENERAL MAINZEAL & CRANE HERE
STRUCTURAL ENGINEERS
18/01/11 18/01/11 18/01/11 18/01/11 18/01/11 18/01/11 18/01/11 18/01/11 18/01/11 18/01/11

- GENERAL NOTES:**
- HOLES TO BE 2 DIA UNLESS NOTED OTHERWISE
 - ALL WELDS TO BE 6mm OF W UNLESS NOTED OTHERWISE
 - ALL BUTT WELDS TO BE FULL PENETRATION UNLESS NOTED OTHERWISE
 - ALL NOTCHES TO BE AS PER DRAWING
 - ASSEMBLY MARK TO BE STAMPED ON FACE WHERE INDICATED THIS
 - NO PAINT TO THE CONNECTION FACES

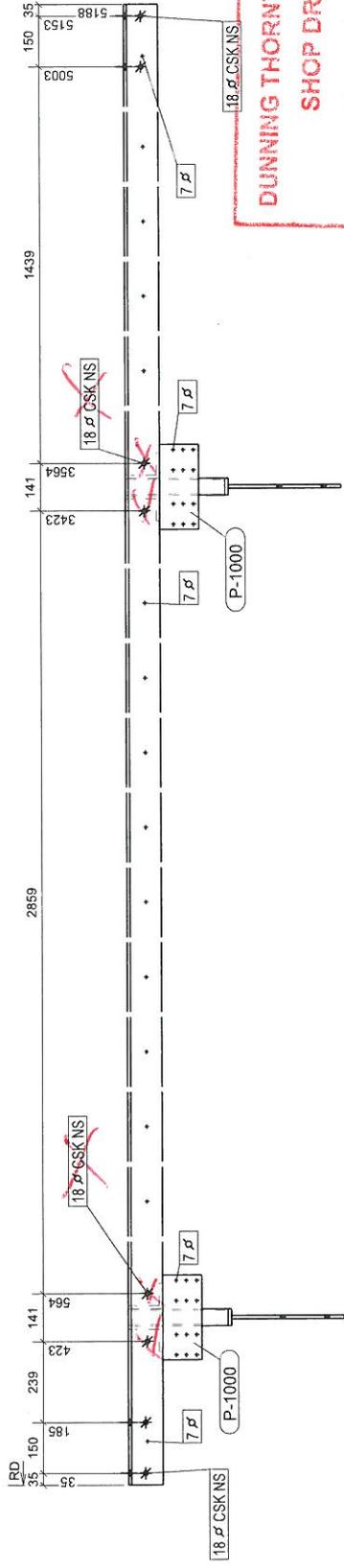
MATERIAL LIST FOR ONE ASSEMBLY MARK LA-1003

PART	PROFILE	GRADE	QTY	LENGTH	AREA	WEIGHT
A-1002	EA100*100*10	300PLUS	1	5188	2.02	72.7
A-1011	UA100*75*10	300PLUS	4	1175	1.60	58.3
M-1002	SHS50*50*4.0	C360L0	2	292	0.11	3.1
P-1000	FL10*250	300	2	115	0.13	4.5
P-1001	FL10*50	300	6	100	0.08	2.4
P-1002	FL10*50	300	2	160	0.04	1.3
P-1003	FL10*160	300	2	330	0.23	8.3
Total - One Assembly						151.6

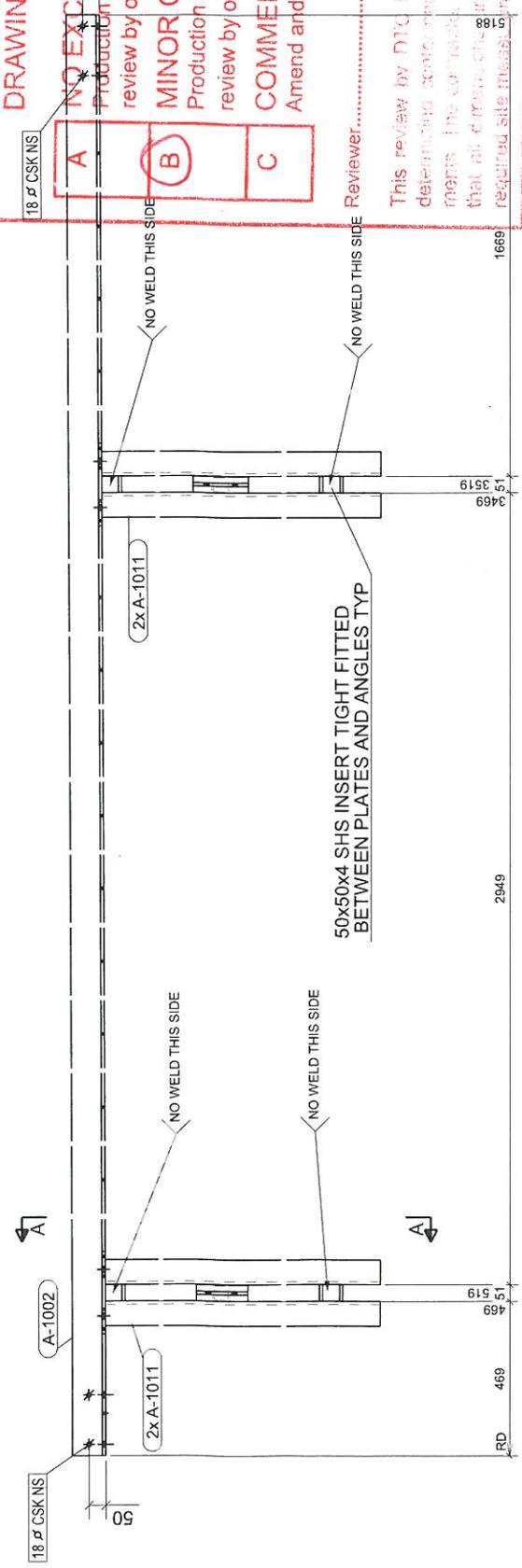
GRID LOCATION
3-5/C



B - B



A - A



DUNNING THORNTON CONSULTANTS LTD
SHOP DRAWING REVIEW
DRAWING STATUS

NO EXCEPTIONS TAKEN:
 Production may commence subject to review by others

MINOR COMMENTS NOTED:
 Production may commence subject to review by others

COMMENTS NOTED:
 Amend and resubmit for further review

Reviewer: Date:

This review by DTIC is solely for the purpose of determining compliance with the design requirements. The contractor is responsible for ensuring that all dimensions and materials conform to the required standards.

APPROVAL

PROJECT NO.	6994F522
PROJECT	FIRST LIGHT FOUNDATION
DRAWING TITLE	ANGLE FRAME
DESIGNED BY	RICHARD
CHECKED BY	MAINZEAL
DATE	1
REV.	LA-1003

PROJECT NO.	6994F522
PROJECT	FIRST LIGHT FOUNDATION
DRAWING TITLE	ANGLE FRAME
DESIGNED BY	RICHARD
CHECKED BY	MAINZEAL
DATE	1
REV.	LA-1003

MJH
ENGINEERING LTD.
 GENERAL MAINTENANCE & STRUCTURAL ENGINEERS
 & CRANE HIRE
 111 Grandview Square, Toronto, Ontario, Canada. PHONE: 416-291-7564 FAX: 416-771-1111

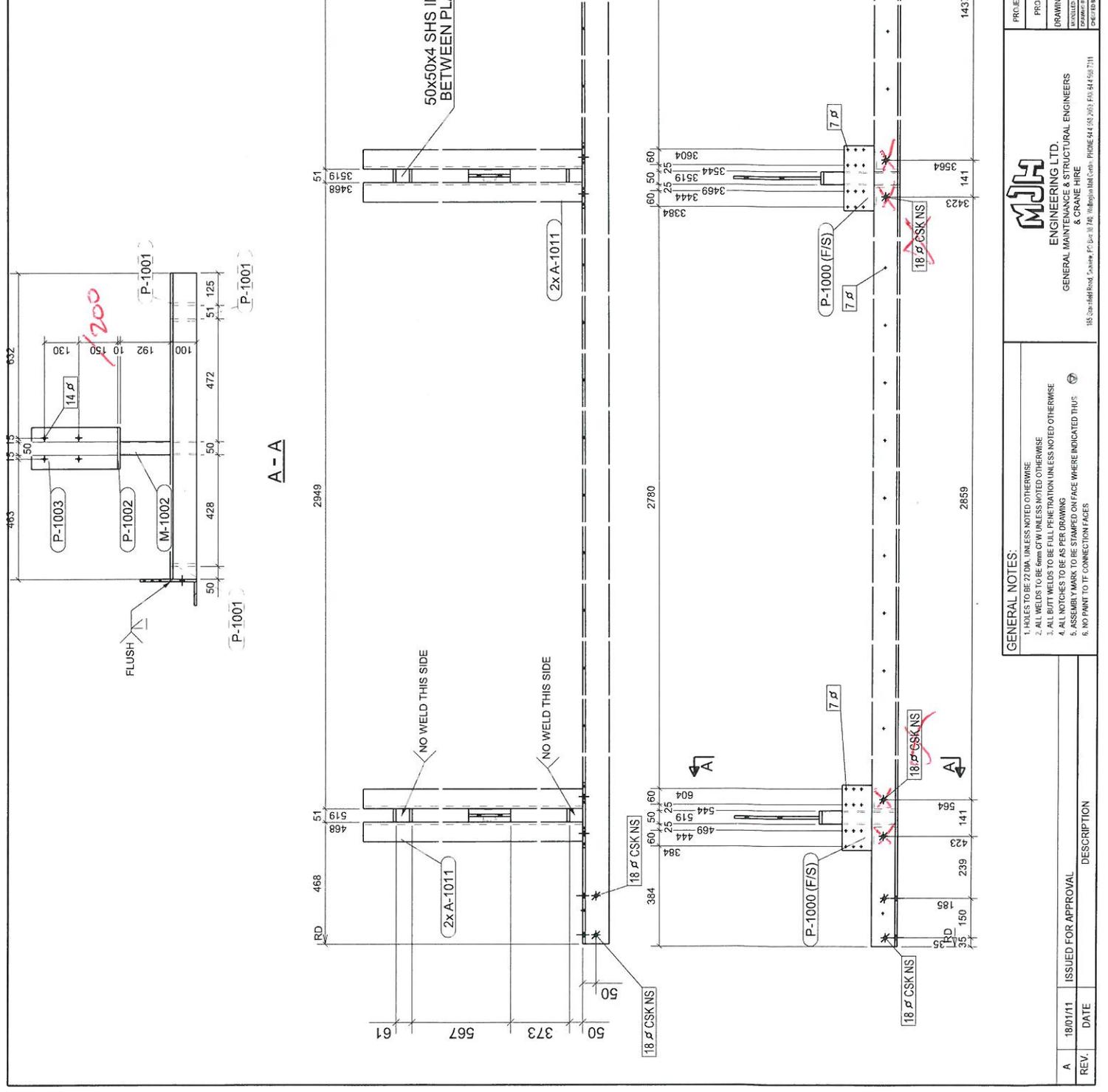
- GENERAL NOTES:**
1. HOLES TO BE 2X DIA UNLESS NOTED OTHERWISE
 2. ALL WELDS TO BE 6mm CFW UNLESS NOTED OTHERWISE
 3. ALL BUTT WELDS TO BE FULL PENETRATION UNLESS NOTED OTHERWISE
 4. ALL NOTCHES TO BE AS PER DRAWING
 5. ASSEMBLY MARK TO BE STAMPED ON FACE WHERE INDICATED THIS
 6. NO PAINT TO FF CONNECTION FACES

REV.	DESCRIPTION
A	ISSUED FOR APPROVAL
18/01/11	DATE

MATERIAL LIST FOR ONE ASSEMBLY MARK LA-1004

PART	PROFILE	GRADE	QTY	LENGTH	AREA	WEIGHT
A-1003	EA100*100*10	300PLUS	1	5186	2.02	73.7
A-1011	UA100*75*10	300PLUS	4	1175	1.50	58.3
M-1002	SHS50*50*4.0	C350L0	2	292	0.11	3.1
P-1000	FL10*250	300	2	115	0.13	4.5
P-1001	FL10*50	300	6	100	0.08	2.4
P-1002	FL10*50	300	2	160	0.04	1.3
P-1003	FLT10*160	300	2	330	0.23	8.3
Total - One Assembly					4.21	151.5

GRID LOCATION
3-5/A



DUNNING THORNTON CONSULTANTS LTD
STOP DRAWING REVIEW
DRAWING STATUS

A NO EXCEPTIONS TAKEN:
 Production may commence subject to review by others

B MINOR COMMENTS NOTED:
 Production may commence subject to review by others

C COMMENTS NOTED:
 Amend and resubmit for further review

Review Date: 17/01/11

This review is only for the purpose of determining if the drawing contains errors. The reviewer is not responsible for ensuring that all drawings are accurate and complete.

APPROVAL

REV. A	18/01/11	ISSUED FOR APPROVAL	DESCRIPTION
--------	----------	---------------------	-------------

PROJECT NO.	6994FS22
PROJECT	FIRST LIGHT FOUNDATION
DRAWING TITLE	ANGLE FRAME
DESIGNED BY	RICHARD
CHECKED BY	MAINZEAL
DATE	1
PHASE	1
LOT	1
REF NO.	LA-1004

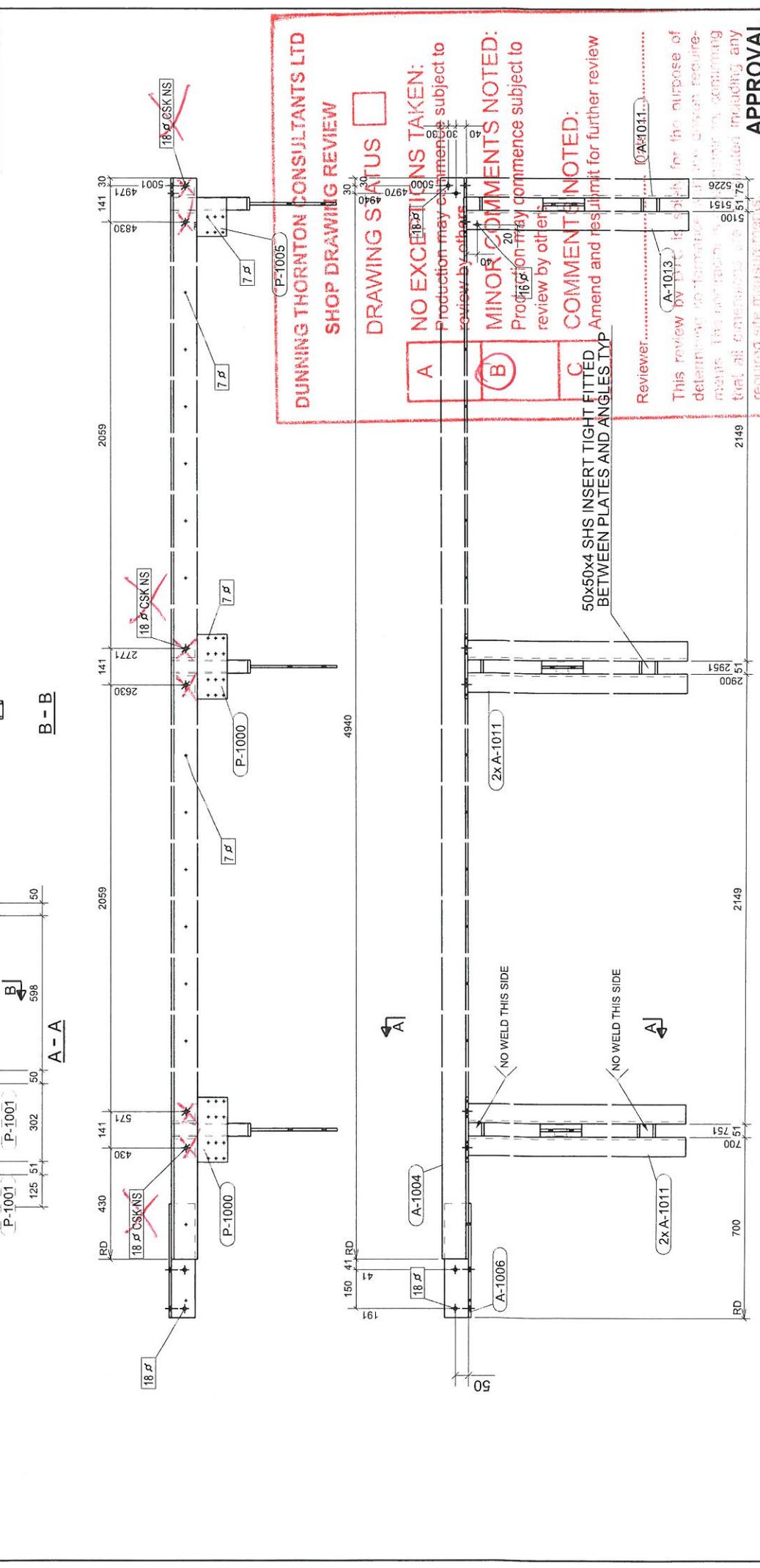
MJH
ENGINEERING LTD
 GENERAL MAINTENANCE & STRUCTURAL ENGINEERS
 185 Southfield Road, Capenhurst, P.O. Box 314, Macclesfield, Cheshire, M13 9PL, UK
 Tel: 01625 532323 Fax: 01625 532324

- GENERAL NOTES:
- HOLES TO BE 2 DIA. UNLESS NOTED OTHERWISE
 - ALL WELDS TO BE 6mm GTW UNLESS NOTED OTHERWISE
 - ALL BUTT WELDS TO BE FULL PENETRATION UNLESS NOTED OTHERWISE
 - ALL NOTCHES TO BE AS PER DRAWING
 - ASSEMBLY MARK TO BE STAMPED ON FACE WHERE INDICATED PLUS
 - NO PAINT TO BE CONNECTION FACES

MATERIAL LIST FOR ONE ASSEMBLY MARK LA-1005

PART	PROFILE	GRADE	QTY	LENGTH	AREA	WEIGHT
A-1004	EA100*100*10	300PLUS	1	5000	1.85	71.0
A-1005	EA100*100*10	300PLUS	1	440	0.17	6.3
A-1011	UA100*75*10	300PLUS	5	1175	2.00	72.9
A-1013	UA100*75*10	300PLUS	1	1175	0.40	14.6
M-1002	SHS50*50*4.0	C350L0	3	292	0.16	4.7
P-1000	FL10*250	300	2	115	0.13	4.5
P-1001	FL10*50	300	9	100	0.12	3.6
P-1002	FL10*50	300	3	150	0.06	1.9
P-1003	FL10*160	300	3	330	0.35	12.4
P-1005	FL10*150	300	1	115	0.04	1.4
Total - One Assembly					5.37	193.2

GRID LOCATION
4-7/C



GENERAL NOTES:

- HOLES TO BE 2 DIA UNLESS NOTED OTHERWISE
- ALL WELDS TO BE 6mm CFW UNLESS NOTED OTHERWISE
- ALL BUTT WELDS TO BE FULL PENETRATION UNLESS NOTED OTHERWISE
- ALL NOTCHES TO BE AS PER DRAWING
- ASSEMBLY MARK TO BE STAMPED ON FACE WHERE INDICATED THIS
- NO PAINT TO TC CONNECTION FACES

APPROVAL

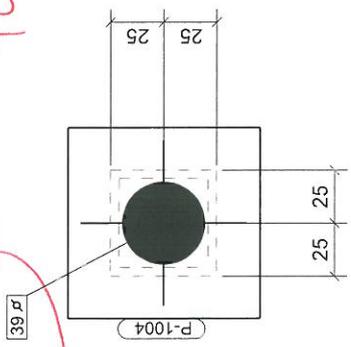
PROJECT NO.	6994F522	PROJECT	FIRST LIGHT FOUNDATION
DRAWING TITLE	ANGLE FRAME	FINISH	
SCALE BY	RICHARD	CLIENT	MANZEAL
DRAWN BY		REF NO.	1
CHECKED BY		PHASE	1
DATE		LOT 1	1
		DRW NO.	LA-1005

MJA ENGINEERING LTD.
GENERAL MAINTENANCE & STRUCTURAL ENGINEERS
& CRANE HIRE
15 The Mall Road, Sarnia, PO Box 276, Sarnia, Ontario, N6H5E4 (519) 261-8444 (519) 261-8444

MATERIAL LIST FOR ONE ASSEMBLY MARK S-1001

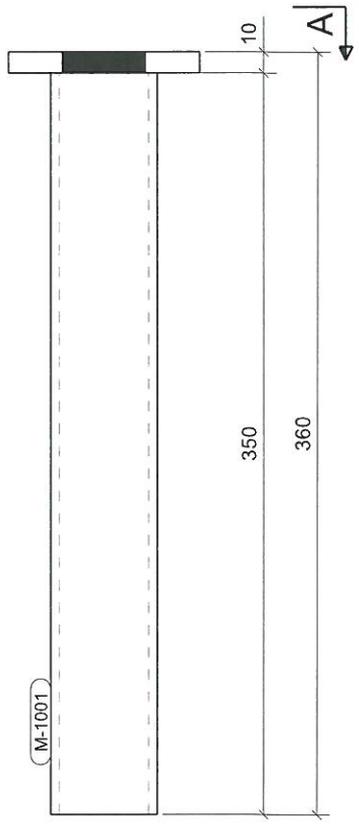
PART	PROFILE	GRADE	QTY	LENGTH	AREA	WEIGHT	
M-1001	SHS50*50*4.0	C350L0	1	350	0.06	1.9	
P-1004	FL10*90	300	1	90	0.02	0.6	
Total - One Assembly						0.08	2.5

TO TIGHT FIT
STANDARD
SCAFFOLD
SCREW.



A - A

A



DUNNING THORNTON CONSULTANTS LTD
7/C

SHOP DRAWING REVIEW

DRAWING STATUS

A NO EXCEPTIONS TAKEN:
Production may commence subject to review by others

B MINOR COMMENTS NOTED:
Production may commence subject to review by others

C COMMENTS NOTED:
Amend and resubmit for further review

Reviewer..... Date.....

This review by DTC is solely for the purpose of detailing conforming with the design requirements. The contractor is responsible for confirming that all dimensions are coordinated including any required site measurements.

PROJECT NO.	6994FS22
PROJECT	FIRST LIGHT FOUNDATION
DRAWING TITLE	POST
DESIGNED BY	RICHARD
CHECKED BY	IMAINZEAL
DATE	28
REV.	1
PHASE	1
REF NO.	S-1001
REV.	A

MJH
ENGINEERING LTD
GENERAL MAINTENANCE & STRUCTURAL ENGINEERS
& CRANE HIRE

181 Grandview Road, Suite 201, 314, Highgate Hill, Cape Town 7745, South Africa

GENERAL NOTES:

1. HOLES TO BE 22 DIA UNLESS NOTED OTHERWISE
2. ALL WELDS TO BE 6mm GFW UNLESS NOTED OTHERWISE
3. ALL BUTT WELDS TO BE FULL PENETRATION UNLESS NOTED OTHERWISE
4. ALL NOTCHES TO BE AS PER DRAWING
5. ASSEMBLY MARK TO BE STAMPED ON FACE WHERE INDICATED THIS.
6. NO PAINT TO TF CONNECTION FACES

REV.	DATE	DESCRIPTION
A	18/01/11	ISSUED FOR APPROVAL

APPROVAL



**Dunning
Thornton**
consultants

Ph: (64 4) 385-0019
 Fax: (64 4) 385-0312
 PO Box 27 153, Wellington
 E-Mail: dtcwgtn@dunningthornton.co.nz



SITE REPORT

Job Name: Solar Decathlon 2011
 Job No.: 6751 Page: 1/2
 Date: 04/03/2011 S.R. No: SR03
 Consent Ref:

PROGRESS:

Roof panel fabrication 90%

INSTRUCTIONS & COMMENTS:

- Roof panels (box beams and roof diaphragm) have not been fixed as per the engineering sketches. See the attached sketch for alternative screw fixings for the roof panel modules.
- In addition to the fixings shown: vertical blocking connecting the ply joists to the box beam shall have an additional 6g screw through the ply to the block from each direction.

CAT

Ryan Clarke

AGC 250111

Contract Interpretation Not Involving Any Variation
 Variation For Immediate Action (Price Must Be Submitted Within 28 Days)
 Variation Price Request (Price Must Be Approved Before Work Proceeds)

A
B
C

COPY/FAX/

Name

Organisation

Contact

PLY DIAPHRAGM FIXINGS
@ 250cfs - 6g x 50 screws

JOINT ON PLY
BOX BEAM

IF $X < 1000$

8x5g screws.
7x6g screws.
10x $\phi 25$ NAILS
EACHSIDE OF JOINT
EACHSIDE OF BEAM.
ELSEWHERE

AS BELOW

5g x 40 screws @ 215cfs.
6g x 50 screws @ 260cfs.
 $\phi 2.5 \times 50$ NAILS @ 175cfs

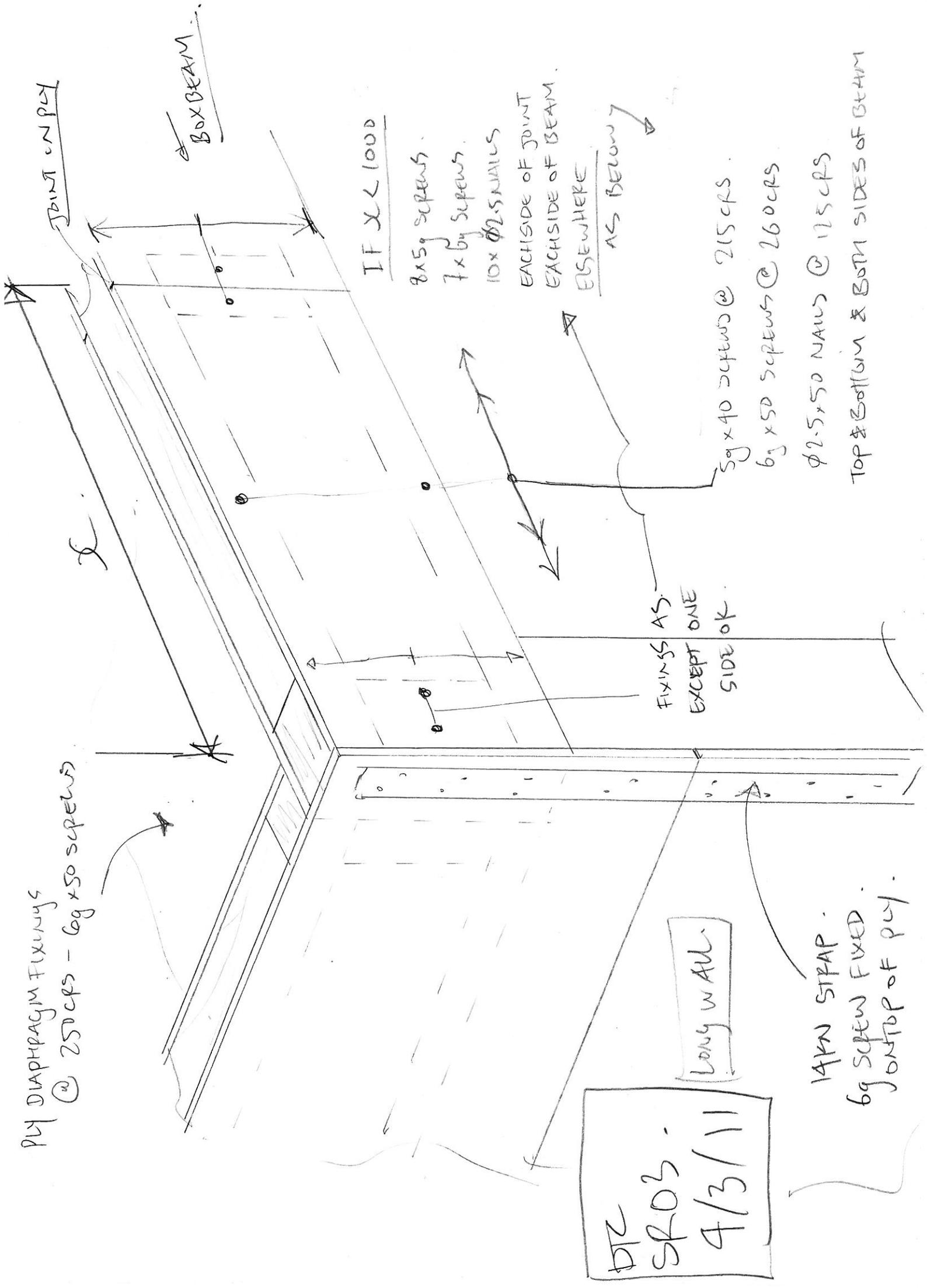
TOP & BOTTOM & BOTH SIDES OF BEAM

FIXINGS AS
EXCEPT ONE
SIDE OK.

DTC
SROB
4/3/11

LONG WALL

14KN STRAP
6g SCREW FIXED
J ON TOP OF PLY.





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SITE REPORT

Job Name: Solar Decathlon 2011
Job No.: 6751 Page: 1/1
Date: 25/04/2011 S.R. No: SR04
Consent Ref:

PROGRESS:

House envelope structure complete. Internal fit out near completion.

INSTRUCTIONS & COMMENTS:

- Confirmation of previous correspondence and site discussions: Internal transverse braced walls are ok to have a 650 wide by 245 deep penetration through the centre at the top. Wall linings to be 12mm ply one side with nail fixings at 75 crs rather than 7mm ply each side with fixings at 150 crs.
- The above has been inspected on 21/04/11 site appears to be installed as agreed.
- Random inspection of a perimeter wall hold down bracket (by cutting internal wall lining to inspect) revealed the bracket to be installed correctly.
- Steel diaphragm tie bracket installed as per the drawings. Ensure tie is not overly tightened but also does not sag or droop. Tie should be capable of producing a low E note once struck (if not dampened by touching the walls).

CAT

Ryan Clarke

AGC 250411

Contract Interpretation Not Involving Any Variation
Variation For Immediate Action (Price Must Be Submitted Within 28 Days)

A
B



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SITE REPORT

Job Name: Solar Decathlon 2011
 Job No.: 6751 Page: 1/2
 Date: 25/04/2011 S.R. No: SR05
 Consent Ref:

PROGRESS:

House envelope structure complete. Internal fit out near completion.

INSTRUCTIONS & COMMENTS:

- Refer to the attached (previously agreed and issued on email) detail for fixing the fall restraint connector to the roof modules.
- A later random inspection (04/04/11) from the underside of one of fixings revealed it to be installed as per the sketch.

CAT

Ryan Clarke

AGC 250411

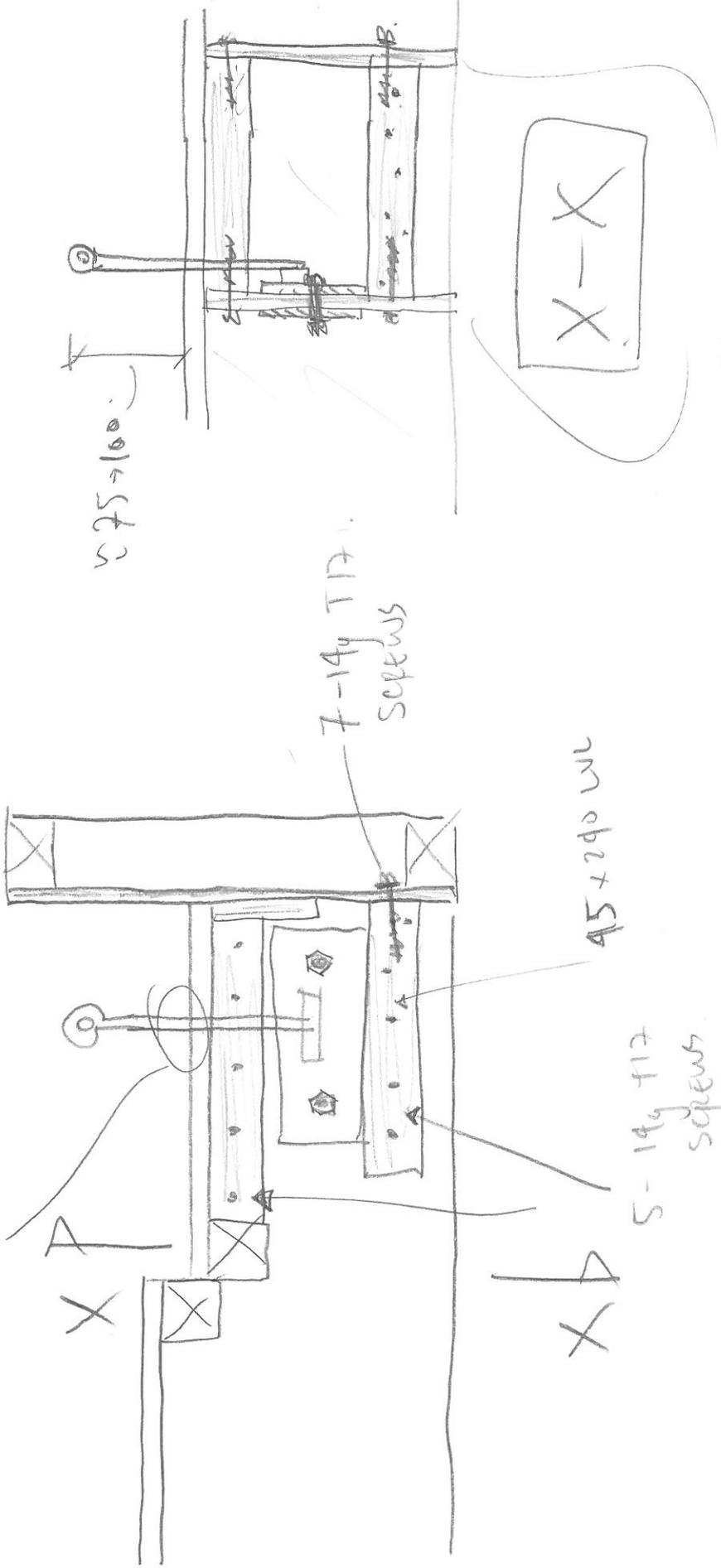
Contract Interpretation Not Involving Any Variation
 Variation For Immediate Action (Price Must Be Submitted Within 28 Days)
 Variation Price Request (Price Must Be Approved Before Work Proceeds)

A
B
C

COPY/FAX/ EMAIL TO:

	Name	Organisation	Contact
Owner:			Email
Architect:	Eli Nuttall	VUW Solar Decathlon	Email Elinuttall@gmail.com
Builder:			Email

Water proofing Detail ?!



PLY FRGS.

DTC-6751

18/03/11



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 E-Mail: dtcwgt@DunningThornton.co.nz



SITE REPORT

Job Name: Solar Decathlon 2011
 Job No.: 6751 Page: 1/7
 Date: 25/04/2011 S.R. No: SR06
 Consent Ref:

PROGRESS:

House envelope structure complete. Internal fit out near completion.

INSTRUCTIONS & COMMENTS:

- Confirmation of previous correspondence: Find attached sketches for revised canopy bracing and comments on fabrication shop drawings of bracing.

CAT

Ryan Clarke

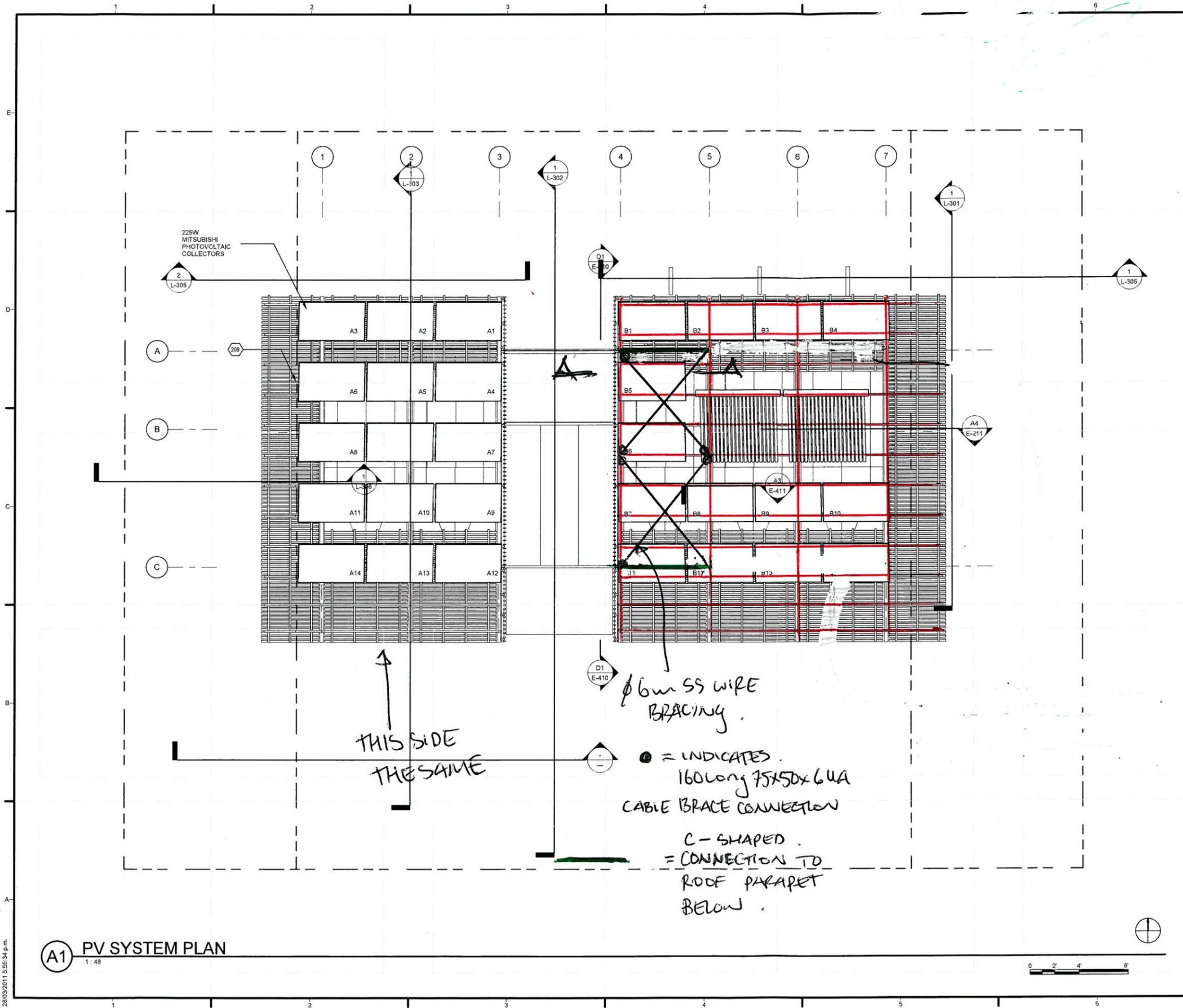
AGC 250411

Contract Interpretation Not Involving Any Variation
 Variation For Immediate Action (Price Must Be Submitted Within 28 Days)
 Variation Price Request (Price Must Be Approved Before Work Proceeds)

A
B
C

COPY/FAX/ EMAIL TO:

	Name	Organisation	Contact
Owner:			Email
Architect:	Eli Nuttall	VUW Solar Decathlon	Email Elinuttall@gmail.com
Builder:			Email



REFERENCE KEYNOTES

26 31 00 A1 225W MITSUBISHI PHOTOVOLTAIC COLLECTORS

SHEET KEYNOTES

209 PANELS MOUNTED FORWARD OF FRONT RAFTER SO BACK LINES UP WITH BACK RAFTER @ 15 DEGREES



TEAM NAME: FIRSTLIGHT NZ
 ADDRESS: 139 VIVIAN STREET
 TE ARO, WELLINGTON
 NEWZEALAND
 CONTACT: INFO@FIRSTLIGHTHOUSE.AC.NZ
 WWW.FIRSTLIGHTHOUSE.AC.NZ

CONSULTANTS
 TENNENT + BROWN ARCHITECTS
 DUNNING THORNTON CONSULTANTS LTD
 LEAP AUSTRALASIA LTD
 SOUTHERN PERSPECTIVES / SOLAR CITY

CLIENT
 U.S. DEPARTMENT OF ENERGY
 SOLAR DECATHLON 2011
 WWW.SOLARDECATHLON.GOV



MARK	DATE	DESCRIPTION
CN	11-01-11	FOR CONSTRUCTION

LOT NUMBER:	LOT NUMBER
DRAWN BY:	AUTHOR
CHECKED BY:	CHECKER
COPYRIGHT:	VICTORIA UNIVERSITY

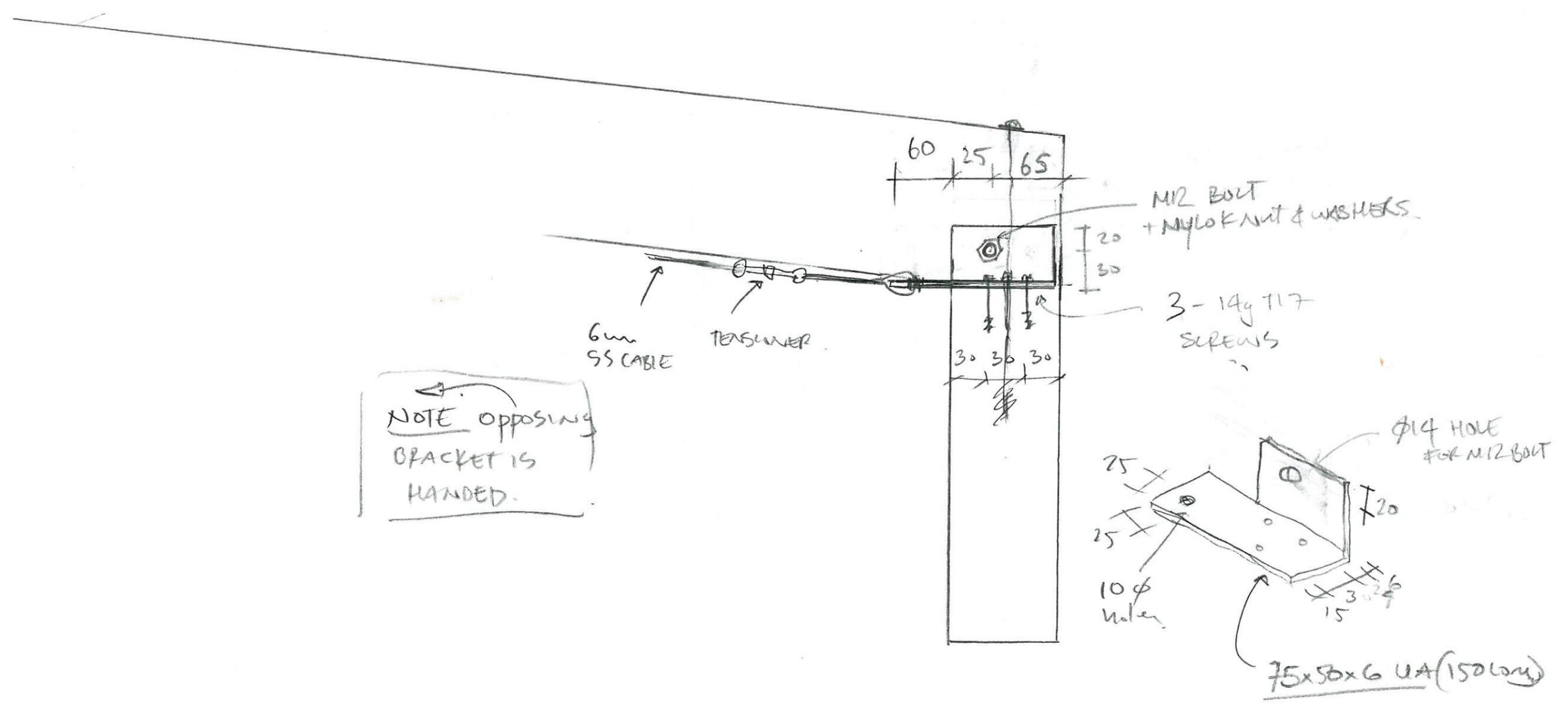
SHEET TITLE
 PV SYSTEMS PLAN

E-112

A1 PV SYSTEM PLAN
 1:48

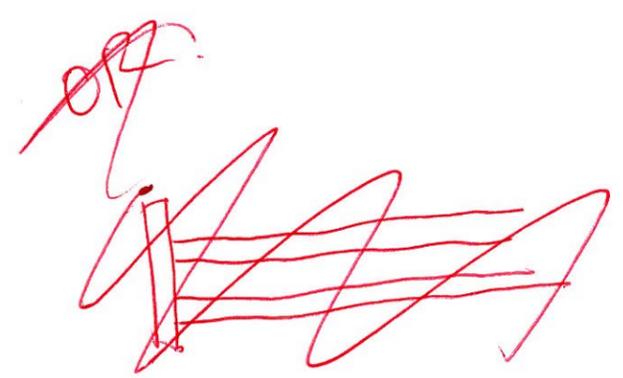
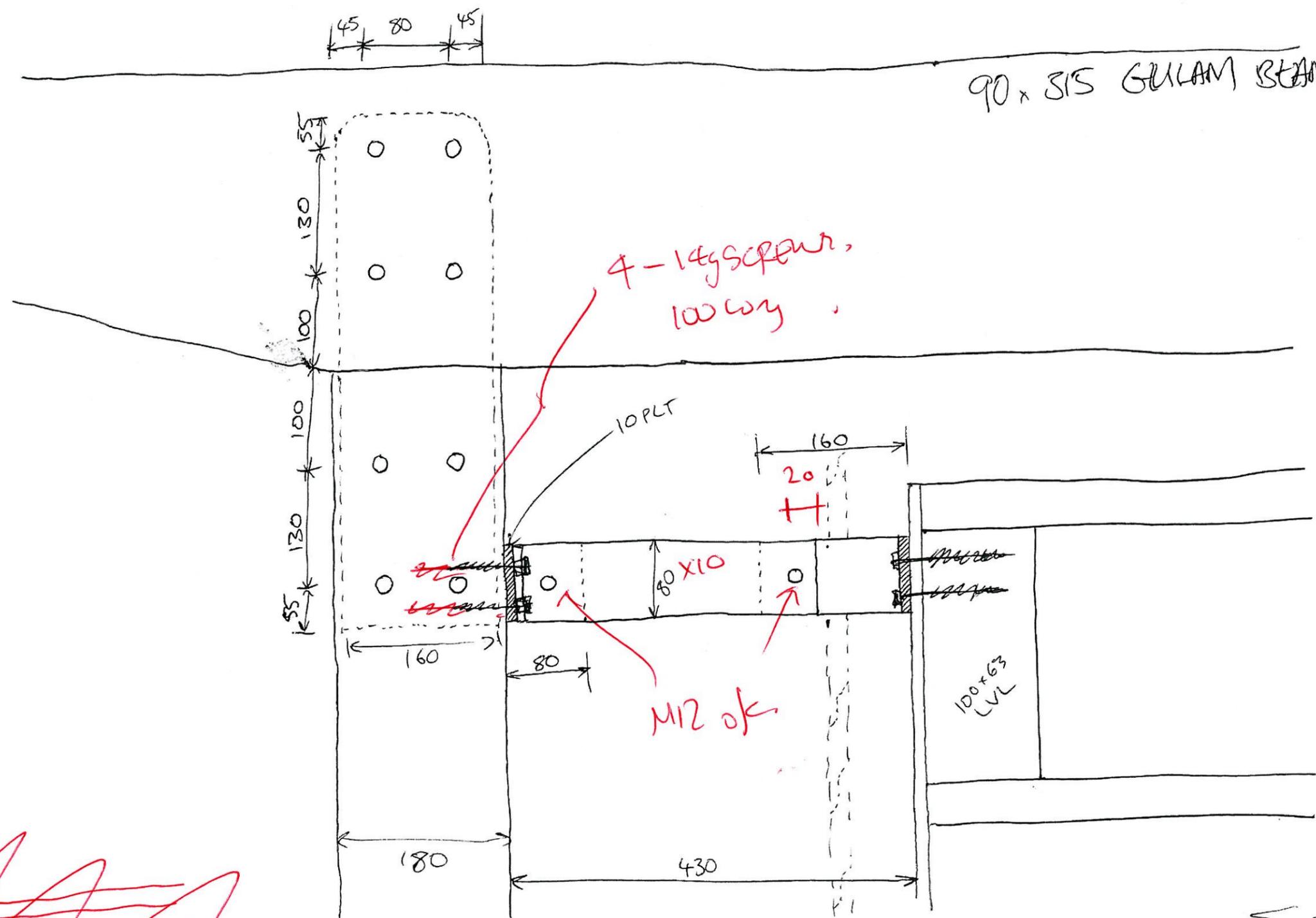


28/03/2011 5:56:34 p.m.

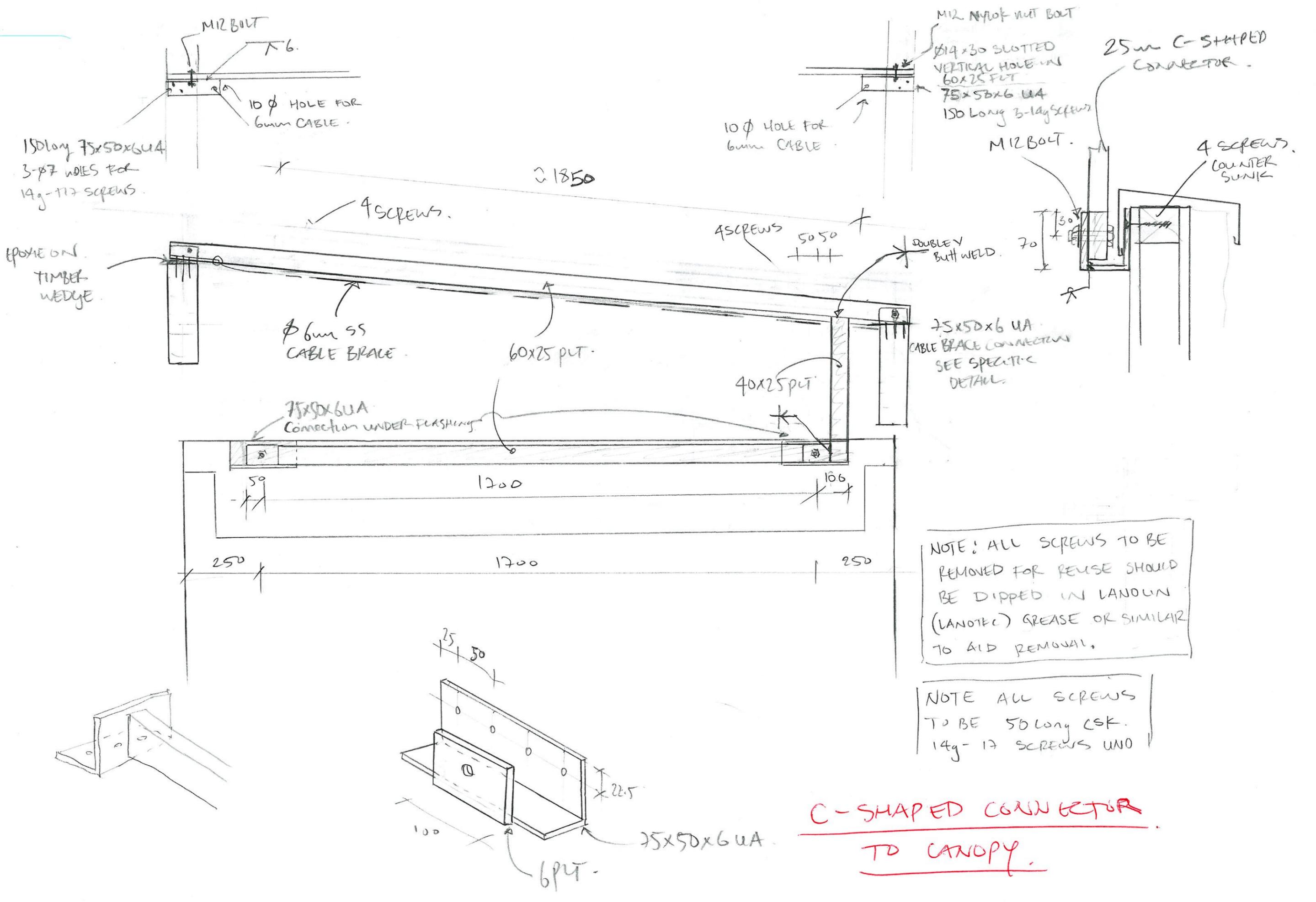


CABLE BRACE CONNECTION

90 x 315 GULAM BEAM



SECTION



150 long 75x50x6 UA
3-17 WDS for
14g-17 screws.

EPoxy ON
TIMBER
WEDGE.

M12 BOLT
10 ϕ HOLE FOR
6mm CABLE.

10 ϕ HOLE FOR
6mm CABLE.

M12 NYLON NUT BOLT
1014x30 SLOTTED
VERTICAL HOLE IN
60x25 PLT
75x50x6 UA
150 Long 3-lag screws
M12 BOLT.

25mm C-SHAPED
CONNECTOR.

4 SCREWS
COUNTER
SUNK

ϕ 6mm SS
CABLE BRACE.

60x25 PLT.

40x25 PLT.

75x50x6 UA
CABLE BRACE CONNECTION
SEE SPECIFIC
DETAIL.

75x50x6 UA
Connection UNDER FLASHING

NOTE: ALL SCREWS TO BE
REMOVED FOR REUSE SHOULD
BE DIPPED IN LANOUN
(LANOTEK) GREASE OR SIMILAR
TO AID REMOVAL.

NOTE ALL SCREWS
TO BE 50 LONG CSK.
14g-17 SCREWS UNO

C-SHAPED CONNECTOR
TO CANOPY.

75x50x6 UA
6 PLT.



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SITE REPORT

Job Name: Solar Decathlon 2011
Job No.: 6751 Page: 1/3
Date: 25/04/2011 S.R. No: SR07
Consent Ref:

PROGRESS:

House envelope structure complete. Internal fit out near completion.

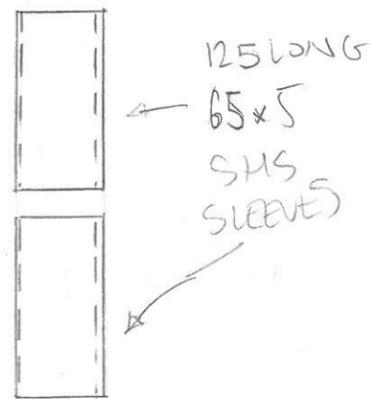
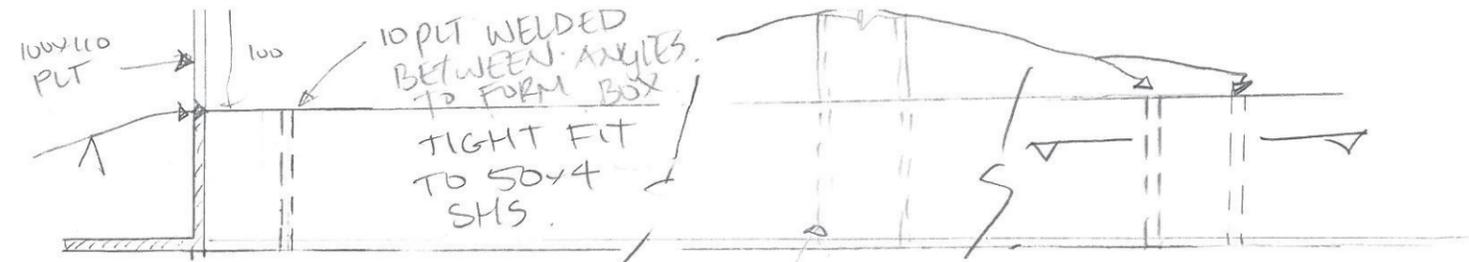
INSTRUCTIONS & COMMENTS:

- Find attached a sketch showing how the foundation legs maybe extended to accommodate the 18" (457mm) potential extension.
- We confirm that the temporary New Zealand condition at Frank Kitts Park is the critical design case for the foundations. The maximum floor height for the New Zealand condition is 600mm above ground and the lateral loads designed for are over twice that of the USA condition.
- It is important that the SHS leg and adjacent cleat is packed (shimmed) tight to the house wall to prevent rotation of the outrigger. A suggest method is to place a bottle jack adjacent the closest SHS leg to raise the support and open the gap between the SHS leg and building wall to enable packing.
- A supply of D16 reinforcing bars shall be kept on hand to peg the end of the outrigger down if the packing is unable to relieve the magnification of the rotation. Refer to the attached sketch.

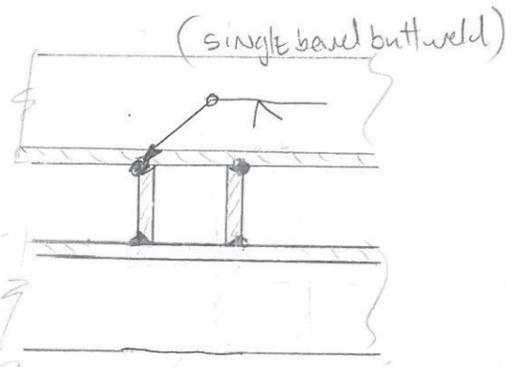
CAT

Ryan Clarke

AGC 250411



50x4 SHS FOR CANOPY POST. SHIM TO FIT & GUN FILLET WELD ROUND.



50x4 SHS SLIDING LEG.

10 PLT LARGE ENOUGH TO BEAR ONTO SCAFF SCREW NUT & 65 SHS.

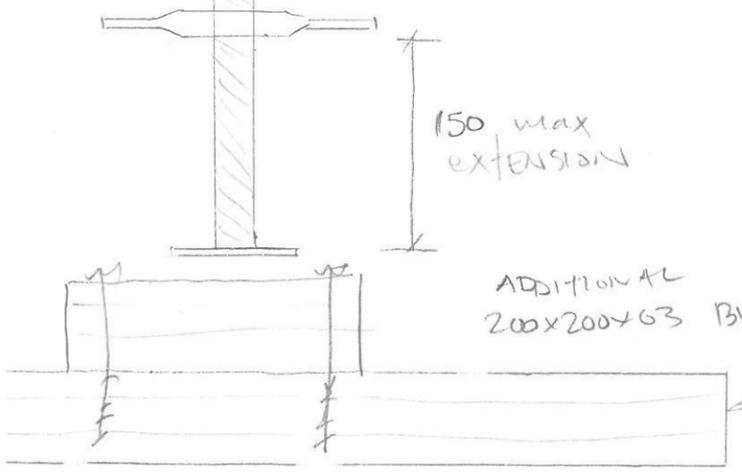
MAX EXTENSION
 = 125 + 125 + 150 + 63
 = 463 > 457

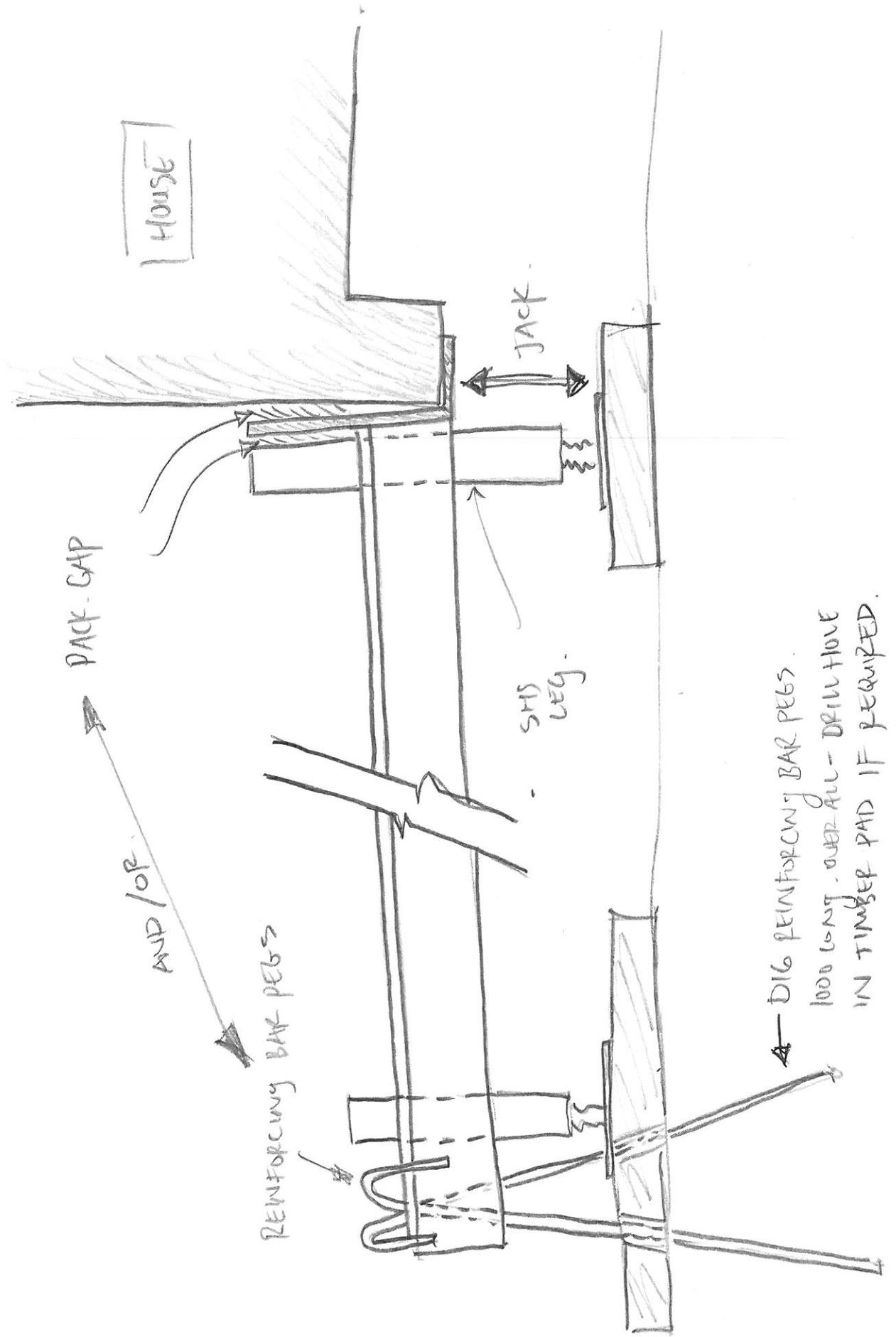
OUTER LEG AS PER INNER LEG

150 max extension

ADDITIONAL 200x200x63 Block

700x700x63 Block (400x400x63 AT OUTER PAD)





PACK GAP

AND/OR

REINFORCING BAR PEGS

SMB LEG

JACK

HOUSE

4 - DIG REINFORCING BAR PEGS.
 1000 LONG - OVER ALL - DRILL HOLE
 IN TIMBER PAD IF REQUIRED.



**Dunning
Thornton**
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SITE REPORT

Job Name: Solar Decathlon 2011
 Job No.: 6751 Page: 1/1
 Date: 03/05/2011 S.R. No: SR08
 Consent Ref:

PROGRESS:

Assembly at Frank Kitts Park: Modules assembled on foundations, Canopy roof in place.

INSTRUCTIONS & COMMENTS:

CAT

- Canopy roof C- shaped longitudinal braces have been manufactured too large and as a result sits higher than expected on the canopy and doesn't fit with the angle fixing bracket designed. A new angle bracket is required to be fabricated with a longer vertical leg to ensure the bracket is fixed in the centre of the slotted hole on the brace. Existing brackets shall be left in place in the interim to brace the canopy temporarily.
- The canopy transverse bracing strut at the rear and east of the middle module is currently packed with MDF on the side at the fixing to the building. In order to remove the MDF packing and place the fixing hard against the building the aluminium cladding channel needs to be notched to allow the fixing to move over.
- Fixing of the base of the building to the longitudinal angle bearer is yet to be completed at 600-crs. If the screws do not bite due to reuse. Use another hole or use longer screws.
- The hardwood dowels connecting the modules have been left out from the middle module. To replace the shear capacity of the three dowels use 9- 14g type 17 screws from the transverse LVL beam of the middle module to the bottom chord the adjacent module. Ensure 45mm screw tip penetration.

Ryan Clarke

AGC 030511

Contract Interpretation Not Involving Any Variation
 Variation For Immediate Action (Price Must Be Submitted Within 28 Days)
 Variation Price Request (Price Must Be Approved Before Work Proceeds)

A
B
C

COPY/FAX/ EMAIL TO:

	Name	Organisation	Contact
Owner:			Email
Architect:	Eli Nuttall	VUW Solar Decathlon	Email Elinuttall@gmail.com
Builder:			Email



PRODUCER STATEMENT – PS4 – CONSTRUCTION REVIEW

(Guidance notes on the use of this form are printed on the reverse side*)

ISSUED BY: **Dunning Thornton Consultants Ltd**
(Design Firm)

TO: **Victoria University of Wellington**
(Owner/Developer)

TO BE SUPPLIED TO: **Wellington City Council**
(Building Consent Authority)

IN RESPECT OF: **Temporary Display House for USDE Solar Decathlon**
(Description of Building Work)

AT: **Frank Kitts Park, Wellington**
(Address)
..... **LOT** **DP** **SO**

Dunning Thornton Consultants has been engaged by ... **Victoria University of Wellington** ...
(Construction Review Firm)

To provide CM1 CM2 CM3 CM4 CM5 (Engineering Categories) or OL1 OL2 OL3 OL4 (Architectural Categories)
observation or other **of Specifically Designed Structural Elements**.
(Extent of Engagement)

in respect of clause(s) B1..... of the Building Code for the building work described in documents relating to Building Consent No. **SR...222896**..... and those relating to Building Consent Amendment(s) Nos.Nil..... issued during the course of the works. We have sighted these Building Consents and the conditions of attached to them.

Authorised instructions / variations(s) No. **1 – 8** (copies attached)

or by the attached Schedule have been issued during the course of the works.

On the basis of this these review(s) and information supplied by the contractor during the course of the works, I **believe on reasonable grounds** that All Part only of the building works have been completed in accordance with the relevant requirements of the Building Consents and Building Consent Amendments identified above, with respect to Clause(s) ...B1..... of the Building Regulations.

I, **Alistair Cattanach**..... am: CPEng No. **168031**.....
(Name of Construction Review Professional)

Reg Arch No.

I am a Member of: IPENZ NZIA and hold the following qualifications: BE (hon).....

The Construction Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less Than \$200,000*.

The Construction Review Firm is a member of ACENZ: YES NO

SIGNED BY Alistair Cattanach..... ON BEHALF OF **Dunning Thornton Consultants Ltd**.....

Date: **28th June 2011**..... Signature:.....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of \$200,000.*

This form is to accompany **Forms 6 or 8 of the Building (Form) Regulations 2004** for the issue of a Code Compliance Certificate.



APPENDIX B: MANUFACTURERS PRODUCT SPECIFICATIONS

10 APPENDIX B: MANUFACTURERS SPECIFICATIONS

10.1.1 Fisher and Paykel appliances

10.1.2 Roller Blinds

10.1.3 Bladder Tanks

10.1.4 Hot Water Cylinder

10.1.5 Lighting

10.1.6 Solar Cabling

10.1.7 Lexcom Home Network

10.1.8 Mobile Crane

Installation instructions and User guide

Built-in oven

OB60 single, double, and compact models

NZ AU GB IE SG

Safety and warnings	2
Installation instructions	4
Oven controls and setting the clock	10
First use	14
Using your oven	15
Oven functions	16
Baking charts	18
Cooking with 'auto-off'	22
Using the timer	23
Automatic cooking	24
Care and cleaning	25
Warranty and service	36

Important!

SAVE THESE INSTRUCTIONS

The models shown in this user guide may not be available in all markets and are subject to change at any time. For current details about model and specification availability in your country, please visit our local website listed on the back cover or contact your local Fisher & Paykel dealer.

2 Safety and warnings

Installation

WARNING!



Electrical Shock Hazard

Always disconnect the appliance from the mains power supply before carrying out any maintenance or repairs.

Connection to a good earth wiring system is essential and mandatory. Alterations to the domestic wiring system must only be made by a qualified electrician.

Failure to follow this advice may result in death or electrical shock.

WARNING!



Fire Hazard

Do not use adapters, reducers, or branching devices to connect this appliance to the mains power supply.

Failure to follow this advice may result in overheating, burning, or fire.

WARNING!



Cut Hazard

Take care - panel edges are sharp.

Failure to use caution could result in injury or cuts.

Important safety instructions

- *To avoid hazard, follow these instructions carefully before installing or using this appliance.*
- *Please make this information available to the person installing the appliance - doing so could reduce your installation costs.*
- *This appliance must be installed and connected to the mains power supply only by a suitably qualified person according to these installation instructions and in compliance with any applicable local building and electricity regulations. Failure to install the appliance correctly could invalidate any warranty or liability claims.*

Operation and maintenance

Your built-in oven has been carefully designed to operate safely during normal cooking procedures. Please keep the following guidelines in mind when you are using your oven:

WARNING!



Electrical Shock Hazard

Switch the oven off at the wall before any cleaning or maintenance.
Failure to do so may result in death or electrical shock.

WARNING!



Hot Surface Hazard

Accessible parts may become hot when this oven is in use.
To avoid burns and scalds, keep children away.
Do not touch hot surfaces inside the oven.
Use oven mitts or other protection when handling hot surfaces such as oven shelves or dishes.
Take care when opening the oven door.
Let hot air or steam escape before removing or replacing food.
Failure to follow this advice could result in burns and scalds.

Important safety instructions

- *Isolating switch: make sure this oven is connected to a circuit which incorporates an isolating switch providing full disconnection from the power supply.*
- *Household appliances are not intended to be played with by children.*
- *Children, or persons with a disability which limits their ability to use the appliance, should have a responsible person to instruct them in its use. The instructor should be satisfied that they can use the appliance without danger to themselves or their surroundings.*
- *Safe food handling: leave food in the oven for as short a time as possible before and after cooking. This is to avoid contamination by organisms which may cause food poisoning. Take particular care during warmer weather.*
- *Do not place aluminium foil, dishes, trays, water or ice on the oven floor during cooking as this will irreversibly damage the enamel.*
- *Do not stand on the door, or place heavy objects on it.*
- *Do not use harsh abrasive cleaners or sharp metal scrapers to clean the oven door glass since they scratch the surface, which may result in shattering of the glass.*
- *Do not use a steam cleaner to clean any part of the oven.*
- *Caution. Hot air can blow from under the control panel as part of the oven's cooling system.*
- *Do not keep flammable substances in the oven.*

4 Installation instructions

OB60S and OB60N models

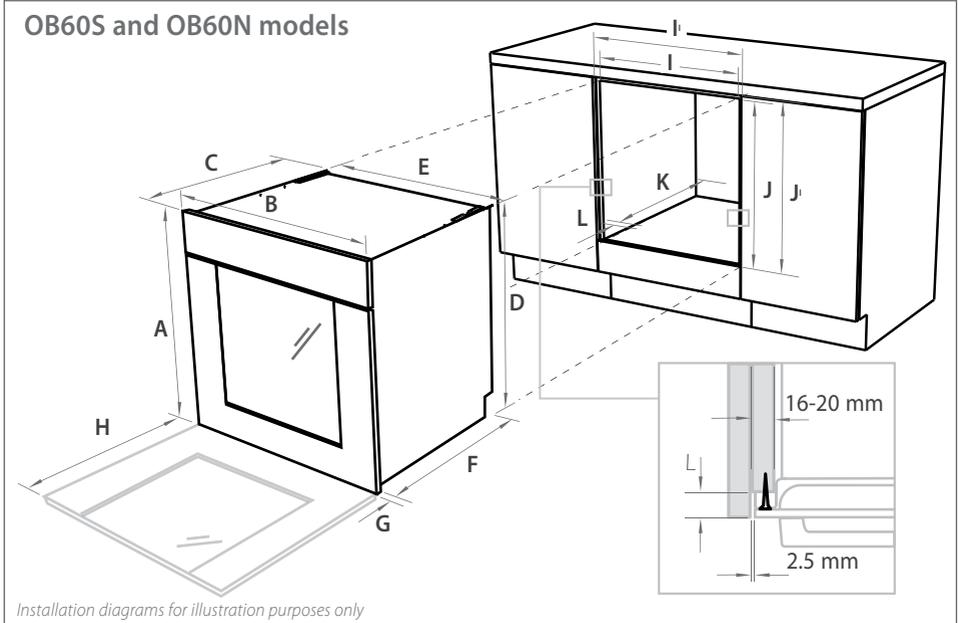


Fig. 1 OB60S and OB60N product and cabinetry dimensions

Product and cabinetry dimensions (mm)

	OB60S	OB60N
A overall height* of product	597	450**
B overall width of product	595	595
C overall depth of product (excluding handle and knobs)	567	556
D height of chassis	582	436
E width of chassis	556	536
F depth of chassis	545	532
G depth of oven frame and control panel (=distance between front of chassis and front of oven door, excl. knobs)	22	22
H depth of oven door when fully open (measured from front of control panel)	435	289
I minimum inside width of cavity	560	560
I' overall width of cavity	600	600
J inside height of cavity	585	440**
J' overall height of cavity	600	455**
K minimum inside depth of cavity	550	550
L flush fitting cabinetry clearance	22	22

Note: If installing a cooktop above the oven, ensure adequate clearance is provided for the cooktop as per the cooktop manufacturer's instructions.

*All height measurements include mounted feet.

** If fitting the lower trim extension kit, the overall height of product (A) increases by 25 mm (to 475 mm). The height of the cavity (J and J') therefore needs to be increased by 25 mm also (to 465 mm and 480 mm respectively).

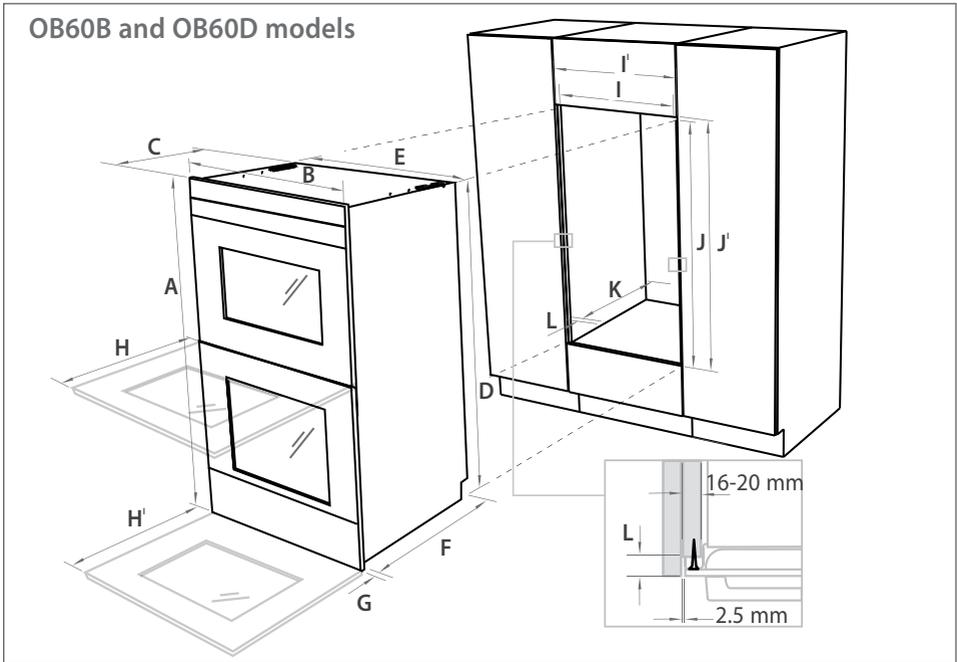


Fig. 2 OB60B and OB60D product and cabinetry dimensions

Product and cabinetry dimensions (mm)

	OB60B	OB60D
A overall height* of product	888	1077
B overall width of product	595	595
C overall depth of product (excluding handle and knobs)	567	567
D height of chassis	874	1057
E width of chassis	556	556
F depth of chassis	545	545
G depth of oven frame and control panel (=distance between front of chassis and front of oven door, excl. knobs)	22	22
H depth of upper oven door when fully open (measured from front of control panel)	261	435
H' depth of lower oven door when fully open (measured from front of control panel)	435	450
I minimum inside width of cavity	560	560
I' overall width of cavity	600	600
J inside height of cavity	877	1065
J' overall height of cavity	893	1082
K minimum inside depth of cavity	550	550
L flush fitting cabinetry clearance	22	22

*All height measurements include mounted feet.

Installation instructions

Before you install the oven, make sure that

- the benchtop and oven cavity are square and level, and are the required dimensions
- the installation will comply with all clearance requirements and applicable standards and regulations
- a suitable isolating switch providing full disconnection from the mains power supply is incorporated in the permanent wiring, mounted and positioned to comply with the local wiring rules and regulations. The isolating switch must be of an approved type and provide a 3 mm air gap contact separation in all poles (or in all active [phase] conductors if the local wiring rules allow for this variation of the requirements)
- the isolating switch will be easily accessible to the customer with the oven installed
- there is at least 1.5 m (and not more than 2 m) free length of power supply cable within the cavity for ease of installation and servicing
- the oven connection socket (if fitted) is outside the cavity if the oven is flush to the rear wall
- the oven will rest on a surface that can support its weight
- the height from the floor suits the customer
- you consult local building authorities and by-laws if in doubt regarding installation.

When you have installed the oven, make sure that

- the oven door can open fully without obstruction
- the power supply cable does not touch any hot metal parts
- the isolating switch is easily accessible by the customer
- you complete the 'Final checklist' at the end of these installation instructions.

Unpacking the oven

- Remove all packaging and dispose of it responsibly. Recycle items that you can.
- When you remove the oven from the carton, place it onto wooden blocks or similar supports to prevent damaging the lower trim.

Important!

Please take extra care not to damage the lower trim of the oven. It is important for correct air circulation and allows the door to open and close without obstruction. The manufacturer does not accept any responsibility for damage resulting from incorrect installation.

- You may remove the feet but ensure that the oven does not sit on the lower trim.

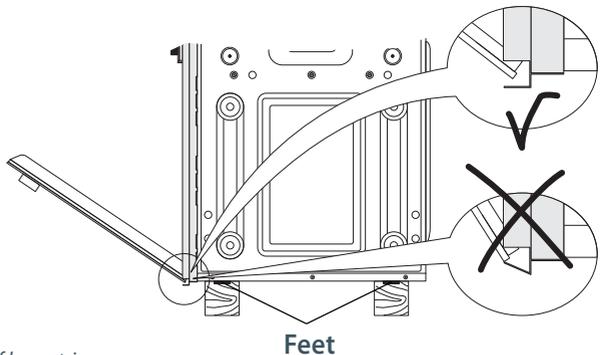
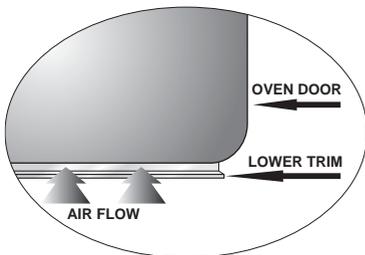


Fig. 3 Correct and incorrect placement of lower trim

Connecting the oven to the mains power supply

Important!

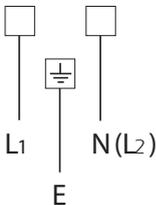
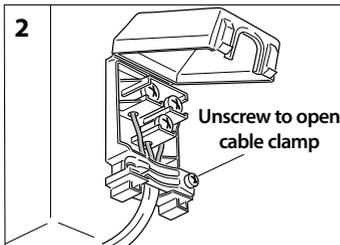
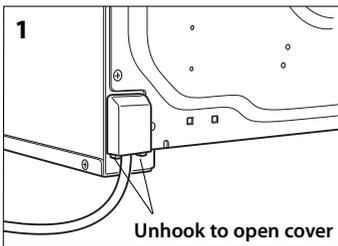
- This oven must be connected to the mains power supply only by a suitably qualified person.
- This oven must be earthed.

Before connecting the oven to the mains power supply, check that

- the domestic wiring system is suitable for the power drawn by the oven (as specified on the rating plate)
- the voltage corresponds to the value given on the rating plate.

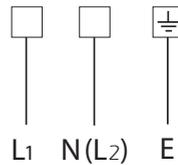
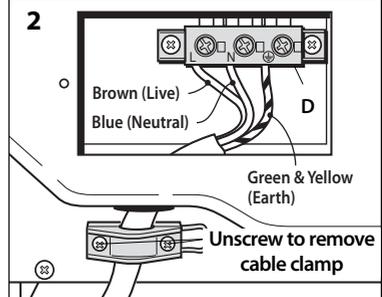
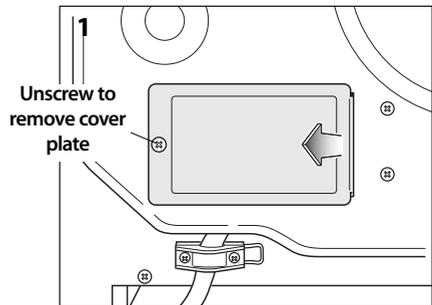
OB60S and OB60N models

Model code	Power	Voltage
OB60SL...	2350 - 2550 W	230 - 240 V~
OB60SC...	2350 - 2550 W	230 - 240 V~
OB60SD...	2350 - 2550 W	230 - 240 V~
OB60SV...	2350 - 2550 W	230 - 240 V~
OB60NL...	2050 W	220 - 240 V~
OB60NC...	2800 W	220 - 240 V~
OB60ND...	2800 W	220 - 240 V~



OB60B and OB60D models

Model code	Power	Voltage
OB60BC...	4400 - 4800 W	230 - 240 V~
OB60BD...	4400 - 4800 W	230 - 240 V~
OB60B77C...	5850 W	220 - 240 V~
OB60B77D...	5850 W	220 - 240 V~
OB60DD...	6120 W	220 - 240 V~



Securing the oven to the cabinetry

- 1 Position the oven in the prepared cavity.

Important!

Do not lift the oven by the door handle.

- 2 Open the oven door fully.
- 3 Use the supplied screws to secure the oven to the cabinetry.

Important!

- *Do not over-tighten the screws.*
- *Do not seal the oven into the cabinetry with silicone or glue. This makes future servicing difficult. Fisher & Paykel will not cover the costs of removing the oven, or of damage caused by this removal.*

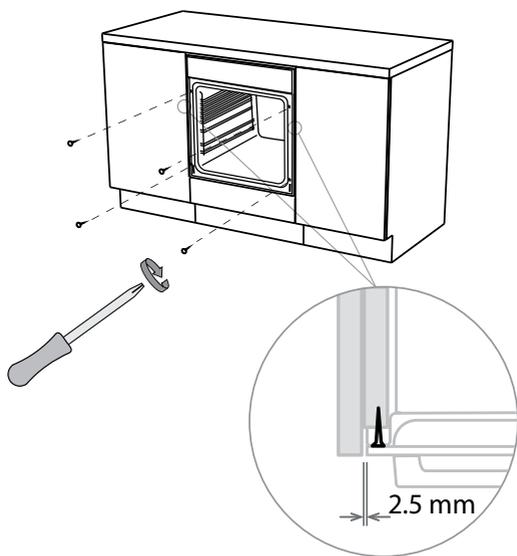


Fig. 4 Securing the oven to the cabinetry

Final checklist

TO BE COMPLETED BY THE INSTALLER



- Make sure the oven is level and securely fitted to the cabinetry.
- Check the lower trim is still undamaged.
- Open the oven door slowly to its fully open position and check if there is adequate clearance between the bottom of the door and the lower trim. This is to ensure correct air circulation. Should the lower trim become damaged, straighten the trim and ensure the oven door opens fully without obstruction.
- Turn the power to the oven on.  will flash in the clock display.
- Advise the customer to set the clock and condition the oven, following the instructions under 'First use' in the user guide.

Installer's name: _____

Installer's signature: _____

Installation company: _____

Date of installation: _____

LEAVE THESE INSTRUCTIONS WITH THE CUSTOMER

10 Oven controls and setting the clock

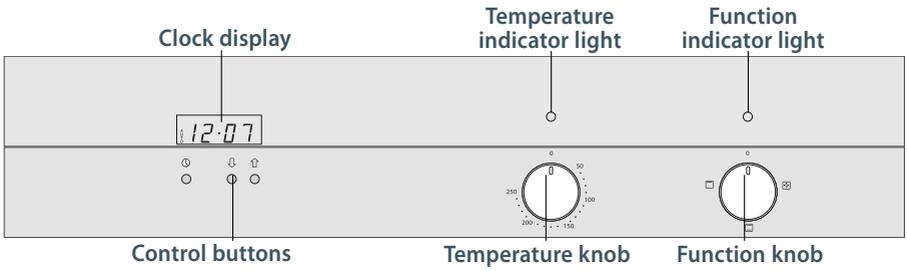


Fig. 5 Control panel- Compact models with two cooking functions

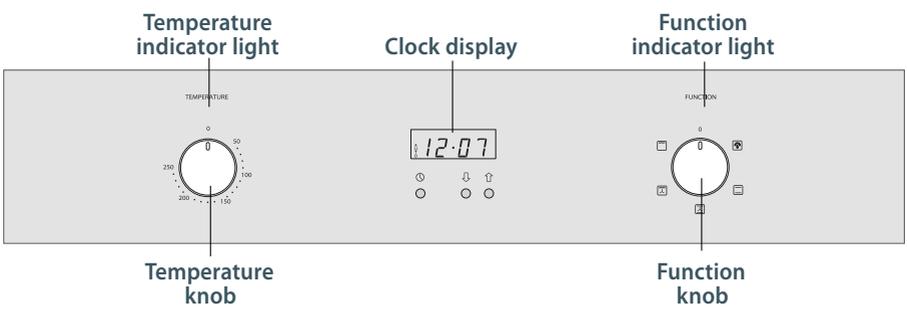


Fig. 6 Control panel- Single models with four cooking functions

Buttons

- ⌚ sets the clock, shows the time of day when oven is cooking with 'auto-off' set
- ⏮ decreases time and beep volume
- ⏭ increases time

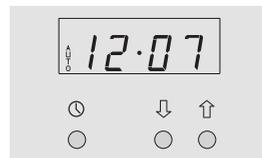


Fig. 7 Clock display and control buttons

Illuminated symbols

AUTO flashing: oven is ready to be set for cooking with 'auto-off'

AUTO steadily lit: oven is cooking with 'auto-off' set

To set the clock

When first connected, or after a power failure, **12:00** will flash in the display.

- 1 Press ⌚.
- 2 Press ⏮ and ⏭ until you have the correct time of day.

12 Oven controls and setting the clock

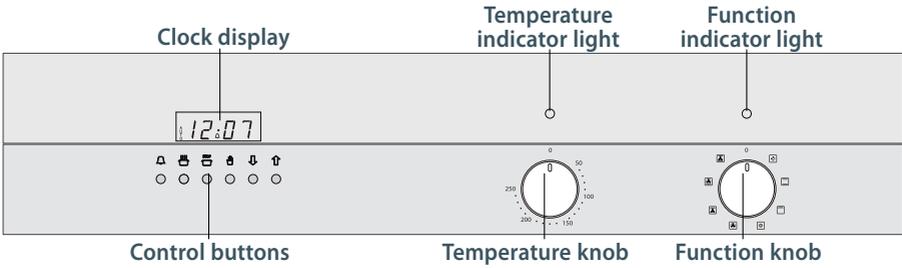


Fig. 8 Control panel- Compact models with seven cooking functions

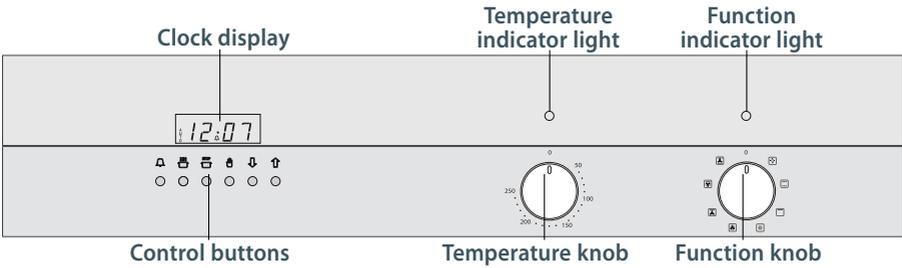


Fig. 9 Control panel- Single models with seven cooking functions

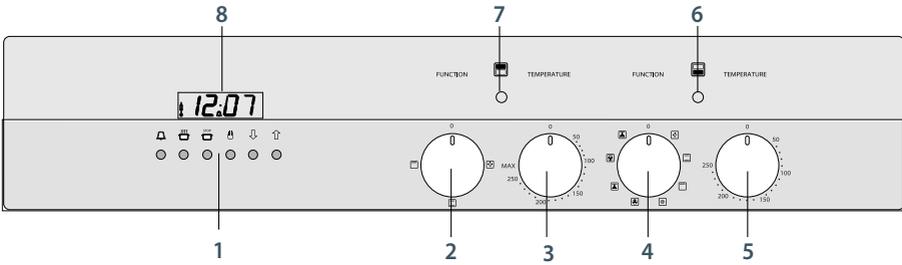


Fig. 10 Control panel- Double models with seven-function full oven and two-function compact oven

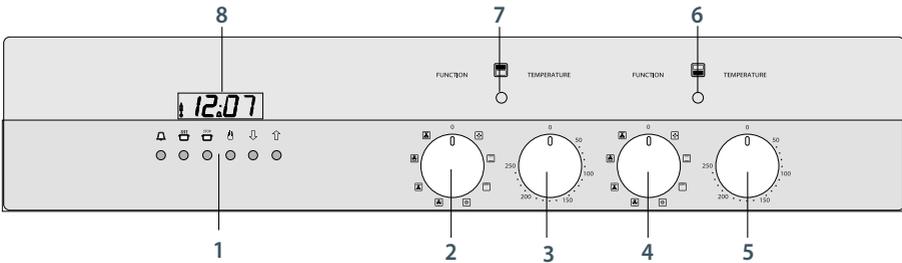


Fig. 11 Control panel- Double models with two seven-function ovens (full or compact upper oven)

- | | |
|-------------------------------|--|
| 1 Control buttons | 5 Lower oven temperature knob |
| 2 Upper oven function knob | 6 Lower oven temperature indicator light |
| 3 Upper oven temperature knob | 7 Upper oven temperature indicator light |
| 4 Lower oven function knob | 8 Clock display |

Buttons

-  sets the timer
-  sets the cooking time for automatic cooking
-  sets the stop time for automatic cooking
-  sets the clock, returns oven to manual mode, cancels automatic cooking
-  decreases time and beep volume
-  increases time

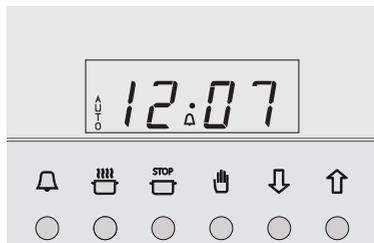


Fig. 12 Clock display and control buttons

Illuminated symbols

AUTO flashing: oven is ready to be set for automatic cooking or the clock needs to be set (after a power failure)

AUTO steady lit: oven is set for automatic cooking

 timer in operation

AUTO flashing and timer beeping when you have set the stop time for automatic cooking: program error (The time of day lies between the cooking start and the stop time.)

To set the clock

When first connected, or after a power failure,  and **AUTO** will flash in the display.

- 1 Press .
- 2 Press  and  until you have the correct time of day.

14 First use

Before using your new oven, please:

- 1 Read this user guide, taking special note of the 'Safety and warnings' section.
- 2 Remove all accessories and packaging. Make sure you peel the protective film off all surfaces.
- 3 Set the clock. The oven will not work until the clock has been set.
 - See 'Oven controls and setting the clock' for instructions.
- 4 Condition the oven:
 - Slide in the shelf/shelves and grill tray as shown in Fig.13 below. Fit them between the metal wires of the side racks, with the safety stop notch down and at the back.
 - If you have catalytic panels and sliding shelf supports, make sure these are fitted too. See 'Care and cleaning' for instructions if they are not already fitted.
 - Heat the oven on maximum temperature for the times below (see 'Using your oven'):

60 minutes using 

30 minutes using 

15 minutes using 

Note: some of these functions may not be available in some models.

- There will be a distinctive smell during the conditioning. This is normal, but make sure your kitchen is well ventilated.
- 5 Once cooled, wipe out the oven with a damp cloth and mild detergent, and dry thoroughly.

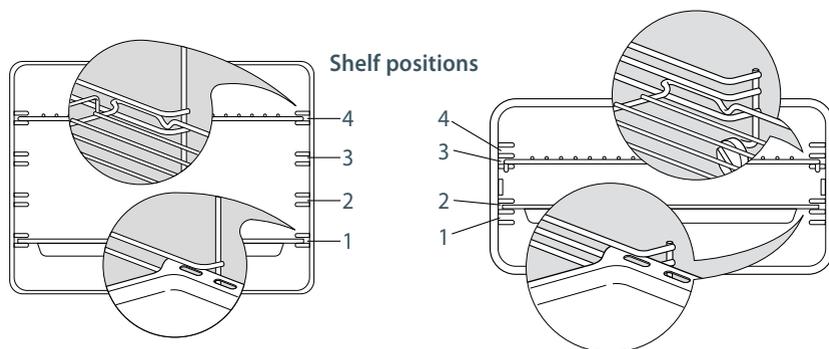


Fig. 13 Correct position of shelves and grill tray - full and compact ovens

To start cooking

- 1 Select the function.
 - The oven light(s) will come on.
 - In single and compact models, the function indicator light will also come on.
- 2 Set the temperature.
 - The temperature indicator light will come on. It will go out when the oven has reached the set temperature.
 - The temperature indicator light may come on and go out again during cooking as the oven maintains the temperature.

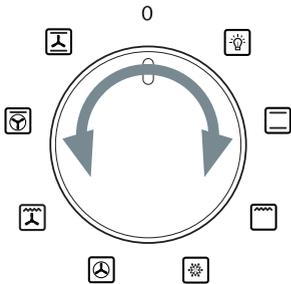


Fig. 14 Turning the function knob
(functions and knobs may vary)

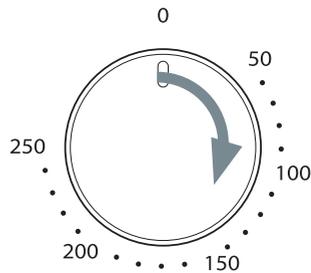


Fig. 15 Turning the temperature knob
(knobs may vary)

When you have finished cooking

- Turn both the function and temperature knobs to the off (0) position.

If AUTO is flashing or steadily lit, press  to return the oven to manual mode (six-button clock models only).

Notes:

- Set the temperature back to off (0) before changing functions during cooking.
- A cooling fan may automatically come on at different times during cooking and blow out warm air below the control panel. It may continue to run even after the oven has been turned off. This is normal.

16 Oven functions

Depending on your model, you may only have some of these functions.



OVEN LAMP

Only the oven light comes on. It remains on in all the cooking functions.



BAKE

This is the traditional method of baking. It is best to bake on only one shelf at a time in this function. Ideal for large cakes and dishes that bake for several hours.



GRILL

Use with the oven door closed and the temperature set no higher than 225°C. For best results, use the topmost shelf position when you want quick browning (eg toast).



DEFROST

Only the oven fan comes on. Use with the temperature set to 0. The fan circulates air around the oven, speeding up the defrosting process by approximately 30%. Note: this function is not for cooking food.



FAN FORCED

Great for multi-shelf cooking. The consistent temperature ensures baking is well risen. Cookies are crisp on the outside and chewy in the middle, meat and poultry are deliciously browned and sizzling while remaining juicy and tender.



FAN GRILL

Use with the oven door closed and the temperature set no higher than 220°C. Ideal for roasting tender cuts of meat and poultry. Use the lower shelf positions for larger items eg a whole chicken.



or



WARM

Use this function to keep cooked food hot and to warm plates and serving dishes. To reheat food from cold, set the temperature to 150°C and reduce it to 70-100°C only when the food is piping hot. Note: this function is not for cooking food and the temperature cannot be set higher than 150°C.



FAN BAKE

Ideal for dishes like lasagne that need to brown on top and also single trays of small cakes or biscuits that bake in less than an hour.

Important!

Safe food handling: leave food in the oven for as short a time as possible before and after cooking or defrosting. This is to avoid contamination by organisms which may cause food poisoning. Take particular care during warmer weather.

Notes on baking:

- Preheat the oven before baking.
- Do not place anything, including water or ice, on the oven floor.
- Remove the fat filter before baking (some models only).

Notes on using the fat filter (some models only):

- Use the fat filter only when roasting meat and poultry on FAN BAKE, FAN GRILL or FAN FORCED. It helps to keep your oven clean and reduces splatter and smoking.
- Clean the fat filter after every use. See 'Care and cleaning'.
- Remove the fat filter before baking.

Important!

If the fat filter is not cleaned after every use, the grease build-up will block and shorten the life of the fan element.

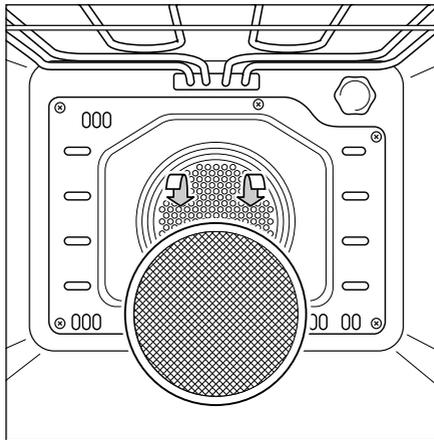


Fig. 16 Fat filter (not supplied with all models)

18 Baking charts

Please note:

- The settings in the following charts are guidelines only. Follow the instructions in your recipe or on packaging and be prepared to adjust the oven settings and baking times to achieve the best possible results for you.
- Shelf positions are counted from the base up (1 is the lowest, 4 the highest).
- Arrange oven shelves before you turn the oven on, then preheat the oven to the required temperature (until the temperature indicator light goes out).
- Full ovens are ideal for multi-shelf baking or larger items.
- Compact ovens are the ideal and most energy-efficient choice for baking small or flat items (eg cookies, pizza) on a single shelf; however, they have not been designed for multi-shelf baking.
- Settings in **bold** indicate the **recommended** oven function.

Baking chart - full ovens

- The shelf positions recommended below use the flat oven shelf (not the step-down shelf) used either with or without sliding shelf supports. Note: the step-down shelf and sliding shelf supports are not supplied with all models.

Food	 BAKE			
		Shelf position	Temperature (°C)	Time (mins)
Small cakes	single shelf	2	180-190	13-17
	multi shelf		<i>not recommended</i>	
Scones	single shelf	2	210-230	8-12
	multi shelf		<i>not recommended</i>	
Sponge	two small (20 cm), staggered on shelf	2	170-190	25-35
	one large (26 cm)	2	175	30-40
Light fruit cake		2	155-165	80-100
Rich fruit cake	exact baking time will depend on size	2	130-150	3-6 hours
Apple pie		1	185	35-45
Custard tart		1	220, then 180*	10, then 20-30*

* This is a two-stage baking process: adjust the temperature after the first stage.

continued...

Baking chart - full ovens

 FAN BAKE				
Food		Shelf position	Temperature (°C)	Time (mins)
Small cakes	single shelf	2	150-170	13-17
	multi shelf		<i>not recommended</i>	
Scones	single shelf	2	200-220	8-12
	multi shelf		<i>not recommended</i>	
Sponge	two small (20 cm), staggered on shelf	2	160-175	20-30
	one large (26 cm)	2	150	30-40
Light fruit cake		2	150-160	80-100
Rich fruit cake			<i>not recommended</i>	
Apple pie		1	160	35-45
Custard tart			<i>not recommended</i>	

 FAN FORCED				
Food		Shelf position	Temperature (°C)	Time (mins)
Small cakes	single shelf	2	150-170	13-17
	multi shelf	1 and 4**	150-170	15-20
Scones	single shelf	2	210-230	8-12
	multi shelf	1 and 4**	210-230	10-14
Sponge	two small (20 cm), staggered on shelf	2	170-190	25-35
	one large (26 cm)	2	175	30-40
Light fruit cake		2	155-165	80-100
Rich fruit cake	exact baking time will depend on size	2	130-150	3-6 hours
Apple pie		1	185	35-45
Custard tart			<i>not recommended</i>	

** Use the flat shelf in position 1 and the step-down shelf in position 4.

20 Baking charts

Baking chart - compact ovens

- The shelf positions recommended below use the step-down shelf without sliding shelf supports.

Food		 BAKE	Shelf position	Temperature (°C)	Time (mins)
Small cakes			2	180-190	13-17
Scones			2	210-230	8-12
Sponge	two small (20 cm), staggered on shelf		2	170-190	25-35
	one large (26 cm)		2	175	30-40
Light fruit cake			2	155-165	80-100
Rich fruit cake		exact baking time will depend on size	2	130-150	3-6 hours
Apple pie			1	185	35-45
Custard tart			1	220, then 180*	10, then 20-30*

* This is a two-stage baking process: adjust the temperature after the first stage.

continued...

Baking chart - compact ovens

 FAN BAKE				
Food		Shelf position	Temperature (°C)	Time (mins)
Small cakes		2	150-170	13-17
Scones		3	200-220	8-12
Sponge	two small (20 cm), staggered on shelf	2	160-175	20-30
	one large (26 cm)	2	150	30-40
Light fruit cake		2	150-160	80-100
Rich fruit cake		<i>not recommended</i>		
Apple pie		1	160	35-45
Custard tart		<i>not recommended</i>		

 FAN FORCED				
Food		Shelf position	Temperature (°C)	Time (mins)
Small cakes		2	150-170	13-17
Scones		2	210-230	8-12
Sponge	two small (20 cm), staggered on shelf	2	170-190	25-35
	one large (26 cm)	2	175	30-40
Light fruit cake		2	150-160	80-100
Rich fruit cake	exact baking time will depend on size	2	130-150	3-6 hours
Apple pie		1	185	35-45
Custard tart		<i>not recommended</i>		

22 Cooking with 'auto-off'

Use 'auto-off' to automatically turn the oven off when the set cooking time has elapsed.

To set the oven for cooking with 'auto-off'

1 Set the oven:

- Check the clock shows the correct time (eg 12:07).
- Select the function and set the temperature. The oven will turn on.

2 Set the cooking time:

- Decide how long the food will take to cook, allowing time for preheating if necessary (eg 40 minutes).
- Press .
- While AUTO is flashing, use  and  to set the cooking time (eg 40 minutes).

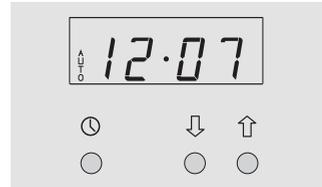


Fig. 17 Three-button clock display and control buttons

Notes on setting the cooking time

If the cooking time is 99 minutes or less:

- you can set it in 10-second steps
- the remaining time will count down in seconds (min-sec).

If the cooking time is 100 minutes (ie 1 hour 40 minutes) or more:

- you can set it in 1-minute steps
- the remaining time will start counting down in minutes (h-min).

When 'auto-off' is set

- The time will start counting down and the clock display will show the remaining time with AUTO steadily lit.
- To see the current time of day, press .
- To cancel the 'auto-off' setting, press  and  together. The current time of day will appear in the display. Turn the function and temperature knobs to O (off).

When the cooking time is over

- The oven will automatically turn off (eg at 12:47). AUTO will start flashing, the current time of day will appear in the display and the timer will beep:
 - 1 Press any button to stop the beeping and return the oven to manual mode.
 - 2 Turn the function and temperature knobs to O (off).

You can use the timer at any time, even when the oven is not in use.

Important!

The timer does NOT turn the oven off.

To set the timer

- 1 Press . will show and the symbol will start flashing.
- 2 Press and to set the time you want (up to 23 hours and 59 minutes, in 1-minute steps).
 - After a few seconds, the clock will show the time of day with the symbol steadily lit. The timer is now counting down.

To check the remaining time

Press .

To cancel the timer

- 1 Press .
- 2 Press until the time is reset to
 - After a few seconds, the clock will show the time of day.

When the set time is up

- The timer will beep and the symbol will flash. Press to stop the beeping and turn the timer off.
- After a few seconds, the clock will show the time of day.

To adjust the beep volume

Press to hear the next volume level. The last one selected will be stored.

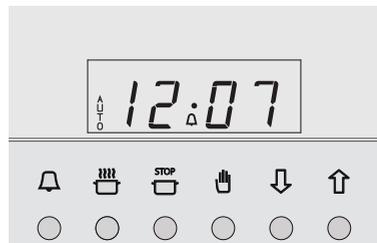


Fig. 18 Six-button clock display and control buttons

24 Automatic cooking

Important!

- In double models with compact upper ovens, only the lower (main) oven can be set for automatic cooking.
- In double models with two full ovens, only the upper oven can be set for automatic cooking.

To set the oven for automatic cooking**1 Set the oven:**

- Check the clock shows the correct time (eg 12:07).
- Select the function and set the temperature. The oven will turn on.

2 Set the cooking time:

- Decide how long the food will take to cook, allowing time for preheating if necessary (eg 40 minutes).
- Press .
- Use  and  to set the cooking time. AUTO will show in the display.

3 Set the stop time:

- Decide when you want your food to be ready by (eg 13:30).
- Press .
- Use  and  to set the stop time.

You can turn the oven on manually and set it to turn off automatically by setting the stop time (step 3 above).

When automatic cooking is set

- If there is time before cooking starts, the oven will turn off and the current time of day and AUTO will show in the clock display, indicating that the oven is set for automatic cooking. Note: the cooling fan may stay on.
- The oven will automatically turn on at the required time (eg 12:50) and turn off at the set stop time (eg 13:30).
- To see the remaining cooking time, press .
- To see the set stop time, press .
- To cancel automatic cooking, press  and turn the function and temperature knobs to 0 (off).

When the stop time is reached

- The oven will turn off, the timer will beep and AUTO will flash.
- 1 Press  to stop the beeping and return the oven to manual mode.
 - 2 Turn the function and temperature knobs to 0 (off).

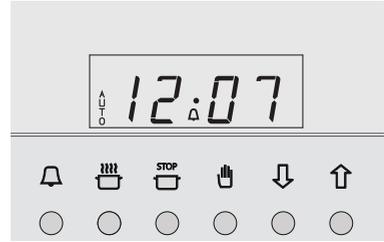


Fig. 19 Six-button clock display and control buttons

Important!

- Always switch the power to the oven off at the wall before any cleaning or maintenance. When you switch the power back on after cleaning, you will have to set the clock.
- Do not use abrasive cleaners, cloths or pads to clean any part of your oven. Some nylon scourers may also scratch. Check the label.
- See the following pages for instructions on removing and refitting different parts of the oven for cleaning.
- Before cleaning, make sure the oven is a safe temperature to touch.
- Do not use a steam cleaner.

What?	How?	Important!
General advice	<ul style="list-style-type: none"> ▪ Wipe out the oven after every use. ▪ Wipe up spills as soon as the oven is a safe temperature to touch. 	<ul style="list-style-type: none"> ▪ Avoid leaving alkaline or acidic substances (such as lemon juice, vinegar or salty spills) on the oven surfaces. ▪ Do not use cleaning products with a chlorine or acidic base.
Stainless steel surfaces	<ol style="list-style-type: none"> 1 Wipe the soiling off with a cloth using a mild household detergent or stainless steel cleaner. 2 Wipe the surface dry. 3 Use a suitable stainless steel polish. 	Immediately wipe off any caustic cleaners if they are spilled onto the oven door handle or the knobs.
Glass surfaces	Wipe with a damp cloth or use a glass cleaner.	Do not use harsh abrasive cleaners or sharp metal scrapers since they scratch the surface and may result in the glass shattering.
Oven cavity (enamel)	<ol style="list-style-type: none"> 1 Remove everything from the oven: all shelves and trays, the side racks and the catalytic panels and fat filter if supplied. 2 Remove the oven door (see instructions on following pages). 3 Wipe the inside of the oven using a household detergents or an ammonia-based cleaner. 4 Wipe clean with a damp cloth and allow to dry completely. 	<ul style="list-style-type: none"> ▪ To make cleaning easier, the grill element in some ovens drops down after you have removed the side racks. ▪ If using 'off the shelf' oven cleaners, always follow the manufacturer's instructions.
Side racks, oven shelves, trays	<ul style="list-style-type: none"> ▪ Clean these using a solution of detergent and hot water. They are also dishwasher safe. ▪ If badly soiled, soak in a solution of hot water and biological clothes washing powder to make cleaning easier. 	

What?	How?	<i>Important!</i>
Side catalytic panels (not supplied with all models)	Either remove the side racks and reverse the panels or heat the oven at 250°C on  for 60-90 minutes and they will self-clean.	<i>These panels absorb and eliminate greasy splashes at high-temperature cooking. They do not normally require cleaning. Clean only if they remain dirty after you have cooked very fatty foods.</i>
Sliding shelf supports (not supplied with all models)	Wipe with a damp cloth and mild detergent. Do not wipe off or wash away the white lubricating grease (visible when the slides are extended).	<i>Do not wash these in the dishwasher, immerse in soapy water, or use oven cleaner on them as doing so will remove the white lubricating grease and prevent the slides from running smoothly.</i>
Fat filter (not supplied with all models)	<ul style="list-style-type: none"> ■ If lightly soiled: wash in dishwasher (normal cycle). ■ If heavily soiled: <ol style="list-style-type: none"> 1 Place under water in a pan. 2 Add two tablespoons of clothes washing powder. 3 Bring to the boil. 4 Leave to soak for 30 minutes. 5 Rinse in clean water and dry. 	<i>Clean after every use. If the filter is not cleaned, the grease build-up will block and shorten the life of the fan element.</i>
Rubber seal framing the oven cavity	Wipe very gently with a damp cloth and mild detergent.	<ul style="list-style-type: none"> ■ <i>Take care not to unhook and displace the rubber seal while cleaning it.</i> ■ <i>Take care not to spray any oven cleaner or other caustic cleaner on the rubber seal, as doing so may damage the rubber.</i>
Knobs	<ol style="list-style-type: none"> 1 Wipe with a damp cloth and mild detergent. 2 Dry thoroughly with a soft cloth. 	<i>Do not use stainless steel or oven cleaner on the knobs, as doing so may damage their coating.</i>

Removing and refitting the side racks and catalytic panels

Note: only some models have catalytic panels and a lamp in the left oven wall.

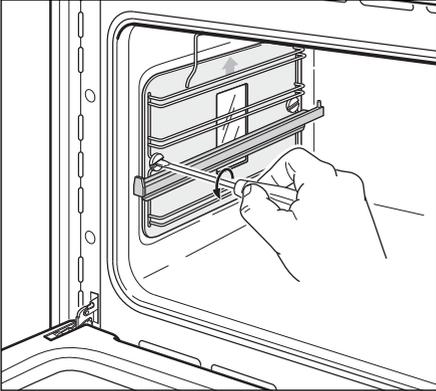


Fig.20a Side rack and catalytic panel in full oven cavity

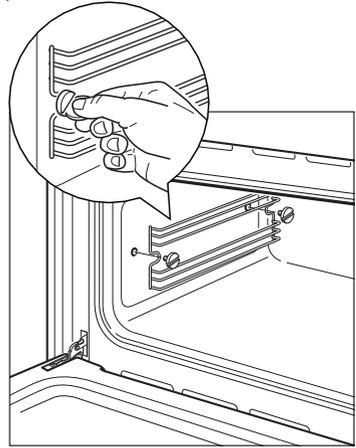


Fig.20b Side rack in compact oven cavity

When refitting the side racks, make sure they are the right way up, as in the illustrations. When refitting the catalytic panels, make sure that:

- the arrows are pointing upwards
- the panel with the hole is on the left oven wall (if there is a lamp in the wall).

Note: in some models, the back of the oven is also a catalytic panel, but this is not reversible and should not be removed.

Drop-down grill element (some models)

Once you have removed the side racks, the grill element in some full ovens drops down (Fig. 21). The grill element itself is self-cleaning. Note: some grill elements are fixed.

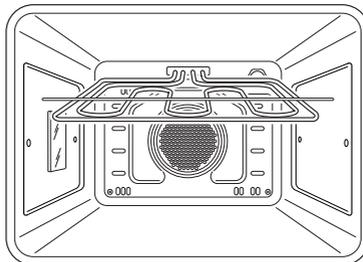


Fig.21 Drop-down grill element

Removing and refitting the sliding shelf supports (some models only)

Important!

Remove the side racks first to make removing the sliding shelf supports easier.

When refitting the sliding shelf supports, make sure that you fit

- the side racks first
- the slides to the top wire of a shelf position. They do not fit on the lower wire
- both sides of each pair of slides
- both slides on the same level.

Notes:

- In some full ovens, you cannot fit the slides to the topmost shelf position.
- In a compact oven, you can only fit the slides on the wire immediately below the side rack fixing screws.

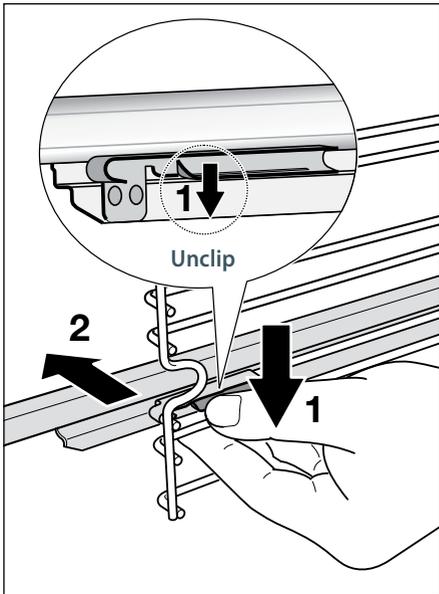


Fig.22 Removing the sliding shelf supports

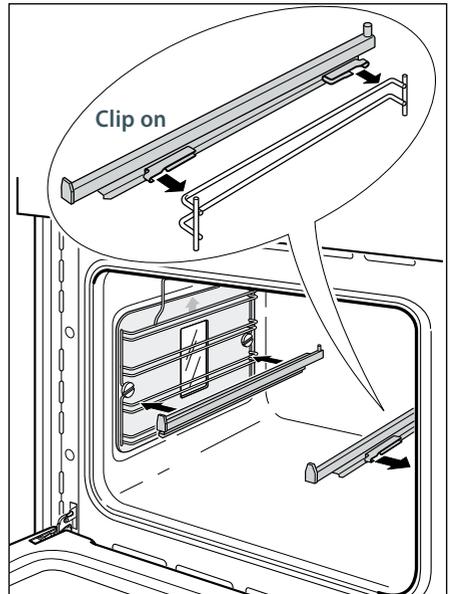


Fig.23 Refitting the sliding shelf supports - full oven cavity

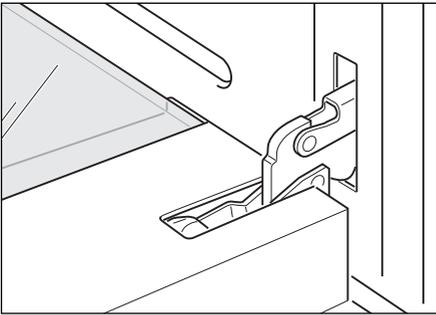
Removing and refitting the glass panes of the oven door

Important!

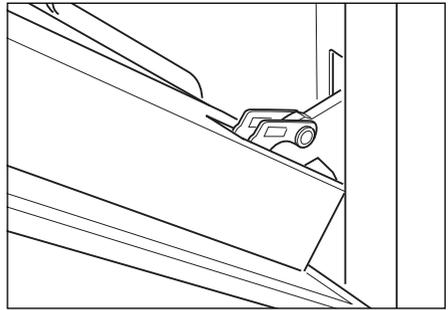
- *Oven doors vary. Some have three glass panes, others only two.*
- *The outer pane is not removable.*
- *Take care, the glass panes are heavy.*
- *Place the removed glass panes on a safe, soft surface.*

To remove the glass panes

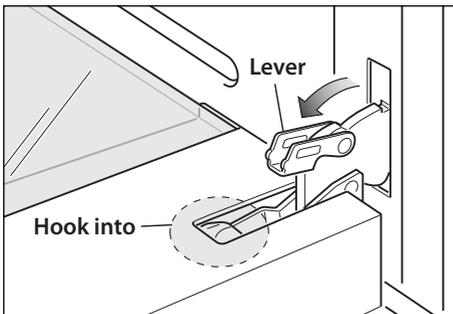
1 Open the door fully.



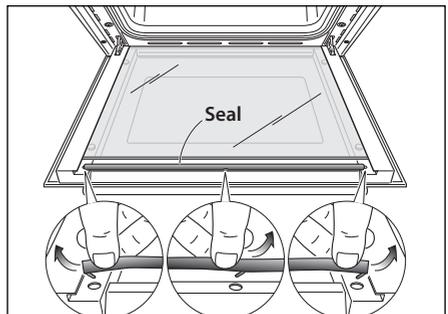
3 Close door until the levers hook to the door.



2 Open the levers.



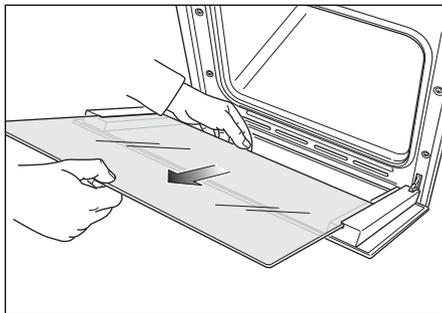
4 Remove seal (some doors only).



...then depending on your model...

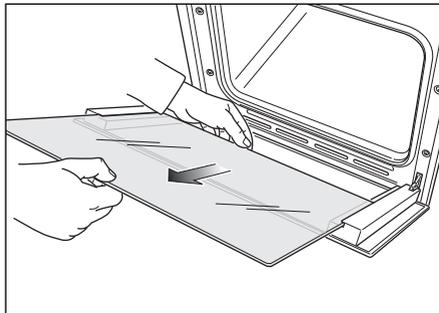
MODELS WITH INNER PANE ONLY

5 Slide out the inner pane.

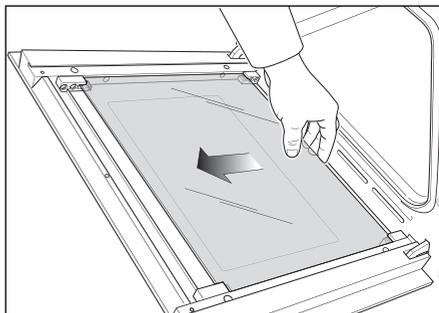


MODELS WITH INNER AND MIDDLE PANES

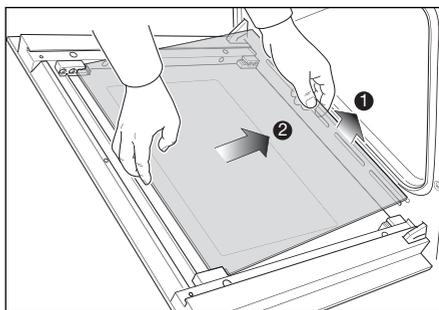
5 Slide out the inner pane.



6 Slide the middle pane up slightly to unhook it from the bottom clamps.



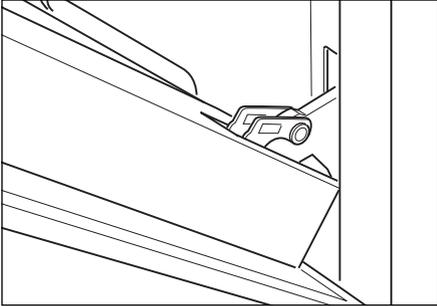
7 Lift out the bottom edge and remove.



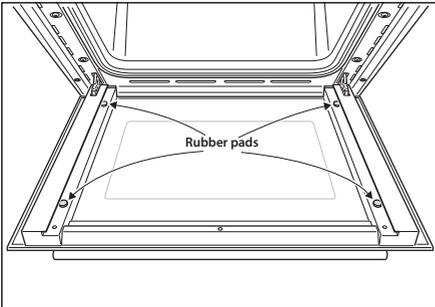
To refit the glass panes

MODELS WITH INNER PANE ONLY

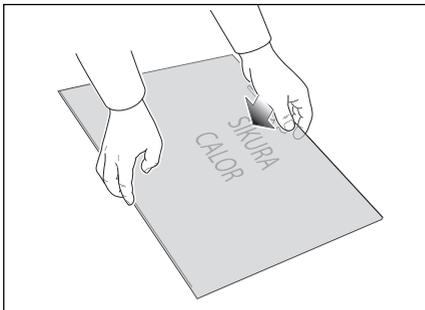
- 1 Make sure the open levers firmly hook to the door.



- 2 Check the rubber pads are in place.

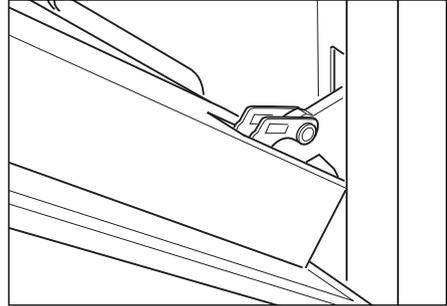


- 3 Check the pane is the right way up.

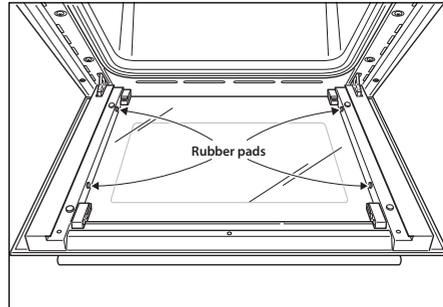


MODELS WITH INNER AND MIDDLE PANES

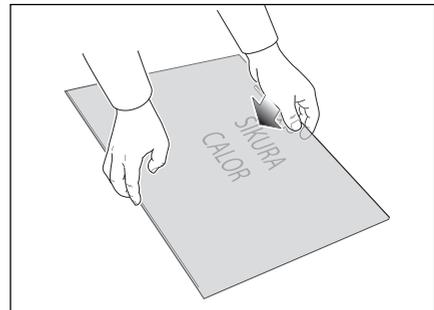
- 1 Make sure the open levers firmly hook to the door.



- 2 Check the rubber pads are in place.

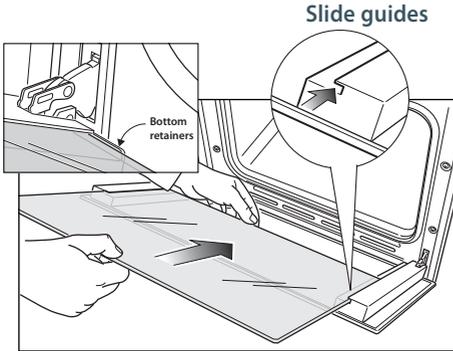


- 3 Check the pane is the right way up.

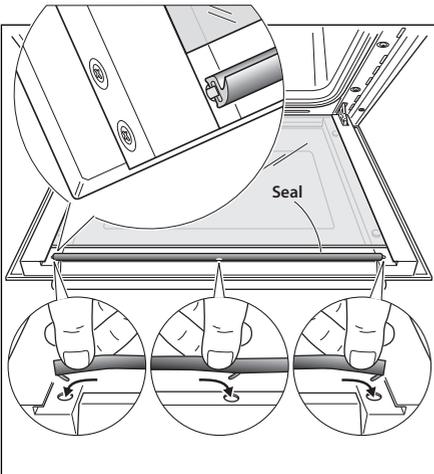


MODELS WITH INNER PANE ONLY

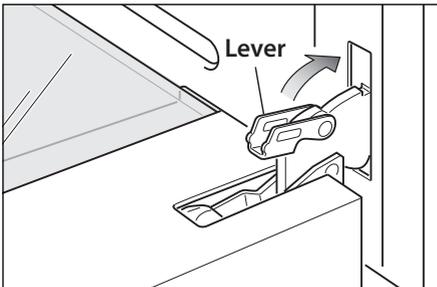
- 4 Insert the pane into the slide guides and slide it to the bottom retainers.



- 5 Replace the seal (some doors only).

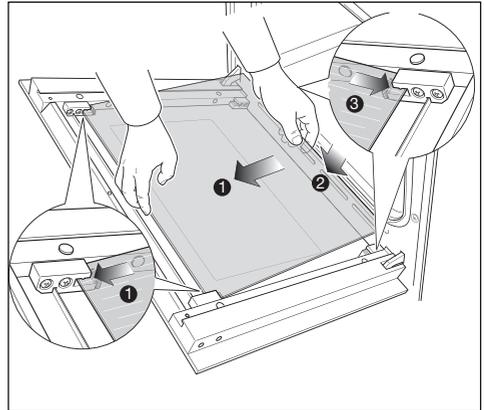


- 6 Open the door fully and close the levers.

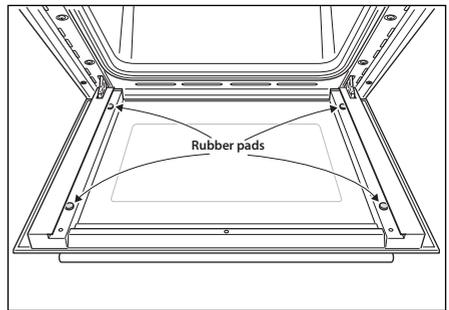


MODELS WITH INNER AND MIDDLE PANES

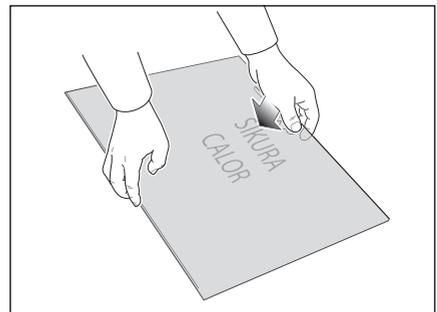
- 4 Insert the pane into top clamps then lower and slide into bottom clamps.



- 5 Check the rubber pads are in place.



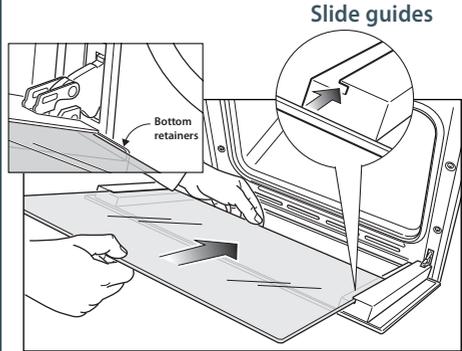
- 6 Check the pane is the right way up.



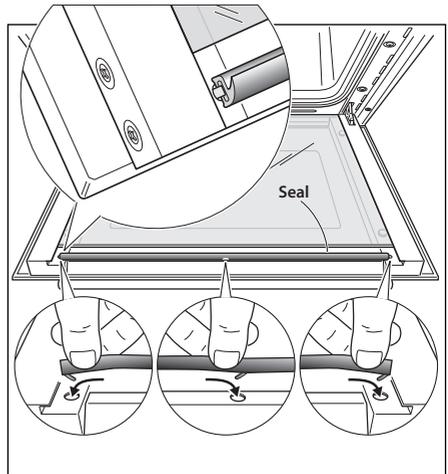
MODELS WITH INNER PANE ONLY

MODELS WITH INNER AND MIDDLE PANES

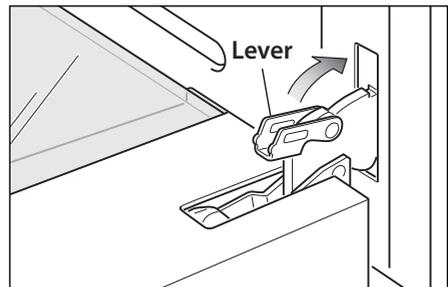
- 7 Insert the pane into the slide guides and slide it to the bottom retainers.



- 8 Replace the seal (some doors only).



- 9 Open the door fully and close the levers.



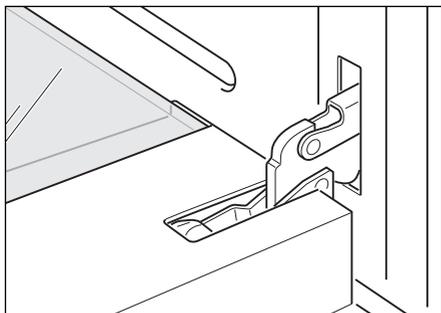
Removing and refitting the oven door

Important!

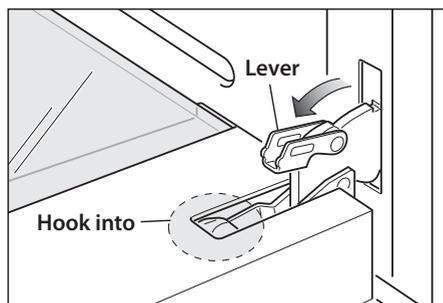
Take care, the oven door is heavy!

To remove the door

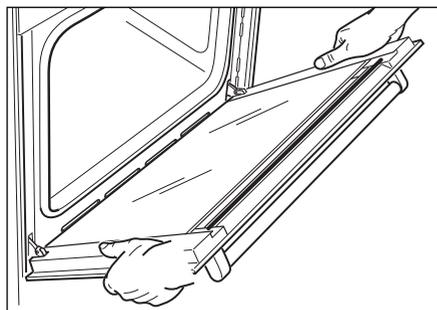
- 1 Open the door fully.



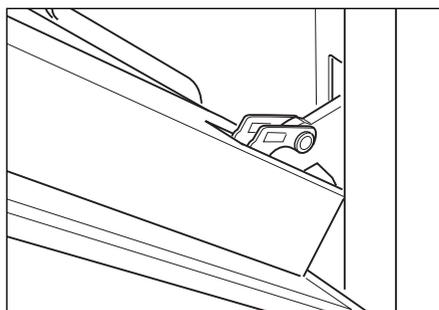
- 2 Open the levers.



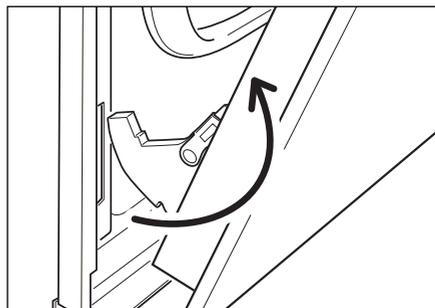
- 3 Hold the door.



- 4 Close the door until the levers hook to it.



- 5 Disengage the hinges and remove the door.



To refit the door

Repeat these steps in reverse order.

Replacing the oven lamp

Note: oven bulb replacement is not covered by your warranty.

- 1 Let the oven cavity and the grill element cool down.
- 2 **Switch the power to the oven off at the wall.**

LEFT LAMP (some models only)

- 3a Remove the left side rack (and catalytic panel if supplied). See 'Removing and refitting the side racks and catalytic panels'.
- 4a Press down on the lamp cover and rotate to remove.

Important!

Never use screwdrivers or other utensils to remove the lamp cover, as doing so could damage the surrounding enamel. Only use your hands.

- 5a Unscrew and replace the bulb with a new one suitable for high temperatures (300°C) with the following specifications: 230-240V, 50Hz, E14 and same wattage as the bulb being replaced (check wattage stamped on the bulb).
- 6a Refit the lamp cover, operating in reverse order. Make sure that it clicks into place.

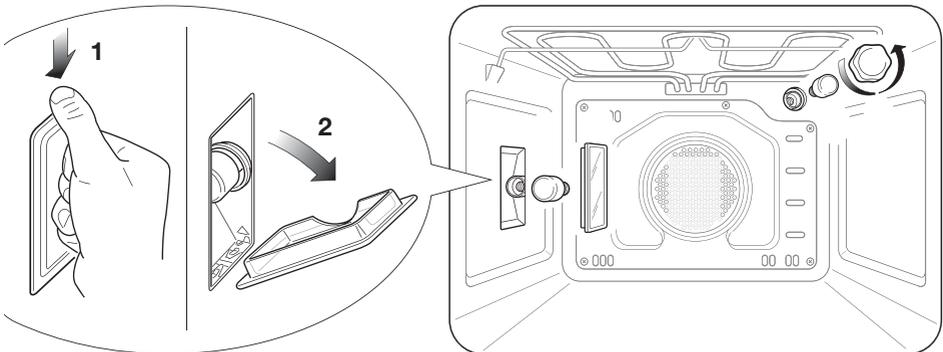
Important!

The notch in the inner edge of the cover must be on the side closer to the back of the oven.

- 7a Refit the left side rack (and the left catalytic panel if supplied).
- 8a Switch the power to the oven back on at the wall.

TOP RIGHT LAMP

- 3b Twist the lamp cover off.
- 4b Unscrew and replace the bulb with a new one suitable for high temperatures (300°C) with the following specifications: 230-240V, 50Hz, E14 and same wattage as the bulb being replaced (check wattage stamped on the bulb).
- 5b Twist the lamp cover back on.
- 6b Switch the power to the oven back on at the wall.



LEFT LAMP (some models only)

Before you call for service or assistance ...

Check the things you can do yourself. Refer to the installation instructions and your user guide and check that:

- 1 your product is correctly installed.
- 2 you are familiar with its normal operation.

If after checking these points you still need assistance or parts, please refer to the Service & Warranty book for warranty details and your nearest Authorised Service Centre, or contact us through our local website listed on the back cover:

This oven has been designed and constructed in accordance with the following codes and specifications:

In New Zealand and Australia:

AS/NZS 60335-1 General Requirements for Domestic electrical appliances

AS/NZS 60335-2-6 Particular Requirements for Domestic electrical cooking appliances

AS/NZS 1044 Electromagnetic Compatibility Requirements.

In Europe:

Safety requirements of EEC Directive "Low voltage" 2006/95:

- EN 60335-1 General Requirements for Domestic electrical appliances

- EN 60335-2-6 Particular Requirements for Domestic electrical cooking appliances

Safety requirements of EEC Directive "EMC" 89/336:

- EN 55014-1, EN 55014-2, EN 61000-3-2, EN 61000-3-3 Electromagnetic Compatibility Requirements



Requirements of EEC Directive 93/68.

European directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE)
(for European Union countries only)

GB This appliance is marked according to the European directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE). By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product.

The symbol  on the product, or on the documents accompanying the product, indicates that this appliance may not be treated as household waste. Instead it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment. Disposal must be carried out in accordance with local environmental regulations for waste disposal. For more detailed information about treatment, recovery and recycling of this product, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

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The product specifications in this booklet apply to the specific products and models described at the date of issue. Under our policy of continuous product improvement, these specifications may change at any time. You should therefore check with your Dealer to ensure this booklet correctly describes the product currently available.

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NZ AU GB IE SG
Built-in oven user guide
Published: 12/2008
Part No. 599606 B
F&P Italy Part No. 1103204 - B2



Built In Ovens

60cm Multiple Function Compact Oven



OB60NDEX1 Brushed Stainless Steel Compact Oven

Key Features

- Multifunction cooking
- Electronic clock
- Automatic cooking
- Door and cavity cooling system
- Cool touch triple glazed door

Dimensions

H 450 x W 595 x D 556

Product Info

Fisher & Paykel ovens are designed with simply perfect cooking in mind. This compact oven offers 7 cooking functions, including fan forced and defrost. The OB60NDEX1 in designer styling also offers a powerful 2700W grilling performance.

Finishes

-  Brushed Stainless Steel

Cleaning

- High acid resistant graphite enamel interior
- Removable inner door panels
- Removable oven door

Controls

- Automatic cooking
- Electronic clock
- Minute timer
- Semi-automatic cooking

Cooking Modes

- Bake
- Cooking modes7
- Defrost
- Fan Bake
- Fan Forced
- Fan Grill
- Grill
- Warm

General Features

- Multifunction cooking
- Oven lightRear

Performance Features

- Closed door grilling
- Grilling power (W)2700
- Multi-shelf cooking

Requirements

- Current requirement (amps)12.8

Safety

- Cool touch triple glazed door
- Door and cavity cooling system

Technical Information

- Energy consumption: conventional (kwh) (main/second oven)0.79
- Energy consumption: fan forced (kwh) (main/second oven)0.72
- Energy efficiency class (main/second oven)A
- Heating function (main oven only)Fan forced
- Size of cavityMedium

Warranty

- 2 year parts and labour warranty

Cutout Dimensions

- Flush fitting cabinetry clearance (mm)22
- Inside height of cavity (mm)440
- Minimum inside depth of cavity (mm)550
- Minimum inside width of cavity (mm)560
- Overall height of cavity (mm)455
- Overall width of cavity (mm)600

Product Dimensions

- Depth of chassis (mm)532
- Depth of oven door (open) (measured from front of oven frame)289mm
- Height of chassis (mm)436
- Overall depth of product (without handle) (mm)556
- Overall height of product (mm)450
- Overall width of product (mm)595
- Width of chassis (mm)536

Contact Details

Customer Care Centre
Fisher & Paykel Appliances
P.O. Box 58732
Botany Manukau 2163
New Zealand
Phone: 0800 FP CARE (0800 37 2273)
Fax: +64-9-2730656



Dishwashing

Single DishDrawer®

DD60SCX6 EZKleen Stainless Steel Single



Key Features

- Fully adjustable racking system
- Flow through detergent dispenser
- Choice of wash programmes
- Key lock and child lock option
- Ergonomic design

Dimensions

H 409 x W 599 x D 570

Product Info

With over a decade of DishDrawer® manufacturing, we are proud to introduce the latest edition. Continuing with the ergonomically superior design, we have found new ways to make your dishwashing experience easier, adjustable racks on the side of the drawer and folding tines ensure complete versatility and adaptability. Follow this up with a range of wash programmes and independently operated drawers and you have the ultimate kitchen clean up companion.

Finishes

-  EZKleen Stainless Steel

Consumption Data

- Energy Efficiency Star Rating ENERGY STAR rated
- Energy Rating 3
- Energy Consumption 136 kWh per year
- Water Rating per drawer 4
- Water Consumption 6.7L

Performance Features

- Choice of wash programmes 9
- Economical eco option
- Flow through detergent dispenser
- Quiet fan dry

Usability Features

- 6 place setting capacity per drawer
- Accommodates long stemmed wine glasses
- Adjustable side racks
- Clean dishes indicator
- Easy to use, primary and secondary (concealed) control panels with single touch programming

- End of cycle beeps
- Energy saving, delay start option - up to 12 hours
- Ergonomic design
- Folding tines
- Fully adjustable racking system
- Genuine half load wash option
- Intelligent load sensing for optimum performance
- Key lock and child lock option
- One button start
- Permanent memory of the last cycle used
- Smart Drive intelligent technology
- Three stage flood protection
- Wash progress and time remaining display

Warranty

- 2 Year Parts and Labour Warranty

Wash Programmes

- Rinse
- Fast Eco
- Fast
- Delicate Eco
- Delicate
- Normal Eco
- Normal
- Heavy Eco
- Heavy

Dimensions

- Overall depth of product (mm)570
- Overall height of product (mm)409
- Overall width of product (mm)599

Contact Details

Customer Care Centre
Fisher & Paykel Appliances
P.O. Box 58732
Botany Manukau 2163
New Zealand
Phone: 0800 FP CARE (0800 37 2273)
Fax: +64-9-2730656

Check with your local retailer for pricing, availability and stock of this model. The product dimensions and specifications in this page apply to the specific product and model. Under our policy of continuous improvement, these dimensions and specifications may change at any time. You should therefore check with your retailer or Fisher & Paykel's Customer Care Centre to ensure this page correctly describes the model currently available.

User guide

DishDrawer®

DD60 models

NZ AU

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Important!

SAVE THESE INSTRUCTIONS

The models shown in this user guide may not be available in all markets and are subject to change at any time. For current details about model and specification availability in your country, please visit our local website listed on the back cover or contact your local Fisher & Paykel dealer.

Your DishDrawer® has been carefully designed to operate safely during normal dishwashing procedures. Please keep the following instructions in mind when you are using your DishDrawer®.

Important safety instructions

WARNING! - When using your dishwasher, follow basic precautions, including the following:

- ***Read all instructions before using the DishDrawer®.***
- ***The information in this manual must be followed to minimise the risk of fire or explosion or to prevent property damage, personal injury or loss of life.***
- ***Use the DishDrawer® only for its intended function as described in this user guide.***
- ***Use only detergents or rinse aid recommended for use in a domestic dishwasher and keep them out of reach of children. Check that the detergent dispenser is empty after the completion of each wash programme.***
- ***When loading items to be washed, locate sharp items so that they are not likely to damage the lid seal and load sharp knives with the handle up to reduce the risk of cut-type injuries.***
- ***Do not touch the heater plate during or immediately after use.***
- ***Do not operate your DishDrawer® unless all enclosure panels are properly in place.***
- ***Do not tamper with the controls.***
- ***Do not abuse, sit on, stand in or on the drawer or dish rack of the DishDrawer®.***
- ***The adjustable racks are designed to support cups, glasses and kitchen utensils. When the adjustable racks are in the DishDrawer® do not lean on or use them to support your body weight.***
- ***To reduce the risk of injury, do not allow children to play in or on the DishDrawer®.***
- ***Under certain conditions, hydrogen gas may be produced in a hot water heater system that has not been used for two weeks or more. HYDROGEN GAS IS EXPLOSIVE. If the hot water system has not been used for such a period, before using the dishwasher, turn on all hot water taps and let the water flow from each for several minutes. This will release any accumulated hydrogen gas. As the gas is flammable, do not smoke or use an open flame during this time.***
- ***Remove the door to the washing compartment when removing an old dishwasher from service or discarding it.***
- ***Dishwasher detergents are alkaline. They can be dangerous if swallowed. Avoid contact with skin and eyes, keep children and infirm persons away from the dishwasher when the drawer is opened.***

Important safety instructions

Installation

- *This DishDrawer® must be installed and located in accordance with the Installation instructions before it is used. If you did not receive Installation instruction sheets with your DishDrawer®, you can order them by calling your Authorised Service Agent or from the Fisher & Paykel website, www.fisherpaykel.com.*
- *Installation and service must be performed by a qualified technician.*
- *If the power supply cord is damaged, it must be replaced by a dealer or Authorised Service Centre or a similar qualified trades person in order to avoid a hazard.*
- *Ensure the DishDrawer® is secured to adjacent cabinetry using the brackets provided. Failure to do so may result in an unstable product, which may cause damage or injury.*
- *Do not operate this appliance if it is damaged, malfunctioning, partially disassembled or has missing or broken parts, including a damaged power supply cord or plug.*
- *Do not store or use petrol, or other flammable vapours and liquids in the vicinity of the DishDrawer®.*
- *Connect to a properly rated, protected and sized power supply circuit to avoid electrical overload.*
- *Make sure that the power supply cord is located so that it will not be stepped on, tripped over or otherwise subject to damage or stress.*
- *Do not install or store the DishDrawer® where it will be exposed to temperatures below freezing or exposed to weather.*
- *Do not use an extension cord or a portable electrical outlet device (e.g. multi-socket outlet box) to connect the DishDrawer® to the power supply.*

Maintenance

- *Disconnect the appliance from the power supply before any cleaning or maintenance.*
- *Do not repair or replace any part of the appliance or attempt any servicing unless specifically recommended in this user guide. We recommend that you call an Authorised Service Agent.*
- *Keep the floor around your appliance clean and dry to reduce the possibility of slipping.*
- *Keep the area around/underneath your appliance free from the accumulation of combustible materials, such as lint, paper, rags and chemicals.*
- *When cleaning the underside of the filter plate, care must be taken on the sharp outer edge to avoid the risk of cut type injuries.*

Important safety instructions

Important!

Under no circumstances should you open the drawer whilst the DishDrawer® is in operation.

Operational

- *Always press the ►|| button to pause and wait until you hear the three additional beeps before opening the drawer.*
- *The DishDrawer® must be used with the motor assembly, filter plate, drain filter and spray arm in place.*
- *When disconnecting the appliance pull the plug rather than the power supply cord or junction of cord to avoid damage.*
- *Take care when loading the DishDrawer® not to load dishware items so they prevent the lid from properly sealing with the drawer. Items should be placed so they do not protrude above and/or forced into the drawer, otherwise a service call may result.*
- *Household appliances are not intended to be played with by children. Children or persons with a disability which limits their ability to use the appliance, should have a responsible person instruct them in its use. The instructor should be satisfied that they can then use the appliance without danger to themselves or their surroundings.*
- *Close supervision is necessary if this appliance is used by or near children. Do not allow children to play inside, on or with this appliance or any discarded appliance.*
- *If a dishwasher cleaner is used, we would strongly recommend a wash programme with detergent should be run immediately afterward, to prevent any damage to the DishDrawer®.*
- *The DishDrawer® is designed for washing normal household utensils. Items that are contaminated by petrol, paint, steel or iron debris, corrosive, acidic or alkaline chemicals are not to be washed in the DishDrawer®.*
- *If the DishDrawer® is not being used for long periods of time, turn the electricity and water supply to the DishDrawer® off.*
- *Do not pour detergent or rinse aid into the salt reservoir. The detergent or rinse aid will destroy the water softener.*
- *Do not operate your appliance by means of an external timer or separate remote-control system.*

6 Controls (models with no LCD)

If you have a double DishDrawer®, each drawer has its own controls and can run independently of the other.

Power button

The  button turns the DishDrawer® on or off. Opening the drawer will automatically turn the DishDrawer® on for 30 seconds. To end a wash programme in mid cycle, press the  button. Any water in the DishDrawer® will be pumped out.



Start/Pause button

The  button starts a wash programme. Press the  button to pause or restart the DishDrawer® during a wash programme. When paused, wait for three beeps before opening the drawer. Forcing the drawer open while in mid cycle may cause damage or injury.



Delay start

The  button also sets the Delay start feature which can delay the start of a wash programme from 1 to 12 hours.

To activate Delay start

- 1 Press and hold the  button until the light above the  button turns orange (or purple, depending on your model).
- 2 Continue holding the  button down until the desired delay time has been reached. The DishDrawer® will emit audible 'beeps' as you hold the  button down, each beep indicates another hour delay.
- 3 The DishDrawer® will start once the delay time has elapsed and the drawer is closed.

To cancel Delay start

Press the  button.

Lock button (optional)

The  button activates/deactivates the Keylock or the Childlock functions.

Keylock

The Keylock feature disables all the buttons on the DishDrawer®.

To activate, press and hold the  button until you hear one beep (3 seconds). The light above the  button is lit when Keylock is activated.

To cancel the Keylock feature, press and hold the  button until the light above the  button disappears.

Childlock

The Childlock feature locks the drawer and disables all the buttons.

To activate, press and hold the  button until you hear two beeps (5 seconds). The light above the  button is lit when Childlock is activated.

To cancel the Childlock feature, press and hold the  button until the light above the  button disappears.

Wash programme selector

Press the  button to select a wash programme. The DishDrawer® will remember the last programme used.



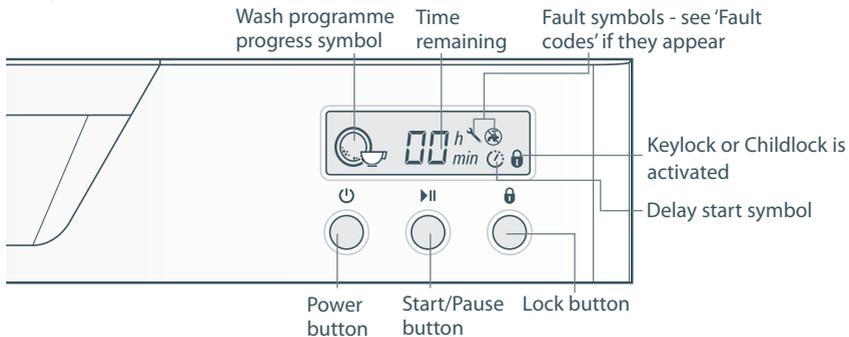
Eco button *ECO* (optional)

Press the *ECO* button if you would like the wash programme to use less energy. The red ECO light will indicate the feature is on. If your dishes are heavily soiled or you require enhanced dry performance, we do not recommend ECO programmes.

Power failure

If the DishDrawer® is operating and a power failure occurs, it will stop. The DishDrawer® may be unable to be opened during this time. When the power supply is resumed, the DishDrawer® will restart in the same part of the wash programme.

If you have a double DishDrawer®, each drawer has its own control panel and can run independently of the other.



Power button

The  button turns the DishDrawer® on or off. Opening the drawer will automatically turn the DishDrawer® on for 30 seconds. To end a wash programme in mid cycle, press the  button. Any water in the DishDrawer® will be pumped out.

Start/Pause button

The  button starts a wash programme. Press the  button to pause or restart the DishDrawer® during a wash programme. When paused, wait for three beeps before opening the drawer. Forcing the drawer open while in mid cycle may cause damage or injury.

Delay start

The  button also sets the Delay start feature which can delay the start of a wash programme from 1 to 12 hours.

To activate Delay start

- 1 Press and hold the  button until the delay symbol  appears on the electronic display.
- 2 Continue holding the  button down until the desired delay time has been reached.
- 3 The DishDrawer® will start once the delay time has elapsed and the drawer is closed.

To cancel Delay start

Press the  button.

Lock button (optional)

The  button activates/deactivates the Keylock or the Childlock functions.

Keylock

The Keylock feature disables all the buttons on the control panel.

To activate, press and hold the  button until you hear one beep (3 seconds). The  symbol appears in the electronic display when the Keylock feature is activated.

Childlock

The Childlock feature locks the drawer and disables all the buttons on the control panel.

To activate, press and hold the  button until you hear two beeps (5 seconds). The  symbol appears in the electronic display when the Childlock feature is activated.

To cancel the Childlock feature, press and hold the  button until you hear one beep and the  symbol disappears from the electronic display.

Wash programme selector

Press the  button to select a wash programme. The DishDrawer® will remember the last programme used.



Eco button *ECO* (optional)

Press the *ECO* button if you would like the wash programme to use less energy. The red ECO light will indicate the feature is on. If your dishes are heavily soiled or you require enhanced dry performance, we do not recommend ECO programmes.

Wash programme progress symbols

As the wash programme advances through the cycle, the following symbols will appear in the electronic display to indicate the progression. When a wash programme has started, the electronic display also will count down the time remaining in one minute increments.



Power failure

If the DishDrawer® is operating and a power failure occurs, it will stop. The DishDrawer® may be unable to be opened during this time. When the power supply is resumed, the DishDrawer® will restart in the same part of the wash programme.

10 Operation

1 Load dishes

Remove all food scraps and load the dishes.

2 Add detergent

3 Check rinse aid

4 Press the button

5 Select a wash programme

The length of the wash programme will appear on the electronic display (models with LCD only).

6 Select *ECO* (optional)

7 Check

Ensure there is nothing obstructing the spray arm. The drain filter must be level with the filter plate.

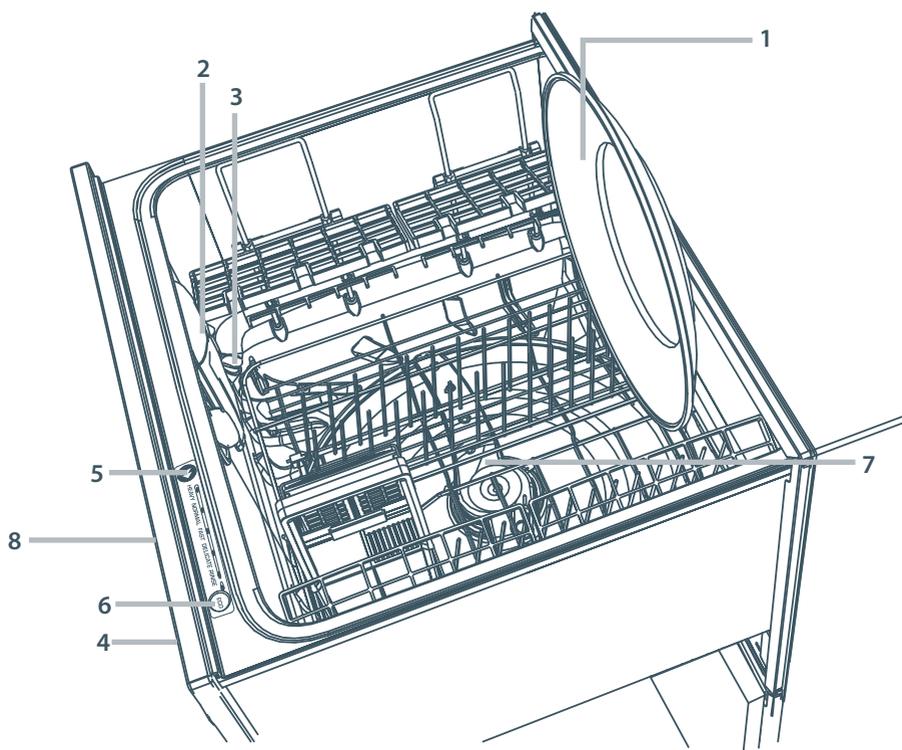
8 Start

Close the drawer and press the  button.

9 Finish

The DishDrawer® will beep six times to indicate the end of the wash programme. At the end of the wash programme the drying fan will continue to run for a set time or until the drawer is opened. The fan assists with drying and uses negligible amounts of energy. It is normal for some water to remain in the drain filter area after the wash programme is complete.

Double models only: At the end of a wash programme, you may find both drawers draining simultaneously. This is normal.



Standard wash programme - when to use

Heavy <i>Heavily soiled pots, pans and dishes.</i>	Normal <i>Dishes with normal soils for optimum wash and dry performance. Also the only recommended programme if you are using dishwasher tablets. </i>	Fast <i>Lightly soiled dishes.</i>	Delicate <i>Lightly soiled and heat sensitive crockery.</i>	Rinse <i>Prevents odours and soils drying on dishes.</i>
--	---	--	---	--

pre wash 45°C			pre wash	
pre wash			pre wash	
main wash 70°C	main wash 55°C	main wash 55°C	main wash 50°C	
post rinse	post rinse	post rinse	post rinse	
final rinse 65°C	final rinse 65°C	final rinse 50°C	final rinse 60°C	
drying phase	drying phase		drying phase	

Eco wash programme - when to use

Heavy <i>Heavily soiled everyday dishes.</i>	Normal* <i>Normal soiled dishes for optimum energy use.</i>	Fast <i>Lightly soiled, non greasy dishes.</i>	Delicate <i>Lightly soiled, non greasy and heat sensitive crockery.</i>
--	---	--	---

pre wash 35°C			
pre wash			pre wash
main wash 60°C	main wash 40°C	main wash 45°C	main wash 45°C
post rinse	post rinse	post rinse	post rinse
final rinse 55°C	final rinse 43°C	final rinse 45°C	final rinse 50°C
drying phase	drying phase		drying phase

Note

*Reference programme for energy label in compliance with AS/NZS 2007.

Wash times can vary depending on the incoming water temperature, ambient conditions, type of dish load and whether the drawer has been opened during the wash. Wash times are only APPROXIMATE on the electronic display and based on 20 °C incoming water.

12 Caring for your dinnerware

The combination of high temperatures and dishwasher detergent may cause damage to some items if they are washed in the DishDrawer®. Remember, if in any doubt about any aspect concerning items washed in the DishDrawer®, follow the instructions from the manufacturer of the items, or wash the item by hand.

Cutlery & silverware

All cutlery and silverware should be rinsed immediately after use to prevent tarnishing caused by some foods. The Rinse wash programme is useful for this. Silver items should not come into contact with stainless steel, eg other cutlery. Mixing these items can cause staining. Remove silver cutlery from the DishDrawer® and hand dry it immediately after the programme has finished.

Aluminium

Aluminium can be dulled by dishwasher detergent. The degree of change depends on the quality of the product.

Other metals

Iron and cast iron objects can rust and stain other items. Copper, pewter and brass tend to stain.

Woodware

Wooden items are generally sensitive to heat and water. Regular use in the dishwasher may cause deterioration over time. If in doubt, wash by hand.

Glassware

Most everyday glassware is dishwasher safe. Crystal, very fine and antique glassware may etch that is, become opaque. You may prefer to wash these items by hand.

Plastic

Some plastic may change shape or colour with hot water. Check manufacturer's instructions about washing plastic items. Washable plastic items should be weighed down so they do not flip over and fill with water or fall through the base rack during the wash.

Decorated items

Most modern china patterns are dishwasher safe. Antique items, those with a pattern painted over the glaze, gold rims or hand painted china may be more sensitive to machine washing. If in doubt, wash by hand.

Glued items

Certain adhesives are softened or dissolved in machine washing. If in doubt, wash by hand.

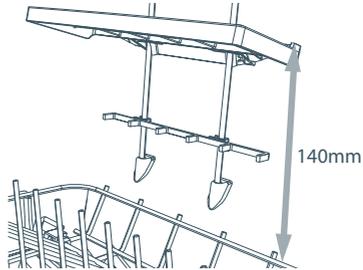
Holiday time

If the DishDrawer® is not going to be used for some time, we recommend you leave the DishDrawer® clean and empty. Leave the drawers ajar to allow air to circulate. Turn off both the power and water supply to the DishDrawer®.

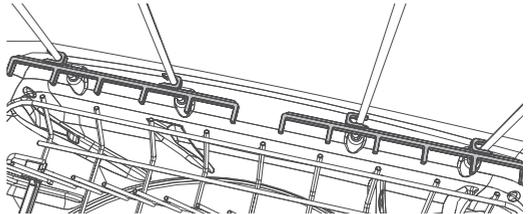
The DishDrawer®s are tested to AS/NZS 2007 standards for both wash and dry performance. The following are loading pattern diagrams, detergent quantities and rinse aid quantities used for the DishDrawer®.

Wash programme	Normal Eco (At the end of the programme, open the DishDrawer 50 mm to improve the dry performance.)
Detergent quantities	22.5g (main wash) per drawer
Rinse aid setting	4
Maximum place setting (per drawer)	6
Accessories to be used in the Dishwasher standards test	Base rack, drain filter access panel, folding tines, 'slide-and-fold' tines, cutlery basket, adjustable racks, glass supports.

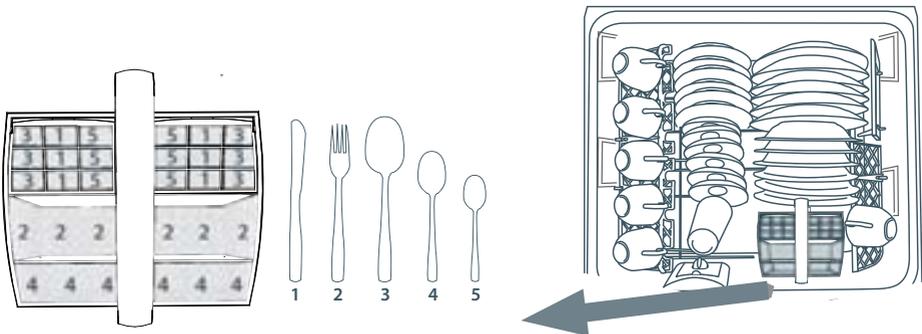
Height setting of adjustable racks



Correct orientation of glass supports on both sides of drawer

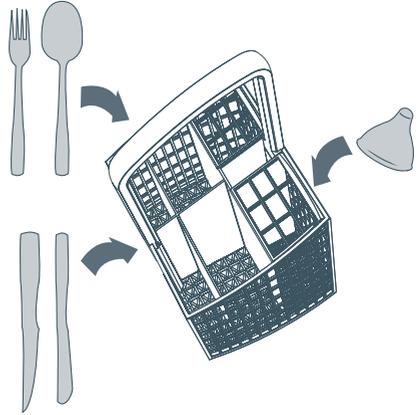


Recommended loading pattern



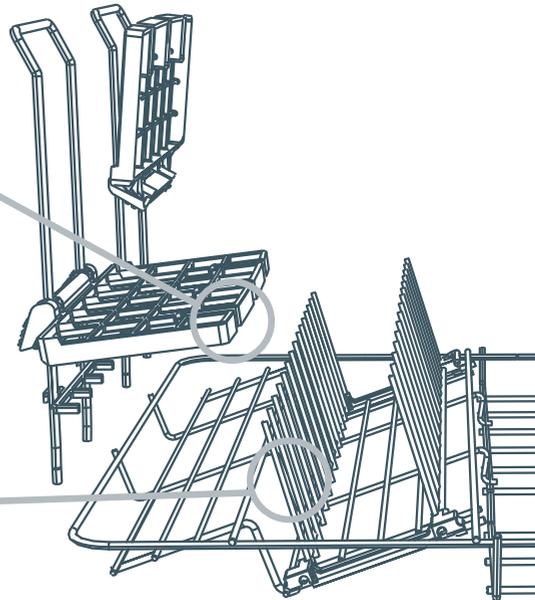
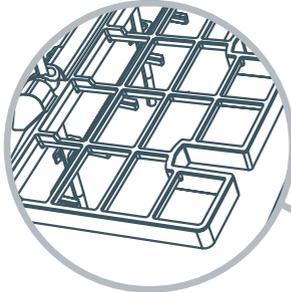
Cutlery basket

- Mix spoons, knives and forks within each section to stop cutlery nesting together.
- Most cutlery is placed with the handle pointing down.
- For your safety, knives and sharp utensils should have their handles up.
- Small light items like baby bottle teats are best placed under the anti-nesting grids to prevent them from being displaced.



Stemware notches

- The six notches on the left-hand side help support long-stemmed glassware.

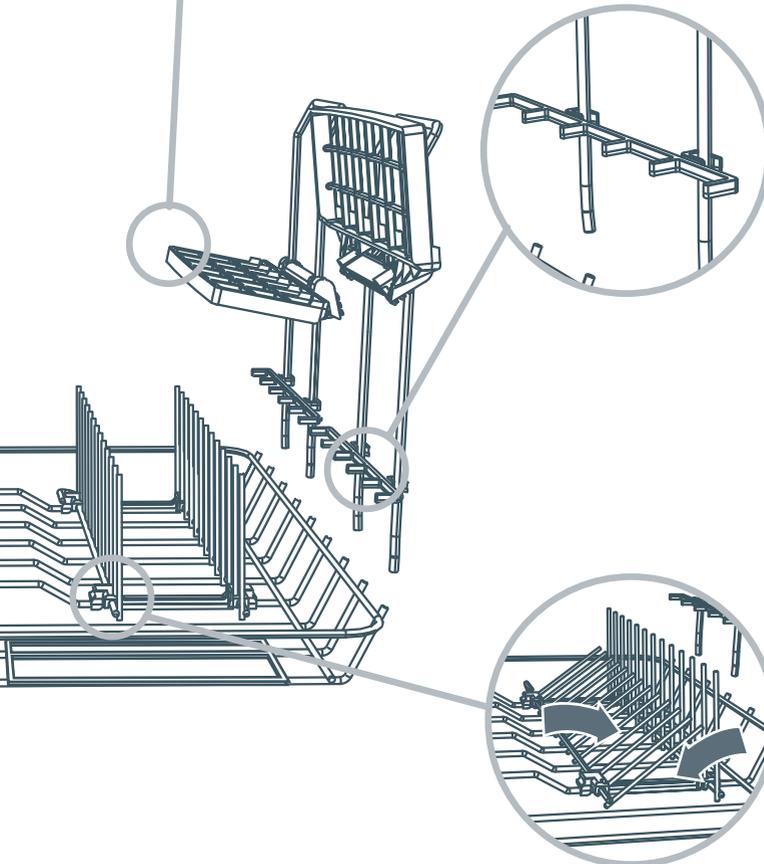
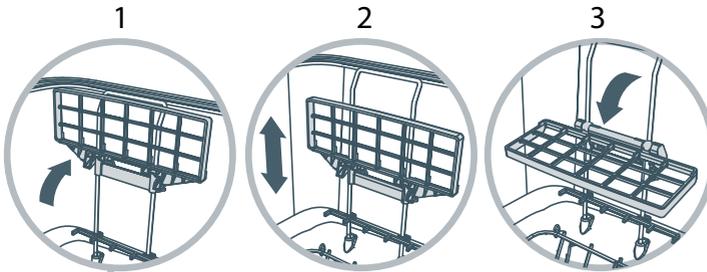


Folding tines

- The front half is ideal for large, deep bowls.
- Fold the tine sections down towards each other if you need the space for pots or other large items.
- Fold down the right-hand section only and lean cups against the upright tines for extra stability.

Adjustable racks

- You can adjust these independently of each other to any height:
 - 1 Fold up to unlock the rack.
 - 2 Adjust the height to suit by sliding up or down.
 - 3 Fold down to lock in position.
- Fold the racks away if you need the space.



Glass supports

- These clip on the rack wires to give your tall glasses extra stability.

'Slide-and-fold' tines

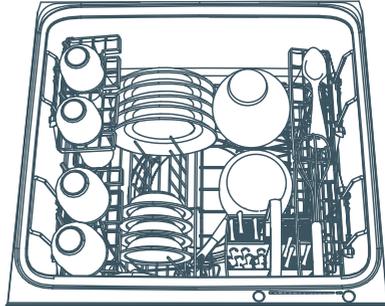
- Slide all the way to the left to fit larger dinner plates.
- For optimum stability, place larger plates between the longer tines in the front.
- Fold the tine sections down towards each other if you need the space for pots or other large items.

16 Loading suggestions

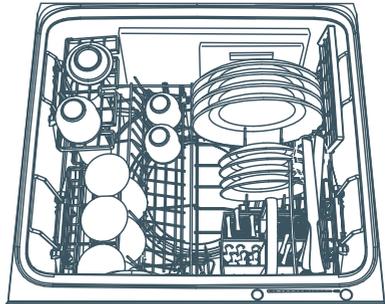
When loading your DishDrawer®, make sure that

- you place items so that water coming from the rotating spray arm below can reach all areas (wash performance will be reduced if it can't)
- nothing blocks the water from getting to items on the adjustable racks.

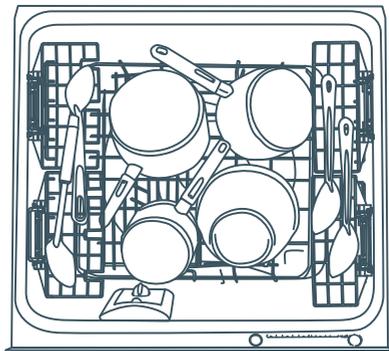
Typical breakfast load



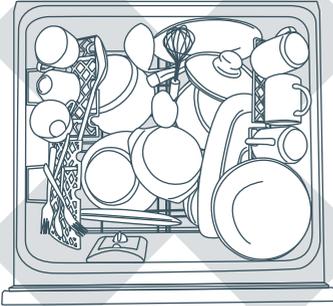
Typical dinner party load



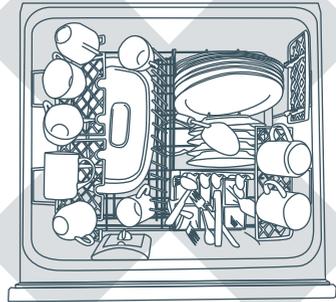
Typical heavy load



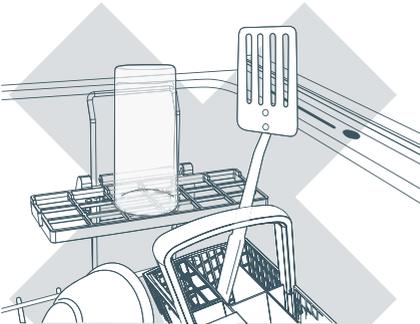
How NOT to load your DishDrawer®



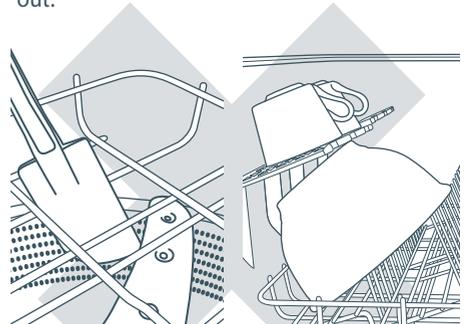
- Overcrowded and wash water will not reach some of the dinnerware.
- Cups, glasses and bowls must have their openings facing down.



- The plates are nesting together and wash water may not get through.
- Ensure cutlery are not nesting or stuck together. They need to be evenly spread out.



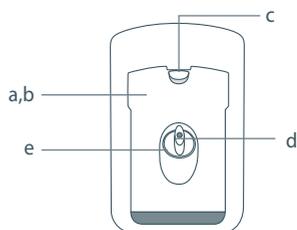
- Ensure dishware items are not forced into or protrude out of the drawer, as this may prevent the lid from properly sealing which could result in a service call.
- Locate sharp items safely to prevent injuring the user and damaging the lid assembly.
- Check the bottom of the cutlery basket to ensure sharp or pointed items have not come through as they may stop spray arm rotation.



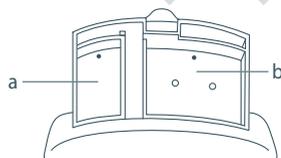
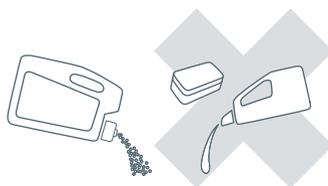
- Ensure cutlery has not fallen through the base rack and stopped the spray arm from rotating.
- The large bowl is blocking wash water reaching the adjustable racks.
- Large utensils should be on the adjustable racks so they do not become dislodged and stop the spray arm from rotating.
- Sharp or pointed items must be placed horizontally or with sharp edges/points facing down to avoid risk of injury.

Important!

- Only use powdered detergent recommended for domestic automatic dishwashers in the detergent dispenser.
- Dishwasher detergents are strongly alkaline and can be dangerous if swallowed.
- Avoid contact with skin and eyes.
- Keep children and infirm persons away from the DishDrawer® when the drawer is open.
- Check that the detergent receptacle is empty after completion of the wash cycle. Failure to do so could result in poisoning.
- Do not place dishwasher tablets in the detergent dispenser.
- Detergent and dishwasher tablets should not be in direct contact with dishes or cutlery.
- Liquid detergents are not suitable to be used in the DishDrawer®.
- Hand washing liquids, soap, laundry detergents or disinfectants will damage the DishDrawer®.



Closed detergent dispenser



Open detergent dispenser

- 1 Press the latch down and the door will open.
- 2 Pour in detergent. No detergent is needed for the Rinse programme.
- 3 After filling the main wash compartment, close the dispenser door until it clicks shut. The detergent will automatically be released into the DishDrawer® during the wash programme.

- a Pre-wash compartment, 10g capacity
- b Main wash compartment, 30g capacity
- c Detergent dispenser latch
- d Rinse aid indicator light
- e Rinse aid plug

Detergent quantities

The detergent quantities recommended below are for individual drawers.

Wash programmes	pre-wash (g)*	main wash (g)*
Heavy	5	15
Normal		15
Delicate		5
Fast		5

* 5g equates to approximately 1 teaspoon, 15g equates to approximately 1 tablespoon.

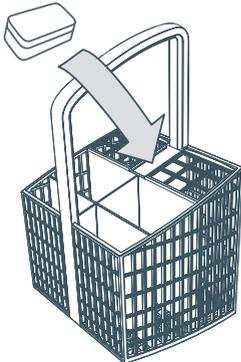
Dishwasher tablets

Important!

If you are using dishwasher tablets, we recommend you use the standard Normal programme only. Using any other programme (including Normal Eco) with dishwasher tablets will not ensure optimum wash performance.

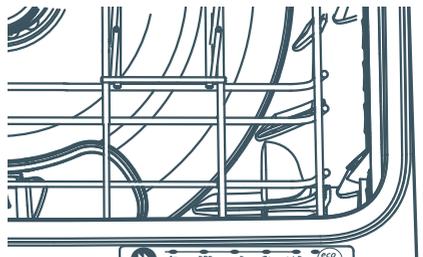


Tablets can either be placed in the cutlery basket or alternatively, placed directly in the wash compartment as below. If you are using dishwasher tablets with a built-in rinse aid component, you may need to reduce the rinse aid setting. See 'Option adjustments' for instructions.



Preferred:

Place the dishwasher tablet in the empty section between the anti-nesting grids.



Alternative:

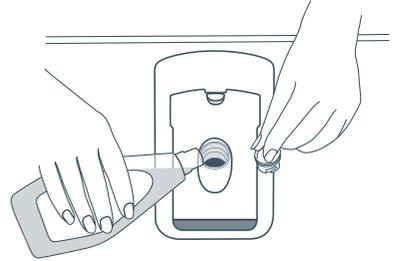
If the cutlery basket cannot be used, place dishwasher tablet in the bottom of the wash compartment.

Rinse aid dispenser

We highly recommend the regular use of liquid rinse aid to give the best drying results. Rinse aid gives a streak-free, sparkling clean look to glass and chinaware. In addition, it prevents metal from tarnishing. The rinse aid dispenser is on the inside of the drawer, located underneath the detergent dispenser. The rinse aid dispenser holds approximately 50 ml of rinse aid.

Filling the rinse aid dispenser

- 1 Turn the plug anticlockwise and remove.
- 2 Pour the rinse aid into the circular opening.
- 3 Take care not to spill rinse aid into the DishDrawer®. Any spillages must be wiped up to prevent excess foaming. Failure to wipe rinse aid spillages may result in a service call which will not be covered by warranty.
- 4 Fit the plug back into the original position.



How much rinse aid to use

The regulator may need adjusting to suit your water conditions or the particular dishwasher tablet you are using. The lowest setting is '1' and the highest is '5'. Refer to the 'Option adjustments' section to adjust the rinse aid setting. If there is excessive foam at the end of the wash or you are using dishwasher tablets with built-in rinse aid, reduce the setting. If dishes are wet or streaky after drying, increase the setting.

Rinse aid indicator light

If the rinse aid indicator light is red, refill the dispenser. If the rinse aid indicator light is dimly lit or not lit at all, there is enough rinse aid for the wash.

Note:

- Lighter coloured rinse aids will not dim the indicator light as effectively as darker coloured rinse aids.
- When the rinse aid is being dispensed, you may notice some unusual noises during the wash: this is normal.

The following options can be adjusted to suit your preferences:

Rinse aid setting

Reduce the Rinse aid setting if there is excess foam after a wash programme or if you are using dishwasher tablets with built-in rinse aid.

Increase the Rinse aid setting if dishes are wet or streaky after a wash programme.

Water softener setting

Refer to the 'Water softener' section.

Auto power setting

By default, DishDrawer® will automatically turn on whenever the drawer is opened. Washing will not start until the drawer is closed and the ►|| button has been pressed. If you do not want the DishDrawer® to turn on automatically, this feature can be turned off.

End of wash programme beeps

By default, DishDrawer® will beep six times at the end of a wash programme. This feature can be turned off.

Closed drawer option

The Closed drawer option will lock the DishDrawer® when the drawer is closed. When you wish to open the drawer, press the ⏻ button. When the drawer is fully closed again, the lid will automatically come down after 30 seconds and lock.

If the Keylock feature is used in conjunction with the Closed drawer option, pressing the ⏻ button will not unlock the drawer. The Keylock feature must be turned off to enable DishDrawer® to be opened.

Note: this option is highly recommended if the DishDrawer® is to be used in motor homes.

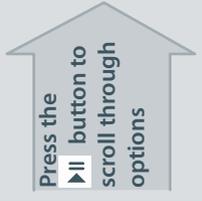
Clean dish indicator option (models with LCD only)

By default, DishDrawer® is programmed with the Clean dish indicator option off. When the Clean dish indicator option is on, the ☐☐ symbol will remain in the electronic display after a wash programme has finished to indicate the dishes are clean. When you have unloaded all the dishes, press the ⏻ button to return to normal operating mode.

This option might be useful when dishes have been left in DishDrawer® and you cannot remember if they have been washed or in situations where household members regularly remove only a few clean dishes without emptying the drawer.

We do not recommend the Clean dish indicator option be used in conjunction with the Closed drawer option.

How to make option adjustments (Integrated and Prefinished - no LCD)

Follow the steps below	Rinse aid setting	Auto power option	End of wash programme beeps option	Closed drawer option*
First Enter Option adjustment mode: 1 Press the  button to turn power on. Open DishDrawer®. 2 Press and hold the ECO and  buttons for 5 seconds until one long beep sounds.	Prefinished - no LCD red / off Integrated - no LCD red / off 	purple / on orange / on 	blue / on green / on 	red / on red / on 
 Press the  button to scroll through options				
Make an adjustment	The current setting is shown on the wash programme selector in red lights. If four red lights are lit, the option selected setting is set to 4. Press the  /  button to increase the setting.			
Save	Press the  button to save the change.			
Example	 Rinse aid setting set to 4	 On	 On	 On
		 Off	 Off	 Off

* The option sequence will start again from the Rinse aid setting.

How to make option adjustments (models with LCD)

	Rinse aid setting	Auto power option	End of wash programme beeps option	Closed drawer option	Clean dish*
Follow the steps below					
First	Enter Option adjustment mode:				
	<ol style="list-style-type: none"> 1 Press the U button to turn power on. Open the DishDrawer®. 2 Press and hold the ECO and 4 buttons for 5 seconds until one long beep sounds. 				
Press the ▶ button to scroll through options	rH	RP	EC	Ld	d5
Make an adjustment	The current setting is shown on the wash programme selector in red lights. If four red lights are lit, the option selected setting is set to 4. Press the 4 button to increase the setting.				
Save	Press the U button to save the change.				
Example	 RINSE AID SETTING: 4	RP On RP Off	EC On EC Off	Ld On Ld Off	d5 On d5 Off

*The option sequence will start again from the Rinse aid setting.

Important!

Disconnect the DishDrawer® from the power supply before any cleaning or maintenance.

Cleaning the surfaces

Important!

We do not recommend the use of the following cleaning aids on your DishDrawer® as they may damage the surfaces:

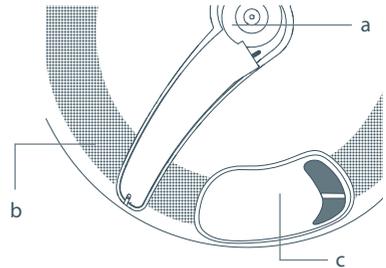
- *Plastic or stainless steel scouring pads*
- *Abrasive, solvent, household cleaners*
- *Acid or alkaline cleaners*
- *Hand washing liquids or soap*
- *Laundry detergents or disinfectants*
- *Proprietary 'Stainless Steel' cleaners or polishes as these may damage the protective coating.*

- 1 Wipe with a clean damp cloth. Take care not to wet the control panel.
- 2 Dry with a clean lint-free cloth.

Cleaning the drain filter, spray arm and filter plate

We recommend that the drain filter is cleaned whenever there is evidence of food particles. The spray arm and filter plate may need cleaning about once a month in normal use or more often should the need arise.

If a dishwasher cleaner/descaler is used, you must run a wash programme with detergent immediately afterward to prevent any damage to your DishDrawer®.



Internal parts of the DishDrawer® :

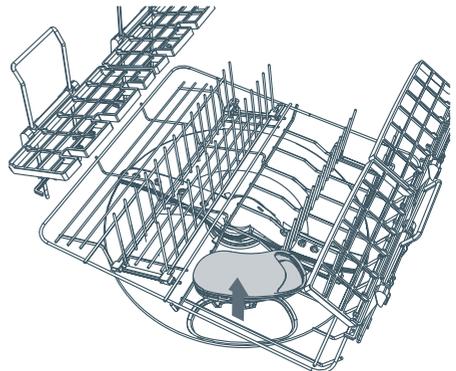
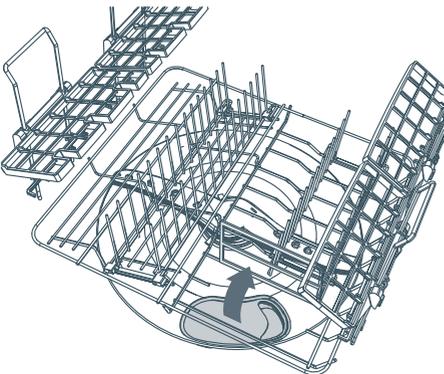
- a Spray arm
- b Filter plate
- c Drain filter

Important !

The DishDrawer® must be used with the filter plate, drain filter and spray arm correctly in place.

Cleaning the drain filter

- 1 Unplug the DishDrawer® or turn it off at the power supply (wall switch).
- 2 Lift up the drain filter access panel on the base rack (if fitted).
- 3 Lift and remove the drain filter.
- 4 Empty, rinse clean under running water and replace back into the allocated space.
- 5 Ensure the drain filter is flush with the filter plate.
- 6 Plug the DishDrawer® back in or turn it on at the power supply (wall switch).



Cleaning the spray arm and filter plate

Ensure the DishDrawer® is cool before you start cleaning and follow the instructions for removing the drain filter and spray arm.

- 1 Unplug the DishDrawer® or turn it off at the power supply.
- 2 Unclip the glass supports from the rack wires and fold all the adjustable racks away, so that they are upright and close to the top.
- 3 Remove the base rack carefully. Lift from the back end first to prevent knocking the detergent and rinse aid dispenser.
- 4 Lift the spray arm and shake any foreign material out.

Rinse the spray arm clean under running water and wipe with a damp cloth.

- 5 In the centre of the filter plate there are two rings. Hold the centre ring still and turn the outer ring anti-clockwise, about a 1/8 turn. This will release the filter plate.
- 6 Lift the filter plate out.

When cleaning the underside of the filter plate, take care handling the sharp outer edge to avoid the risk of cuts.

Remove any foreign material, wash in hot soapy water and rinse thoroughly in clean water. The heater plate can be wiped with a damp cloth.

- 7 Replace the filter plate so it lies flat in the base of the drawer ensuring the filter plate is fully locked into position with the centre ring.

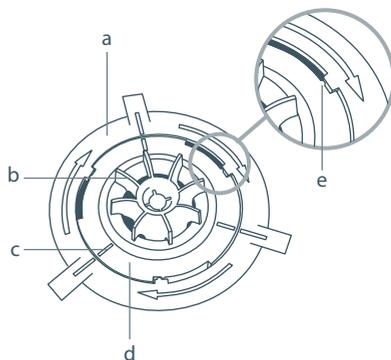
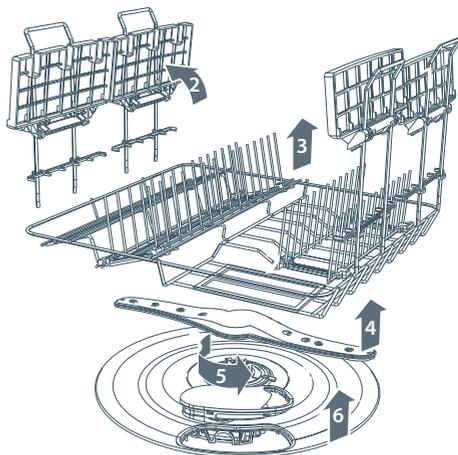
Important!

To lock the filter plate into position, ensure the lines align with each other (c) and all three pin pairs firmly interlock (e).

Refer to the diagram for the correct position.

The filter plate must not be able to move about freely.

- 8 Replace the spray arm back onto the impeller.
- 9 Replace the base rack, lowering its front edge into position first.
- 10 Plug the DishDrawer® back in or turn it on at the power supply.



Correct locking position of filter plate with motor assembly (under spray arm)

- a Outer ring
- b Impeller
- c Correct alignment marks
- d Centre ring
- e Interlocking pins

Note: Where there is broken crockery or glass in the drawer, it must be carefully removed to prevent damage to the DishDrawer®.

Problem	Possible cause	What to do
Unclean dishes	Wash programme unsuitable for the load.	Refer to the 'Wash programme chart' for a suitable wash programme, or the soils were too heavily baked on and dishes may need soaking.
	Spray arm unable to rotate.	Ensure no items are obstructing the spray arm path.
	DishDrawer® overloaded/incorrectly loaded.	Refer to the section on loading.
	Filter plate/drain filter is incorrectly inserted.	Refer to the 'Care and cleaning' section.
	Detergent put in the wrong compartment.	Detergent must be placed in the large compartment.
	Excess food not removed from dinnerware prior to loading.	Scrape all food scraps off dinnerware prior to loading.
	Unsuitable detergent.	Use recommended brands of dishwasher detergent.
	Not enough detergent.	Refer to the detergent section or the detergent manufacturer's instructions.
	Spray arm holes are blocked.	Clean the spray arm.
Foaming	Incorrect amount of detergent.	Refer to the detergent section or consult the detergent manufacturer's instructions.
	Too much egg in the wash load.	Increase the amount of detergent.
	Rinse aid setting too high.	Decrease the rinse aid setting.
Water leaking	Drain hose disconnected from waste pipe.	Reconnect the drain hose to the waste pipe.
	Water inlet hose not properly connected.	Ensure the inlet hose is connected securely.
	Other leaks.	Turn water and power supplies to the DishDrawer® off. Call your dealer or Authorised Service Centre.
DishDrawer® will not open	Childlock feature is on or the Closed drawer option is on, or both.	Turn the Childlock off. Hold down the  button until the  symbol disappears from the LCD screen or the light above the  button disappears and/or press the  button to open the DishDrawer®.
Power failure during cycle		Wait until power resumes, cycle will restart in same part of wash programme.

Problem	Possible Cause	What to do
Continuous beeping	A fault has occurred.	Refer to the 'Fault codes' section.
Intermittent beeping	DishDrawer® is in pause mode.	Close the DishDrawer® and press the ►► button.
DishDrawer® will not start	Power supply is not connected.	Connect the power supply.
	The drawer is not closed properly.	Ensure the drawer is firmly closed.
	Keylock or Childlock feature is on.	Turn the Keylock or Childlock off. Hold down the  /  button until the  symbol disappears from the LCD screen or the light above the  /  button disappears.
	►► button not pressed.	Press the ►► button.
Excess water in the DishDrawer®	Drain hose(s) bent or kinked.	Straighten the drain hose(s).
	Blocked filters.	Clean the filter plate/drain filter. Refer to the 'Care and cleaning' section.
Water marks on the dishes	Rinse aid depleted.	Refill the rinse aid dispenser.
	Rinse aid setting too low.	Increase the rinse aid setting.
	DishDrawer® overloaded/incorrectly loaded.	Refer to the section on loading.
DishDrawer® interior is stained	Some foods, like tomato based products, may stain the inside of the DishDrawer®.	Pre-rinse dishes before placing in the DishDrawer®. Alternatively, using the Rinse programme after adding the dishes may minimise staining.
Dishes did not dry	Incorrect loading.	Ensure the dishes are not nesting together.
	Rinse aid depleted.	Refill the rinse aid dispenser.
	Rinse aid setting too low.	Increase the rinse aid setting.
	Eco wash programme used.	Choose a standard wash programme.
No detergent dispensed	Detergent dispenser was wet when loaded.	Clean the dispenser and ensure the dispenser is dry when adding detergent.
Excessive motor noise	The filter plate and/or spray arm is incorrectly placed.	Refer to the 'Care and cleaning' section for details on correct placement.
	No water in the motor area.	This usually occurs on the first use or when the DishDrawer® has not been used for long periods of time. Run the DishDrawer® through a wash programme.

How to recognise a fault code

When a fault has occurred, the DishDrawer® will continuously beep every second.

The fault code will be displayed on the electronic display for models with LCD and on the wash programme selector for models with no LCD.

Each fault code is shown in the following chart.

How to attend to a fault code

- 1 Press the  button to remove the fault code.
- 2 If the fault code and continuous beeps cannot be removed by pressing the  button, turn the DishDrawer® off at the power supply.
- 3 We recommend you check the following chart and correct the fault where possible.
- 4 After attending to the fault, turn the DishDrawer® on at the power supply.
- 5 If the fault code and continuous beeps remain, turn the water and power supply off to the DishDrawer®.
- 6 When calling your Authorised Service Centre, advise them of the fault code that has appeared on the DishDrawer®. This information will help the Authorised Service Centre respond to your request.

Fault codes	Possible causes	What to do
<p>F1 </p> 	<p>Flood switch has been activated.</p>	<p>Turn the water and power supply to the DishDrawer® off and call your Authorised Service Centre or Customer Care.</p>
<p>F2 </p> 	<p>Motor problem.</p>	<p>Call your Authorised Service Centre or Customer Care.</p>
<p>F3 </p> 	<p>Temperature sensor failed.</p>	<p>Ensure water coming in through the inlet hose is less than 65 °C. You may need to install a tempering valve on your water supply.</p>
<p>F4 </p> 	<p>Faulty temperature sensor or element.</p>	<p>Call your Authorised Service Centre or Customer Care.</p>
<p>F5 </p> 	<p>Lid fault.</p>	<p>1 Turn power supply to DishDrawer® off, then turn on power supply. Fault may reset. 2 Call your Authorised Service Centre or Customer Care.</p>
<p>F6 </p> 	<p>Lid fault.</p>	<p>1 Turn power supply to DishDrawer® off, then turn on power supply. Fault may reset. 2 Call your Authorised Service Centre or Customer Care.</p>
<p>F7 </p> 	<p>Lid fault.</p>	<p>Call your Authorised Service Centre or Customer Care.</p>
<p>F8 </p> 	<p>Electrical problem.</p>	<p>1 Turn power supply to DishDrawer® off. 2 Call your Authorised Service Centre or Customer Care.</p>
<p>F9 </p> 	<p>Electronics malfunction.</p>	<p>Call your Authorised Service Centre or Customer Care.</p>

Fault codes	Possible causes	What to do
<p>U1 </p> 	<p>Fill fault.</p>	<ol style="list-style-type: none"> 1 Turn the DishDrawer® water supply on. 2 Ensure the spray arm is placed on the impeller and can rotate about the centre. If the DishDrawer® is full of water, it will need to be emptied manually. 3 Call your Authorised Service Centre or Customer Care.
<p>U4 U4</p> 	<p>Fault in the other drawer preventing the use of this drawer.</p>	<p>Check other drawer, attend to fault code on that drawer.</p>

Before you call for service or assistance ...

Check the things you can do yourself. Refer to the installation instructions and your user guide and check that:

- 1 your product is correctly installed
- 2 you are familiar with its normal operation.

If after checking these points you still need assistance, please refer to the Service & Warranty book for warranty details and your nearest Authorised Service Centre, or contact us through our website listed on the back cover.

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The product specifications in this booklet apply to the specific products and models described at the date of issue. Under our policy of continuous product improvement, these specifications may change at any time. You should therefore check with your Dealer to ensure this booklet correctly describes the product currently available.

www.fisherpaykel.co.nz
www.fisherpaykel.com.au

NZ AU
DishDrawer® user guide
Published: 02/2009
Part No. 599732 A



Refrigerators

Active Smart Refrigerator/Freezer 329L

E331TRT White 329 litres



Key Features

- Active Smart™ system
- Frost Free
- Adjustable Glass shelves
- Humidity controlled half-width crisper bins

Dimensions

H 1425 x W 635 x D 712

Product Info

If you prefer the classic look and want the benefits of Active Smart's leading edge technology, the Tasman range is the ideal choice. Tasman combines subtle styling with outstanding performance, maintaining freshness for longer - because food is one of life's greatest pleasures.

Finishes

-  White

Configuration

- Adjustable Glass shelves
- Adjustable roller feet
- Covered door shelves²
- Egg Trays²
- Freezer door pockets²
- Freezer shelves¹
- Front levelling feet
- Humidity controlled half-width crisper bins²
- Ice cube trays²
- Rear rollers
- Three shelves (incl above vegetable area)

Consumption Data

- Energy Star rating²2.5
- Energy usage (kWh/yr)⁴405
- Premium Energy Efficiency - Energy star

Design

- Door opening Available left and right
- Interchangeable doors (Conversion kit required)
- Top mount freezer
- White Prepaint Cabinet

Performance Features

- Active Smart™ system
- Door Alarm - Freezer
- Door Alarm - Refrigerator
- Frost Free

Warranty

- 2 year parts and labour warranty
- 5 years rust free
- 5 years sealed system (parts only)

Dimensions

- Height - incl. feet and hinge cap 1425mm
- Width 635mm
- Depth - including handle 712mm
- Depth door open 90 ° 1278mm
- Depth - door closed not including handle 694mm
- Minimum air clearance - each side 20mm
- Minimum air clearance - at rear (incl. compressor tray) 30mm
- Minimum air clearance - on top 50mm
- Refrigerator Volume 232 litres
- Freezer Volume 97 litres
- Total Gross Volume 329 litres

Contact Details

Customer Care Centre
Fisher & Paykel Appliances
P.O. Box 58732
Botany Manukau 2163
New Zealand
Phone: 0800 FP CARE (0800 37 2273)
Fax: +64-9-2730656

Check with your local retailer for pricing, availability and stock of this model. The product dimensions and specifications in this page apply to the specific product and model. Under our policy of continuous improvement, these dimensions and specifications may change at any time. You should therefore check with your retailer or Fisher & Paykel's Customer Care Centre to ensure this page correctly describes the model currently available.



Installation instructions and user guide

Refrigerator & Freezer

NZ AU UK IE PAC

Active Smart™ models

635mm wide E331T, E372B, E381T, E402B, E411T, E415H

680mm wide E406B, E413T, E440T, E442B

790mm wide E521T, E522B

Cyclic and compact models

525mm wide P120, E169T, C170T, C190, E240B, E249T, C270

635mm wide C373, C450, E373, E450

Vertical freezer models

525mm wide E150, E210

635mm wide E308, E388

Chest freezer models

Slimline H215, H275, H320

Standard H160, H220, H280, H360, H510, H701

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Ice & Water refrigerators

Please refer to supplement Ice & Water User Guide

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Chest freezers

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Storing food in your freezer	27

Problem solving checklist

Customer care information

Important!

This User Guide is to be used for all refrigerator/freezers. It contains all the general information required for the operation of your refrigerator/freezer.

A User Guide is provided with the Ice & Water refrigerator. This booklet contains additional specific information about the ice and water functions on the refrigerator.

SAVE THESE INSTRUCTIONS

2 Safety and warnings

To reduce the risk of fire, electric shock, or injury to persons read the IMPORTANT SAFETY INSTRUCTIONS before operating this appliance.

Use this appliance only for its intended purpose as described in this User Guide.

Important safety precautions

Warning

When using this appliance always exercise basic safety precautions including the following:

Danger

- *This appliance is not intended for use by young children or infirm persons without supervision. Young children should be supervised to ensure they do not play with the appliance.*
- *Risk of child entrapment. Before you throw away your old refrigerator or freezer:*
 - *Take off the doors*
 - *Leave the shelves in place so that children may not easily climb inside.*

Disposal

- *Extreme care must be taken when disposing of your old appliance to avoid hazards. The refrigerant gas must be safely removed and for the safety of young children, remove doors.*
- *Your Fisher & Paykel Appliances Authorised Service Centre will be able to give advice on environmentally friendly methods of disposing of your old refrigerator or freezer.*

Electrical

- *Your new appliance must be properly installed in accordance with the installation instruction before it is used.*
- *Never unplug your refrigerator or freezer by pulling on the power cord.*
- *Always grip the plug firmly and pull straight out from the outlet.*
- *Do not plug in any other appliance at the same power point as your refrigerator or freezer or use extension cords or double adapters.*
- *Repair or replace immediately all electric service cords that have become frayed or otherwise damaged. Do not use a cord that shows cracks or abrasion along its length or at either the plug or appliance end.*

If the power supply cord is damaged, it must only be replaced by your Fisher & Paykel Appliances Authorised Service Centre because special purpose tools are required.
- *When moving your appliance away from the wall, be careful not to roll over or damage the power cord.*
- *Unplug your refrigerator or freezer before cleaning or replacing the lightbulb.*

Storing food and drinks

- *Never store volatile or flammable materials in your refrigerator or freezer as they may explode.*
- *Never freeze liquids in glass containers. Liquid expands during freezing, which may cause the container to explode.*
- *Never freeze carbonated drinks. They may explode.*
- *Do not consume food if it is too cold. Food removed from the freezer compartment may be cold enough to cause damage when brought into contact with bare skin e.g. frozen ice cubes.*

Power failure – food safety

- *Do not refreeze frozen foods that have thawed completely. Follow the recommendations below if you discover food in your freezer has thawed:*
 - 1) *Ice crystals still visible – food may be refrozen but should be stored for a shorter period than recommended.*
 - 2) *Thawed but refrigerator cold – refreezing generally not recommended. Fruits and some cooked food can be refrozen but use as soon as possible. Meat, fish, poultry – use immediately or cook then refreeze. Vegetables – discard as they usually go limp and soggy.*
 - 3) *Thawed but warmer than 4 °C. Red meat can be cooked immediately and refrozen but use as soon as possible. Discard all other frozen foods.*
- *Do not refreeze frozen foods that have thawed completely. The food may be dangerous to eat.*

Cleaning

- *Many commercially available cleaning products contain solvents which may attack plastic components of your refrigerator or freezer and cause them to crack. Please refer to the cleaning care section of this booklet for further advice.*

SAVE THESE INSTRUCTIONS

4 Installation instructions

Please follow the steps for installation to ensure your appliance operates correctly.

1. Power

- The appliance must be installed so the plug is accessible.
- To ensure that the appliance is not accidentally switched off, connect your refrigerator or freezer to its own power point. Do not plug in any other appliance at this power point or use extension cords and double adaptors, as the combined weight of both power cords can pull the double adaptor from a wall outlet socket.
- For power requirements, refer to the information on the serial plate located at the front bottom right-hand side of the refrigerator when the door is open.
- It is essential that the appliance be properly grounded (earthed).

2. Location

- Your refrigerator or freezer should not be located in direct sunlight or next to any heat generating appliance such as a cooktop, oven or dishwasher.

3. Stability

- It is important that all four corners of the refrigerator or freezer base are supported firmly on the floor to eliminate any cabinet movement.
- Installing the appliance on a soft or uneven or unlevel floor may result in twisting of the cabinet and poor sealing of the doors. If the doors do not seal properly, warm air will enter the food storage areas causing the temperature to increase, resulting in food spoilage and food loss.
- Before moving your refrigerator or freezer into its position, ensure that the adjustable front feet are fully retracted by turning them anticlockwise, i.e. towards the right of the cabinet.
- Position your refrigerator or freezer. Turn the adjustable feet clockwise, i.e. to the left, to lower the adjustable front feet. Raise the front of the appliance until it is stable and the doors move towards the closed position, on their own, when open.
- The front levelling foot on the hinge side should take the majority of the weight of the cabinet and the cabinet should be stable, i.e. cabinet should not rock or wobble.

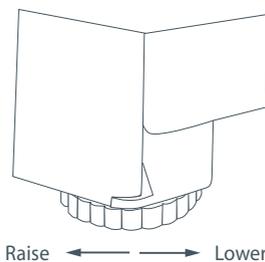


Fig.1 Refrigerator foot

6 Installation instructions

Before placing food in the fresh food or freezer compartments

- Remove all packaging. Ensure that all transit clips are removed from the refrigerator. These are small rubber stops located at the back of the shelves.
- Allow the refrigerator and freezer to run empty for 2 – 3 hours to allow each compartment to cool to the appropriate temperature.
- Clean the inside of the appliance with warm water and a little liquid detergent to remove manufacturing and transportation dust.
- The appliance may have an odour on its initial operation, but this will go when the refrigerator and freezer have cooled sufficiently.

Energy efficiency

- Do not cover your appliances with any material that will prevent air from flowing around the cabinet sides.
- Do not leave the door open for any longer than is necessary.
- Allow good clearances in front of the air ducts within the cabinet for maximum cold air distribution.

If your refrigerator or freezer is turned off for any reason, wait 10 minutes before turning it back on. This will allow the refrigeration system pressures to equalise before restarting.

Moving your refrigerator

- Turn off the appliance and unplug from the power point. Remove all food.
- Turn the adjustable feet to the right as far as they will turn (see page 4).
- Ease the refrigerator out of its position. Tuck the power cord away and tape the doors closed. Tape the shelves in place. If the cabinet needs to be placed at an angle or laid down, carefully lay it on its side (the right hand side when viewed from the front).
- Relocate and install. If the appliance has been left on its side for any length of time, leave it standing upright for at least 10 minutes before turning on.

Storing your refrigerator or freezer

- When storing your cleaned appliance, leave the door(s) open. This allows air to circulate and prevents the build up of bacteria and moulds.
- Before using again, clean well using a mixture of warm water and baking soda (add 1 teaspoon of baking soda to each 500 ml of water). Rinse with clean water.

Holiday time

We recommend you leave your refrigerator or freezer operating while you are on holiday.

If you need to hinge your door on the opposite side we recommend that you call your local Fisher and Paykel Authorised Service Centre or Dealer to make this conversion.

Active Smart™ refrigerator models with silver handles need to be ordered at the point of purchase either with left or right opening doors and can not be interchanged.

All other models need to have an appropriate conversion kit for that model refrigerator.

The kit is available from your Authorised Service Centre or Dealer. Full instructions are included in the conversion kit.

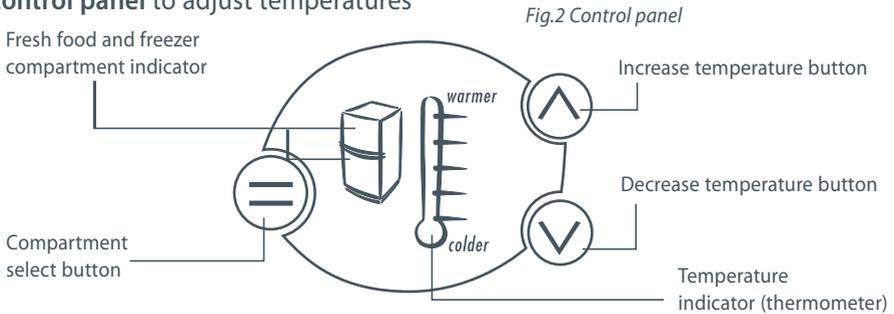
Models:	635mm wide	E331T, E372B, E381T, E402B, E411T, E415H
	680mm wide	E406B, E413T, E440T, E442B
	790mm wide	E521T, E522B

For information on the operation of the Ice & Water control panel please refer to the Ice & Water User Guide.

Temperature control

- When the refrigerator is first turned on, the powerful cooling system will automatically cool both refrigerator and freezer compartments to their set temperatures. This will take between 2 – 3 hours depending on the temperature and humidity of the environment.
- The two compartment temperatures are accurately and independently controlled and do not change with the temperature or humidity of the surroundings; whether summer or winter.
- If you wish to alter the temperature of either the fresh food compartment or freezer compartment, this can be easily done by using the control panel located at the back of the fresh food compartment.

Control panel to adjust temperatures



Fresh food compartment

- The fresh food compartment light on the refrigerator diagram will be showing. The temperature indicator illustrated by a thermometer will show the temperature setting for this compartment as a series of lights.
- The temperature may be altered by pressing the increase temperature or decrease temperature buttons. One press on either of these buttons will produce a dimmer light which indicates a small change in temperature.
- Pressing either button twice gives a brighter light and indicates a greater change in temperature. Fewer lights on the thermometer means a cooler temperature for the compartment selected.

Freezer food compartment

- To adjust the freezer temperature press the compartment select button until the light flashes on the freezer compartment indicator.
- The freezer temperature can be altered by pressing the increase or decrease temperature buttons.
- One press on either of these buttons will produce a dimmer light which indicates a small change in temperature. Pressing either button twice gives a brighter light and indicates a greater change in temperature.

Note: Successively pressing the compartment select button will automatically scroll between the compartments, a return to the fresh food compartment will be accompanied by a longer beep.

- When the door is reopened the control panel will return automatically to the fresh food compartment setting.

Sabbath mode

- To activate the Sabbath mode press the compartment select button on the temperature control panel for 10 seconds.

When the product is in sabbath mode:

- The light will not operate when the door is opened.
- The door alarm will not operate.
- The display will not be illuminated.
- Opening the door will not affect the compressor or fans.

- If the power to the refrigerator is turned off whilst in this mode, the product will continue in Sabbath mode when the power is restored.
- Sabbath mode will automatically de-activate 80 hours after activation.
- To de-activate earlier than 80 hours press the compartment select button on the temperature control panel for 10 seconds.

Normal refrigerator sounds

Active Smart™ refrigerators, with their excellent energy ratings and cooling performance, can produce sounds somewhat different to your old refrigerator.

Normal operational sounds include:

- Fan air flow sound. *Active Smart™* refrigerators have fans which change speed depending on demand. During cooling periods, such as after frequent door openings, fans circulate the cold air in the refrigerator and freezer compartments producing some air flow sound. This is quite normal.
- Cracking or popping which may sound like ice coming off the evaporator. This occurs when the defrost function is operating.
- Running water sound. This is the liquid refrigerant in the system and can be heard as a boiling or gurgling noise.
- An audible hissing sound after closing the freezer door. This is due to the pressure difference between the warm air that has entered the cabinet and suddenly cooled, and the outside air pressure.
- Other strange sounds may be heard for the following reasons:
 - Cabinet not level
 - Floor uneven or weak
 - Bottles or jars rattling on shelves

Fruit and vegetable bins and humidity control cover

The fruit and vegetable bins feature a unique cover which provides two functions:

- The humidity cover seals the bins and provides a humid microclimate to extend storage times of fruits and vegetables.
- The humidity cover prevents condensation, which forms at high humidities, from dripping down onto the fruit and vegetables. The ability to retain high humidity in the fruit and vegetable bin may produce small amounts of water in the bottom of the fruit and vegetable bins. This can be wiped out as required.

Fruit and vegetable bins and humidity slide (where fitted)

- Each fruit and vegetable bin has a humidity adaptor control that can be adjusted to fruit or vegetables depending on what is stored in the bins.
- If possible try to store fruit and vegetables separately. This will help extend their storage life.
- If there is a mixture of fruit and vegetables in the bin adjust the position of the control to the centre.
- If there is too much water in the bins the control can be adjusted towards the setting with fewer drips.
- Remember a small amount of water in the bins is beneficial for fruit and vegetable storage.

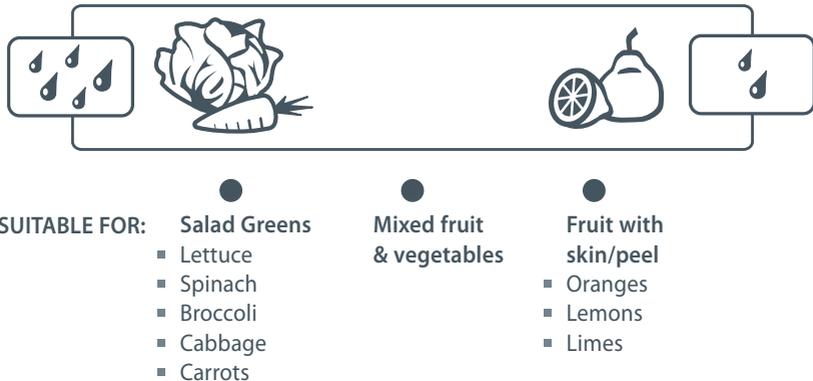


Fig.3 Humidity Control graphic

Ice trays and lid

- To empty the ice cubes into the lid, hold the tray and lid together and twist to dislodge.
- Refill the ice tray with water, place lid containing ice cubes on top and store in the freezer.
- Ice cubes are best stored in a closed container or plastic bag as they readily absorb odours and tastes from other foods.

Deodoriser (Where fitted)

- A deodoriser is fitted to remove unpleasant odours from the refrigerator. It is located behind the duct cover in the fresh food compartment and will last for the life of your fridge.

Door alarms

- If the fresh food compartment door is left open the alarm will beep after 90 seconds and if the freezer door is left open the alarm will beep after 60 seconds.
- While either door remains open, subsequent beeps will sound every 30 seconds for 5 minutes.
- A continuous alarm will sound if the door has been left open for 5 minutes or longer and the light will turn off. The alarm will stop when the door is closed.

Fault alarms

- If the electronic controller detects a fault from which it is unable to recover an alarm will sound.
- When the fresh food compartment door is opened a fault code (specific pattern of lights) will flash red and green on the Control panel to alert you to the fault. The audible alarm will stop when any button is pressed but the lights will remain flashing. If such a fault occurs, call your Fisher & Paykel Appliances Authorised Service Centre immediately; the fault code will help the service person find and remedy the cause of failure.

Divider instructions (Where fitted)

To fit the divider, insert divider into bin on an angle, straighten and slot into place. To adjust the divider, fully extend the bin, partially lift the divider, slide sideways and re-slot into position.

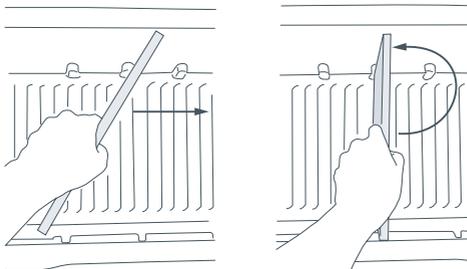


Fig.4 Vegetable bin divider

Roll out drawer model E415H

- The roll out drawer is suitable for storing fruits and vegetables as well as tall bottles and drinks.
- A vent/baffle is located at the front of the drawer.
- The temperature in the drawer can be adjusted by opening or closing this vent.
- Opening the vent fully allows more cold air into the drawer. Typical operating temperatures in this compartment are from 3°C to 9°C.
- The closed vent situation is ideal for storage of tomatoes, tropical fruit, cucumber, capsicum etc. as these foods do not keep as well at colder temperatures.
- The open vent situation is suitable for most vegetables and fruits. Uncut fruit and vegetables with protective skin (e.g. apples and pears) can be stored without wrapping.
- To extend the storage life of other fruit and vegetables place them in loosely sealed plastic bags. This will reduce moisture loss and prevent excess moisture build-up.

Bottle rack (Where fitted)

- The bottle rack can be used to store a variety of bottles and can be positioned anywhere you would a shelf. To re-position, lift the rear of the rack and pull forward. Bottles are best stored with the top facing the front of the refrigerator.

Replacement of the interior light (Halogen light bulb)

Turn the power off at the wall socket before replacing the bulb. The light bulb is located on the top roof of the cabinet at the front.

- Remove the lens cover using a small screwdriver. Insert the screwdriver in the front centre of the lens cover and gently lever down. Pull out old bulb.
- Do not touch the new bulb with your hand. Leave it in the plastic bag whilst slotting into position.
- Remove plastic bag when bulb is in position.
- Replace lens cover.
- Turn power on. Light bulb should now glow.

Note: The replacement halogen bulb must not exceed 12 Volt/10 Watt. Bulbs are available from your Fisher & Paykel Appliances Customer Care Centre.

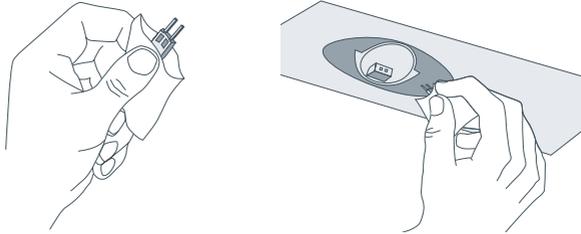


Fig.5 Halogen light replacement

Important!

Your refrigerator is designed to operate for many years without the need for service checks. However, if your refrigerator is malfunctioning, have it attended to by your Fisher & Paykel Appliances Authorised Service Centre as soon as possible. All electrical repairs must be carried out by an adequately trained service technician or qualified electrician.

Interior

- It is important to keep the interior of the refrigerator and freezer clean to help prevent food from becoming contaminated during storage.
- The amount and types of food stored determines how often cleaning should be carried out (ideally once every 1 to 2 weeks) in the refrigerator.
- Remove the shelves from cabinet and door. Wash shelves and storage bins in warm water and detergent; rinse in clean water and dry before replacing.
- Wipe over the interior surfaces with warm water and detergent or baking soda dissolved in warm water (add 1 teaspoon of baking soda to each 500mls of water). Rinse with clean water.
- To help remove “old stale refrigerator” smells add a few drops of vanilla essence or vinegar to the water before cleaning.
- Clean exterior surfaces with warm water and detergent. Use a toothbrush for the magnetic door gasket.
- Do not use harsh, abrasive cloths or cleaners or highly perfumed, strong smelling cleaners or solvents on any part of the refrigerator or freezer.

Exterior

Stainless exterior door

- It is important when cleaning the exterior door surface of your refrigerator, to only use liquid dishwashing detergent dissolved in warm water.
- Dry the door with a clean, lint free cloth.
- The use of any abrasive or stainless steel cleaners and solvents will damage the door surface.

Other exterior surfaces

- Clean all other exterior surfaces with warm water and detergent.
- If necessary, clean the magnetic door gasket with an old toothbrush, warm water and detergent.

Water evaporator tray

- The water evaporator tray is found above the compressor at the back of the refrigerator or freezer. The tray may require infrequent cleaning.
- Carefully move the refrigerator or freezer out from the wall.
- Switch off the appliance.
- If the tray is full, have one person support the tray while another person unscrews the fasteners. Take care not to spill any liquid over the electrical components. Empty trays may have the fasteners loosened and the tray slipped over through the keyhole. (Reverse order to reassemble).
- Wipe out with warm water and detergent or disinfectant.
- Reassemble taking care not to over-tighten the fasteners.
- Switch on the appliance.

Interior

Glass shelves

Clean with warm water and detergent or a glass cleaner. If cleaning the shelves without removing from the cabinet, use only warm water and detergent as a glass cleaner can damage the plastic components of your refrigerator.

Important!

Many commercially available cleaning products contain solvents that may attack the plastic components of your freezer and cause them to crack. It is important to use only warm water and a small amount of liquid dishwashing detergent on any plastic components inside and outside your freezer. Avoid using anti-bacterial cleaning products on either the interior or exterior of the cabinet as they may cause rusting of metal components and cracking of plastic components.

Bottle rack (where fitted)

- Clean with warm water and detergent. The use of abrasive cleaners and solvents may cause damage.

To remove trays or fixed bins

- For ease of removal, empty food from tray/bin first.
- Hold the centre front of the tray/bin handle.
- Lift vertically to unclip from the runners and pull tray/bin towards you to remove.
- Push runners back into refrigerator.

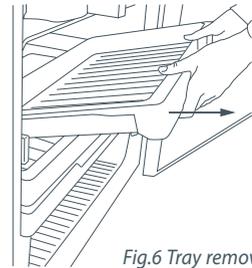
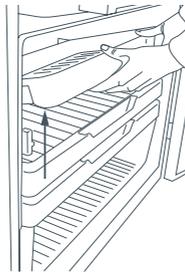


Fig.6 Tray removal

To replace trays or fixed bins:

- With the runners pushed back into the refrigerator, place the tray/bin on top of the runners. Push the tray/bin back slowly until you feel it clip back onto the runners.

Important!

Ensure that trays and bins are securely clipped onto the runners before use.

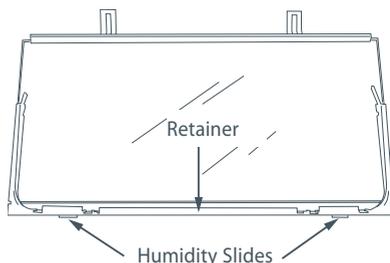
Bin and tray runners are pre-lubricated, and will not need to be re-lubricated during their life. Do not attempt to clean grease from the runners, as this will affect their ability to function. Do not immerse runners in water.

Humidity Control System (where fitted)

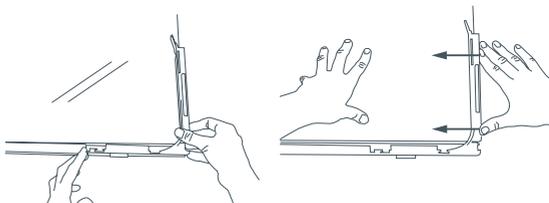
Important!

When cleaning the shelf above the vegetable bins, we recommend that you do not disassemble the Humidity Control System from the shelf.

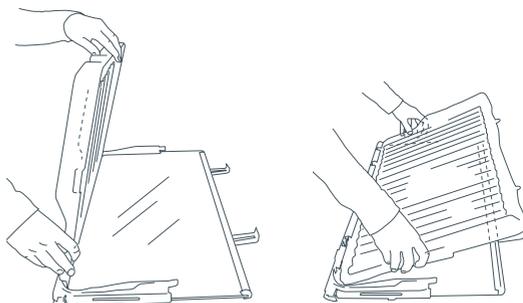
In the event that the plastic lid and humidity slides become separated from the glass shelf, follow these instructions to reassemble.



- 1 Turn shelf upside down
- 2 To attach humidity slides onto shelf front corners, fit bottom clips into shelf front trim. Next, slide sideways towards shelf until arm clips onto glass.



- 3 To attach humidity control lid – with text facing you, align lid with front of shelf. Hold lid vertically and fit front end into retainer on shelf. Ensure lid fits into retainer as well as underneath humidity slides.



- 4 At the sides of the shelf, adjust humidity slide tabs so that the plastic lid is between the shelf and the tabs.
- 5 If clips on back of shelf are present, fasten lid with rear clips. Ensure that the cover is fully secure at front and back of shelf.

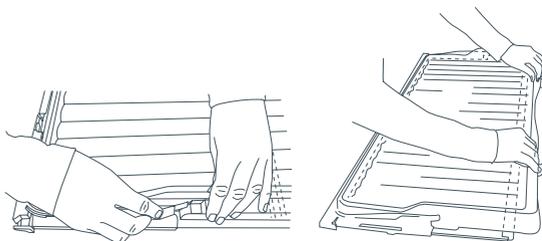


Fig.7 Humidity Control System cleaning

Roll out fruit and vegetable bin – E415H

- Remove for cleaning by pulling out the compartment until it stops, lifting and then continuing to slide it forward until it is fully extended.
- Rest the door front on the floor and with the refrigerator compartment door open, remove the tray, divider rack and bin. Wash with warm water and detergent.
- Rinse, dry and replace.

Lower shelf in models with roll out Fruit and vegetable bin – E415H

- Remove the front baffle after lifting its inner edge. With the refrigerator compartment door open, slide the shelf forward and lift out. Clean with warm water and detergent.
- Rinse, dry and replace in the second groove up from the side runner rail.

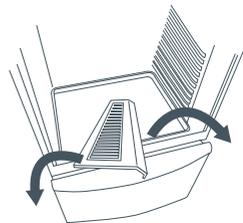


Fig.8 Front baffle

Cyclic and compact operating instructions

Models:	525mm wide	P120, E169T, C170T, C190, E240B, E249T, C270
		(Compact Models)
	635mm wide	C373, E373, C450, E450

Temperature control

- The control has been factory set for normal operating conditions.
- Allow the refrigerator to run empty for 2 – 3 hours before placing food inside the fresh food or freezer compartments.
- Re-adjust the control as necessary to suit your individual preference.

1 is warmest setting

7 is coldest setting

- We recommend adjusting the temperature by half a setting initially and then allow at least 24 hours for the cabinet temperature to stabilise before readjusting.
- If you are altering the temperature of a 2-door refrigerator, remember you are altering the temperature of both compartments.
- The running time and temperature are affected by where your refrigerator is located, how often the door is opened and the temperature of the room the refrigerator is located in. Your refrigerator is designed to operate in a room temperature of between 10°C and 43°C.

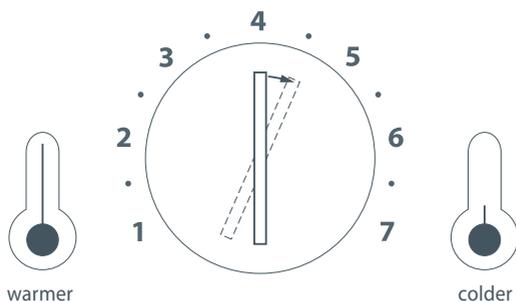


Fig.9 Temperature knob

P120 Ice box

This is designed for short-term storage of frozen foods and ice only. It is recommended that the tray is kept in place under the ice box at all times.

Door alarms (E169T, E240B, E249T, E373, E450 only)

- If the fresh food compartment door is left open the alarm will beep after 90 seconds.
- If the door remains open, subsequent beeps will sound every 30 seconds for 5 minutes.
- A continuous alarm will sound if the door has been left open for 5 minutes or longer.
- The alarm will stop when the door is closed.

Fault alarms

- If the electronic controller detects a fault from which it is unable to recover, an alarm will sound when the door is opened.
- When the fresh food compartment door is opened and a fault has occurred, a specific number of beeps will sound. If a fault occurs, call your Fisher & Paykel Authorised Service Centre immediately; the number of beeps will help the service person find and remedy the cause of failure.

Humidity control cover (635mm wide models)

The vegetable bins feature a unique cover which provides two functions:

- The humidity control cover seals the bins to provide a humid microclimate to extend storage times.
- The humidity control cover prevents condensation which forms at high humidities from dripping down onto the fruit and vegetables.

The ability to retain high humidity in the fruit and vegetable bin may produce small amounts of water in the bottom of the fruit and vegetable bin. This can be wiped out as required.

Replacement of interior light

- Turn the power off at the wall before replacing the lamp. The interior lamp is located at the back of the temperature control box and is removed by unscrewing it.
- Replace bulb, making sure it is tightly screwed in. Switch power back on again.
- The replacement bulb must not exceed 15 Watts. Bulbs are available from your Fisher & Paykel Authorised Service Centre.

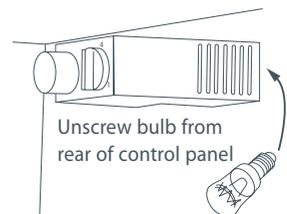


Fig.10 Temperature control box

Important!

Your refrigerator is designed to operate for many years without the need for frequent service checks. However, if your refrigerator is malfunctioning, have it attended to by your Fisher & Paykel Authorised Service Centre as soon as possible.

All electrical repairs must be carried out by an adequately trained service technician or qualified electrician.

Interior

- It is important to keep the interior of the refrigerator and freezer clean to help prevent food from becoming contaminated during storage.
- The amount and types of food stored determines how often cleaning should be carried out (ideally once every 1 to 2 weeks) in the refrigerator.
- Remove the shelves from cabinet and door. Wash shelves and storage bins in warm water and detergent; rinse in clean water and dry before replacing.
- Wipe over the interior surfaces with warm water and detergent or baking soda dissolved in warm water (add 1 teaspoon of baking soda to each 500mls of water). Rinse with clean water.
- To help remove “old stale refrigerator” smells add a few drops of vanilla essence or vinegar to the water before cleaning.
- Clean exterior surfaces with warm water and detergent. Use a toothbrush for the magnetic door gasket.
- Do not use harsh, abrasive cloths or cleaners or highly perfumed, strong smelling cleaners or solvents on any part of the refrigerator or freezer.

Glass shelves

- Clean with warm water and detergent or a glass cleaner. If cleaning the shelves without removing from the cabinet use only warm water and detergent as a glass cleaner can damage the plastic components of your refrigerator.

Exterior

Stainless exterior door

- It is important when cleaning the exterior door surface of your refrigerator, to only use liquid dishwashing detergent dissolved in warm water.
- Dry the door with a clean, lint free cloth.
- The use of any abrasive or stainless steel cleaners and solvents will damage the door surface.

Other exterior surfaces

- Clean all other exterior surfaces with warm water and detergent.
- If necessary, clean the magnetic door gasket with an old toothbrush, warm water and detergent.

Water evaporator tray

- The water evaporator tray is found above the compressor at the back of the refrigerator or freezer. The tray may require infrequent cleaning.
- Carefully move the refrigerator or freezer out from the wall. Switch off the appliance.
- If the tray is full, have one person support the tray while another person unscrews the fasteners. Take care not to spill any liquid over the electrical components. Empty trays may have the fasteners loosened and the tray slipped over through the keyhole. (Reverse order to reassemble).
- Wipe out with warm water and detergent or disinfectant.
- Reassemble taking care not to over-tighten the fasteners. Switch on the appliance.

Vegetable bin – 525mm wide models – except P120 models

- Wash in warm water and detergent. Rinse and dry.

Fruit and vegetable bins and cover – 635mm wide models

- Remove bins then the bottom refrigerator shelf.
- Place the shelf upside down on a flat surface. Pull cover at position A then lift up at position B. Take cover off at sides.
- Clean cover and bins in warm soapy water.
- To reassemble, insert cover and clip at position C, then snap in the clip at position A.

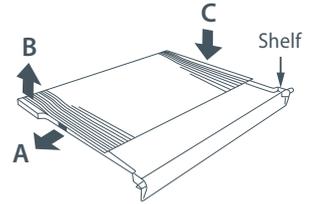


Fig.11 Humidity Control cover

Defrosting the freezer model C170T

- It is recommended that a freezer be defrosted when the frost is greater than 6mm thick.
- Remove all frozen food and wrap it in several layers of paper. Place food in the refrigerator compartment or a cool environment e.g. insulated picnic bin.
- Switch the power off at the wall. The temperature control can remain at its normal setting.
- Remove the freezer baskets or shelves for ease of cleaning.
- Whilst defrosting, leave the freezer door open. If you wish to reduce the defrosting time place a bowl of warm water in the freezer compartment and leave the door open. Keep the refrigerator compartment door closed.
- Use the scraper supplied or a plastic spatula to remove any loose ice. Do not use knives or any other sharp instrument to remove the ice, otherwise the freezer surface may become permanently damaged.
- Ensure that the defrosting of your freezer is carried out as quickly as possible. During defrosting a rise in temperature of frozen food above normal storage temperature can shorten the storage time of the food.
- Wipe the freezer dry. Replace the frozen food.
- Switch the refrigerator on.

Defrosting models with ice boxes

The P120 is designed for short-term storage of frozen foods and ice only.

- Remove all frozen food and wrap it in several layers of paper. Place in a cool environment e.g. insulated picnic bin.
- Position the tray provided beneath the icebox to collect the melting ice.
- Push the defrost button in the centre of the control knob and the compressor will stop. The defrost time may be reduced by placing a bowl of warm water in the icebox and leaving the door of the refrigerator open. Once it has reached the defrost temperature, the compressor will start operating again.
- Use the scraper supplied or a plastic spatula to remove any loose ice.
- Immediately after the refrigerator has automatically restarted, empty the tray of water and ice.
- Wipe the tray and icebox dry.
- Replace the frozen food.

Models: 525mm wide E150, E210
 635mm wide E308, E388

Temperature control

- The cabinet control is located at the bottom rear of the cabinet.
- The control has been factory set to position 4 for normal operating conditions.
- The freezer temperature should be approximately -18°C .
- Re-adjust the control as necessary to suit your individual preference.

1 is the warmest setting.
 7 is the coldest setting.

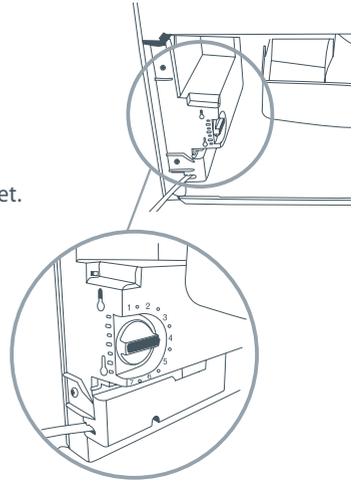


Fig.12 Control box

Door alarms

- If the door is left open the alarm will beep after 60 seconds.
- If the door remains open, subsequent beeps will sound every 30 seconds for 5 minutes.
- A continuous alarm will sound if the door has been left open for 5 minutes or longer.
- The alarm will stop when the door is closed.

Fault alarms

- If the electronic controller detects a fault from which it is unable to recover, an alarm will sound when the door is opened.
- When the door is opened and a fault has occurred, a specific number of beeps will sound. If a fault occurs, call your Fisher & Paykel Authorised Service Centre immediately; the number of beeps will help the service person find and remedy the cause of failure.

Chest freezer operating instructions

Temperature control

- The temperature of the freezer is controlled by a thermostat fitted near the right hand rear corner of the freezer.
- The thermostat has been set to position 4 at manufacturing for normal operating conditions and should not need adjustment. The freezer compartment should be approximately -18°C . At this temperature the food will keep for the length specified on the freezer storage guide.
- Re-adjust the control as necessary to suit your individual preference.

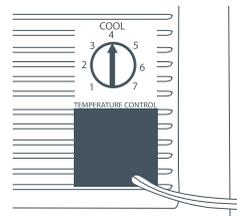


Fig.13 Temperature control

1 is the warmest setting.
 7 is the coldest setting.

Defrosting your chest freezer

- It is recommended that your freezer be defrosted when the frost is greater than 6 to 10mm thick using the plastic scraper provided.
- Remove all frozen food and wrap it in several layers of paper. Place in a refrigerator compartment or a cool environment e.g insulated bin.
- Switch the power off at the wall.
- Unplug and open the defrost water drain and spout. Place a shallow container under the spout. Pour approximately 1 litre of warm water down the drain to clear it of possible residual ice. Should it remain blocked, the spout can be removed to aid thorough cleaning.
- While defrosting, leave the freezer lid open. If you wish to reduce the defrosting time, place containers of hot water in the freezer and close the lid. Use the scraper supplied and a plastic spatula to remove any loose ice.
- Empty out the tray of water. Wipe out the defrosted freezer. Use a mix of 500ml water with 1 teaspoon of baking soda or a small amount of liquid dishwashing detergent and warm water. Rinse with clean water and dry.
- Carefully clean the drain and spout. Replace the drain plug and then close the spout.
- Switch the freezer on. Close the lid and leave running for 15 minutes before replacing the frozen food.
- Do not use knives or any other sharp instrument to remove the ice as the freezer surface may become irreversibly damaged.
- Also do not use harsh abrasive cloths and cleaners, or highly perfumed strong smelling cleaners or solvents on either the interior or exterior of the freezer.
- Frost forms faster on the top edge of the freezer compartment in climates of high humidity as this is the area of first contact to the warm moist air when the lid is open.
- Your chest freezer is designed with a flexible lid seal to keep warm air out of the freezer. Sometimes immediately after closing your chest freezer, you may notice the lid is difficult to re-open. This is normal. Wait a few minutes and try again.

Freezer baskets

- The baskets supplied with your freezer are removable.
- They may be stacked on top of each other by folding the handles downwards. Ensure that packages do not protrude above the top of each basket, and for ease of lifting make sure they are not loaded with a lot of heavy food.
- We recommend that foods requiring longer storage should be kept at the bottom of the freezer.

Replacement of interior light

- When it is necessary to replace the light bulb, turn the freezer off at the wall, remove the light cover and unscrew the bulb. Replace with a new bulb, noting that it must not exceed 15 Watts.

Important!

Your refrigerator is designed to operate for many years without the need for frequent service checks. However, if your refrigerator is malfunctioning, have it attended to by your Fisher & Paykel Authorised Service Centre as soon as possible.

All electrical repairs must be carried out by an adequately trained service technician or qualified electrician.

Storing fresh, perishable foods in your refrigerator helps to extend storage times. The cold temperatures slow down the major causes of food spoilage – namely, the growth of bacteria, moulds and yeasts, and chemical and physical reactions.

Fresh food care

The quality of food before it is placed in the refrigerator is critical to successful storage. For best results:

- Select foods that are very fresh and of good quality.
- Buy only the amount that you will use within the recommended storage time. If you buy extra, plan to freeze it.
- Ensure that food is well wrapped or covered before it is stored. This will prevent food from dehydrating, deteriorating in colour or losing taste and will help maintain freshness. It will also prevent odour transfer. Vegetables and fruit need not be wrapped provided they are stored in the vegetable bins of the refrigerator.
- Make sure that strong smelling foods are wrapped or covered and stored away from foods such as butter, milk and cream which can be tainted by strong odours.
- Refrigerate fresh, perishable foods as soon as possible after purchase. If left at room temperature for any length of time the rate of deterioration will be accelerated.
- Avoid placing food directly in front of air outlets, as it may freeze. Cold air needs to circulate to maintain safe food storage. Do not open the refrigerator door unnecessarily.
- Cool hot foods down before placing them in the refrigerator. This should be done quickly. It can be aided by placing the container of food in a bowl of ice and water; renew the ice as necessary. (Note also that hot containers may damage shelves and wall of the refrigerator).
- Store raw and cooked food in separate containers or packaging to prevent cross contamination.

In addition:

- Keep the refrigerator clean. Wipe the inside walls and shelves frequently (refer to Cleaning Care) and place only clean containers in the refrigerator.
- Keep a close check on the quality of food in your refrigerator. Discard any food that shows signs of spoilage. Pay particular attention to meat, fish and poultry, as these foods are highly perishable. Use food within the recommended storage times.

Dairy foods and eggs

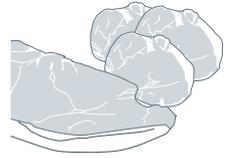
- Most pre-packed dairy foods have a recommended use by/best before/best by' date stamped on them. Store them in the refrigerator and use within the recommended time.
- Butter can become tainted by strong smelling foods so it is best stored in a sealed container.
- Eggs should be stored in the refrigerator. For best results, especially when baking, remove the eggs from the refrigerator two hours before they are to be used.



26 Storing food in your refrigerator

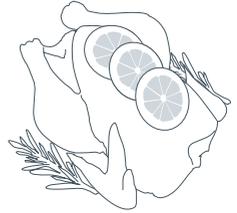
Red Meat

- Place fresh red meat on a plate and loosely cover with waxed paper or plastic wrap or foil.
- Store cooked and raw meat on separate plates. This will prevent any juices lost from the raw meat from contaminating the cooked product.
- Delicatessen meats should be used within the recommended storage time.



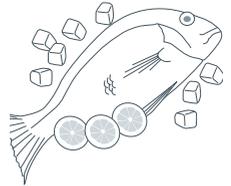
Poultry

- Fresh whole birds should be rinsed inside and out with cold running water. Dry and place on a plate. Cover loosely with plastic wrap or foil.
- Poultry pieces should also be stored this way. Whole poultry should never be stuffed until just before cooking, otherwise food poisoning may result.
- Cool and refrigerate cooked poultry quickly. Remove stuffing from poultry and store separately.



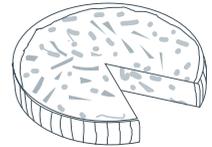
Fish and seafood

- Whole fish and fillets should be used on the day of purchase. Until required, refrigerate on a plate loosely covered with plastic wrap, waxed paper or foil.
- If storing overnight or longer, take particular care to select very fresh fish. Whole fish should be rinsed in cold water to remove loose scales and dirt and then patted dry with paper towels. Place whole fish or fillets in a sealed plastic bag.
- Keep shellfish chilled at all times. Use within 1 – 2 days.



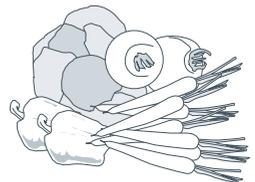
Precooked foods and leftovers

- These should be stored in suitable covered containers so that the food will not dry out.
- Keep for only 1 – 2 days.
- Reheat leftovers only once and until steaming hot.



Fruit and vegetable bins

- Although most fruit and vegetable varieties store best at low temperatures, take care not to store the following at temperatures of less than 7°C for long periods.
 - Citrus fruit ■ Melons ■ Eggplant ■ Pineapple ■ Paw Paw
 - Courgettes ■ Passionfruit ■ Cucumber ■ Peppers ■ Tomatoes
- Undesirable changes will occur at low temperatures such as softening of the flesh, browning and/or accelerated decaying.
- Do not refrigerate avocados (until they are ripe), bananas, mangoes or pepinos. If possible store fruit and vegetables separately, i.e. fruit in one bin and vegetables in the other.



The use of temperatures of -18°C or colder to store food means that the food can be kept for longer periods than when refrigeration temperatures are used. This is because the growth of bacteria, moulds and yeasts are stopped, and chemical and physical reactions are severely restricted at very low temperatures.

Frozen food care

For best results:

- Choose only high quality foods that freeze well.
- Store at -18°C or colder. Take care to maintain this low storage temperature e.g. try to avoid opening the freezer door unnecessarily. If your ice cream is soft you are running your freezer too warm.
- Leave space at the top of containers, glass jars or plastic bags containing liquids or semi-solid foods. These expand as they freeze. Usually 20 – 50mm head space is recommended. Seal. Ideally, remove all the air from the package after food is frozen.
- Packages or containers of solid foods should have the air removed from them and be sealed tightly before freezing.
- Freeze immediately and as quickly as possible. Freeze only small quantities of food at any one time. For best results we recommend that only 1kg of food be frozen per 25L freezer capacity. (About 3 kg in small freezers and 4kg in larger freezers). For faster freezing in *Active Smart™* models, we recommend that fresh food is placed at the top of the freezer compartment close to the air vent.
- Do not pile frozen food around the fan cover. It can prevent adequate air circulation.
- Thaw foods preferably in a refrigerator, or using a microwave oven or multifunction oven.
- Keep a constant turnover of food. Use older items of food first. Do not exceed recommended storage times.
- Use good quality freezer proof packaging to maintain food quality.
- If food is only covered in plastic film place inside a freezer-proof plastic bag.



Recommended freezer storage times

These times should not be exceeded.

	M o n t h s	1	Bacon, casseroles, milk
		2	Bread, ice-cream, sausages, pies – (meat and fruit), prepared shellfish, oily fish
		3	Non oily fish, shellfish, pizza, scones and muffins
		4	Ham, cakes, biscuits, beef and lamb chops, poultry pieces
		6	Butter, vegetables (blanched), eggs whole and yolks, cooked crayfish, minced meat (raw), pork (raw)
		12	Fruit (dry or in syrup), egg whites, beef (raw), whole chicken, lamb (raw), fruit cakes

Storing food in your freezer

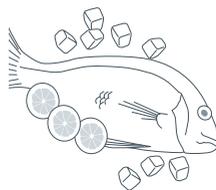
Meat, Poultry and Game

- Do not try to freeze more than 1kg meat per 25L freezer capacity. Meat must be frozen quickly in order to maintain its texture.
- Do not stuff poultry before freezing.
- Red meat can be cooked from frozen, or from the partly or completely thawed states. Remember to allow extra cooking time if cooking from frozen.
- Always thaw poultry completely before cooking.



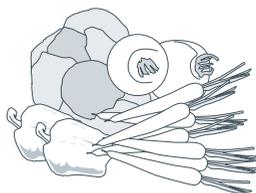
Fish

- Fish is best frozen commercially. If however you do want to freeze fish at home, make sure the fish is very fresh and of high quality.
- Clean, scale and preferably leave whole. All fish should be wrapped in two layers of packaging as depending on the type of fish, odours and flavours can be readily transferred either to or from it. Seal well.
- For best results, cook from either the frozen or partly thawed state.



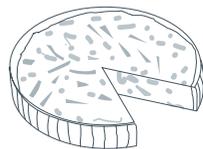
Vegetables

- Most vegetables freeze well, although 'salad' vegetables lose their crispness. Other vegetables e.g. celery, onion and tomatoes should only be used in cooked dishes as they soften on freezing.
- Freeze only high quality, mature, ready-to-eat vegetables.
- Sort and discard any that are damaged.
- **It is necessary to blanch most raw vegetables prior to freezing.**
- Blanching involves a short cooking period during which vegetable enzymes are destroyed. If these enzymes are not destroyed they cause undesirable physical and chemical changes during freezer storage.
- Vegetables can be blanched in boiling water, steam or microwave oven. If using boiling water, boil vegetables for 2 – 4 minutes and cool quickly.
- In general frozen vegetables are best cooked from their frozen state.



Prepared and cooked foods

- Most cooked foods can be frozen but it is not recommended to freeze the following:
- Cooked egg white, custards, cream fillings and milk puddings, gelatine or jelly-like dishes, mayonnaise and similar salad dressings, meringue toppings. These tend to separate on thawing.



Fruit

- Choose high quality, mature, and ready to eat fruit. Preferably select varieties recommended for freezing.
- Avoid unripe and over-ripe fruit.
- The way fruit is packed depends on how it is to be used. Fruits packed in syrup are ideal for desserts, whereas fruits packed without sugar are better used for cooking. Most fruits can be stored for 8 – 12 months.



If there is a problem with your appliance, please check the following points before contacting your local Fisher & Paykel Appliances Authorised Service Centre Dealer or Customer Care Centre.

Problem	Possible causes	What to do
Appliance does not operate	No electricity at power outlet	Check that the plug is correctly connected and power switched on Check another appliance at the same outlet Check house fuse
Light not working	Blown light bulb	Change light bulb
	Refrigerator not working	See Maintenance section
Light and display not working	Product in Sabbath Mode	Hold compartment select button down for 10 seconds
Motor operates for long periods	Hot weather Frequent door lid openings Large amount of food recently added	Minimise door opening to allow temperature to stabilise
	Temperature control set too low	See Temperature control section
	Doors not sealing properly	Check that cabinet is level and gasket seals are clean
Storage compartments too warm	Temperature setting not correct	See Temperature control section
	Frequent door openings Large amount of food recently added	Minimise door openings to allow temperature to stabilise
Food freezing in the refrigerator	Temperature setting not correct	See Temperature control section
	Food placed directly in front of air outlets	Move chill sensitive foods away from the centre back of the shelf
Unfamiliar noises	Cabinet not stable or level Freezer is defrosting	See Installation section
Water in the vegetable bins	Condensation is formed by the water produced by fruit and vegetables	A small amount of condensation is beneficial for fruit and vegetable storage If there is too much water, store fruit and vegetables loosely wrapped in plastic bags Wipe out water with a cloth Set humidity slide to low humidity setting 

30 Problem solving checklist

Problem	Possible causes	What to do
Sides of cabinet are warm	This is normal	
Condensation on outside of refrigerator/freezer	Not unusual during periods of high humidity	Wipe dry
Condensation inside fresh food compartment	Frequent or long door openings	Minimise door openings
	Door gasket leaking	Check that gasket is sitting flat and sealing tightly
	Not unusual during periods of high humidity	Wipe dry
Ice buildup inside freezer compartment	Freezer door not closing tightly	Move items in freezer so door can close tightly Check and clean door gasket seal
	In chest freezer over a period of time i.e. will build up this is normal.	Defrost chest freezers if ice build up is more than 6mm deep
Taste or odour in ice cubes	Transfer of odour/taste from strong smelling foods	Wrap or cover strong smelling foods
Door handles out of alignment	With time and usage, movement may occur	See Installation instructions – Stability instructions
Door alarm not working – E240B, E249T, E169T only	Refrigerator compartment light not working	Replace bulb – refer to page 19
Tray/bin does not slide in and out evenly	Packaging trapped	Check to ensure no food or packaging is trapped behind the tray/bin
	Runners not extending fully	Holding onto sides of tray/bin, extend the runners fully by using a firm pull – this will reset the runner.

Before you call for service or assistance...

Check the things you can do yourself. Refer to your User Guide and check:

- Your appliance is correctly installed
- You are familiar with its normal operation
- You have read the problem solving at the back of the book

If after checking these points you still need assistance please refer to the following...

In New Zealand if you need assistance...*

Call your Fisher & Paykel retailer who is trained to provide information on your appliance, or if we can be of any further help, please contact our Customer Care Centre,

Toll Free: 0800 FP CARE or 0800 37 2273

Fax: (09) 273 0656

Email: customer.care@fp.co.nz

Postal address: P.O.Box 58732 Greenmount, Auckland

If you need service...*

Fisher & Paykel has a network of independent Fisher & Paykel AUTHORISED SERVICE CENTRES whose fully trained technicians can carry out any service necessary on your appliance. Your dealer or our Customer Care Centre can recommend an AUTHORISED SERVICE CENTRE in your area.

In Australia if you need assistance...*

Please call our Fisher & Paykel Customer Care Centre.

Toll Free: 1300 650 590

Fax: (07) 3826 9298

Email: customer.care@fp.com.au

Postal Address: P.O. Box 798, Cleveland, QLD4163

If you need service...*

Fisher & Paykel Australia Pty Ltd has a network of independent Fisher & Paykel AUTHORISED CUSTOMER SERVICE CENTRES whose fully trained technicians can carry out any service necessary on your appliance. Our Customer Care Centre can recommend an AUTHORISED SERVICE CENTRE in your area.

In United Kingdom if you need assistance...*

Phone: (0845) 066 2200

Fax: (0845) 331 2360

Email: customer.care@fisherpaykel.co.uk

Postal address: Fisher & Paykel Appliances Ltd, Maidstone Road, Kingston, Milton Keynes, Buckinghamshire, MK10 0BD

In Ireland if you need assistance...***Phone:** 01800 625 174**Fax:** 01800 635 012**Email:** customer.care@fisherpaykel.ie**Postal address:** Fisher & Paykel Appliances, Unit D2, North Dublin Corporate Park, Swords, Co. Dublin**For the rest of the world...***

Call your Fisher & Paykel Retailer/Dealer from whom you purchased the product. They are trained to provide information on your appliance. If we can be of any further help, please contact us on:

Phone: +64 9 273 0660**Fax:** +64 9 273 0580**Email:** international.enquiries@fp.co.nz**Postal address:** Fisher & Paykel Appliances Ltd, PO Box 58550, Greenmount, Auckland, New Zealand**Feel free to contact us at our website on
www.fisherpaykel.com**

* If you call, write or contact our website please provide: your name and address, model number, serial number, date of purchase and a complete description of the problem. This information is needed in order to better respond to your request for assistance.

Product details

Fisher & Paykel Appliances Ltd

Model/Serial No.**Date of Purchase** _____ **Purchaser** _____**Dealer** _____ **Suburb** _____**Town** _____ **Country** _____

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The product specifications in this booklet apply to the specific products and models described at the date of issue. Under our policy of continuous product improvement, these specifications may change at any time. You should therefore check with our Customer Care Centre to ensure this booklet correctly describes the product currently available.

www.fisherpaykel.com

NZ AU UK PAC

Refrigerator & Freezer

Installation instructions and user guide

Published 05/2007

Part No. 837186

Final checklist

TO BE COMPLETED BY THE INSTALLER

- ✓
- Is the cooktop earthed?
 - Check that there is an adequate and constant flow of cool air from the cabinetry to the base of the cooktop.
 - Check that the power supply cable is not accessible via cupboard doors or drawers.
 - Is the cooktop clamped down securely?
 - Check that the pan detection feature is working correctly. Turn on both cooking zones without putting any cookware on them. Are the set power levels flashing in the displays?
 - Check that both cooking zones function correctly. Place suitable pans with water in them on both zones, then turn all of them on to a high setting. Is the water heating?
 - Are all touch controls and displays functioning?
 - To check that the 'hot surface' indicators function correctly, turn off all the zones. Is *H* displayed in all the cooking zone displays?
 - Have you shown the customer how to use the cooktop? Make sure you explain to the customer about:
 - the importance of taking note of the safety warnings at the beginning of this manual, especially for persons with cardiac pacemakers or other electrical implants
 - the 'hot surface' indicators (*H*)
 - using induction-suitable cookware only
 - the pan detection feature.

Installer's name: _____

Installer's signature: _____

Installation company: _____

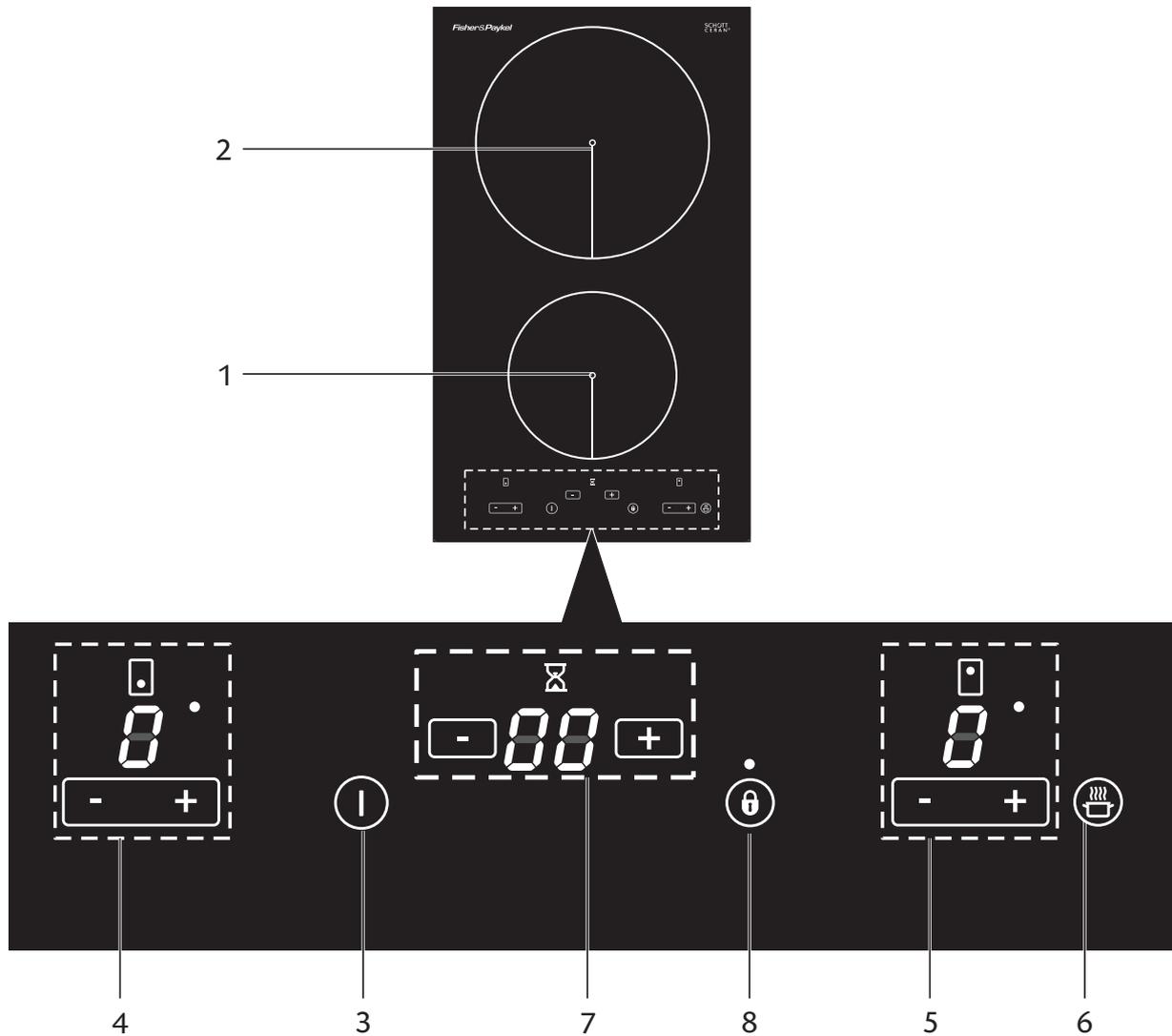
Date of installation: _____

LEAVE THESE INSTRUCTIONS WITH THE CUSTOMER

Before using for the first time

- Read the instructions carefully before installing and using the appliance.
- After unpacking the appliance, make sure it is not damaged. In case of doubt, do not use the appliance and contact your supplier or a qualified engineer.
- Remove all packaging and do not leave the packing material (plastic bags, polystyrene, bands etc) in easy reach of children as they may cause serious injury. The packaging materials are recyclable.
- The appliance should be installed and all the electrical connections made by a qualified engineer in compliance with local regulations in force and following the manufacturer's instructions.
- Do not attempt to modify the technical properties of the appliance, as it may become dangerous to use.

Features and technical data



Cooking Zones

- 1 Induction cooking zone Ø 140 mm - 1400 W
 - 2 Induction cooking zone Ø 210 mm - 2200 W (3000 W with **Booster** function)
- Note: The Nominal and Booster Power may change depending on the size and material of the pan set on the cooking zone.

Touch-Control Description

- 3 ON/OFF key
- 4 Front zone (1) keys (increasing and decreasing power)
- 5 Rear zone (2) keys (increasing and decreasing power)
- 6 Booster function (rear zone only) (2)
- 7 Automatic cooking timer keys
- 8 Child lock selection

12 Using your cooktop

Use of induction hob

- Each selection (by pressing one of the keys) is indicated by an acoustic signal (beep).
- User interface initial calibration: this feature is for the keyboard calibration, to adapt the sensitivity of the keys to your particular needs and the light conditions in your kitchen.

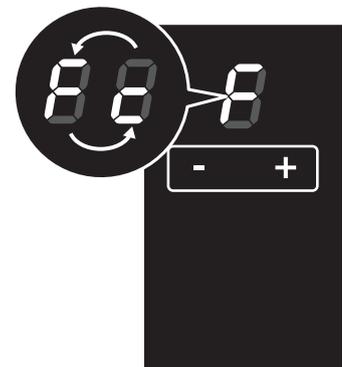
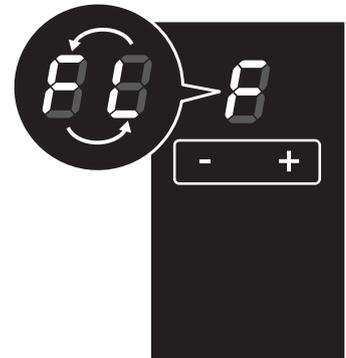
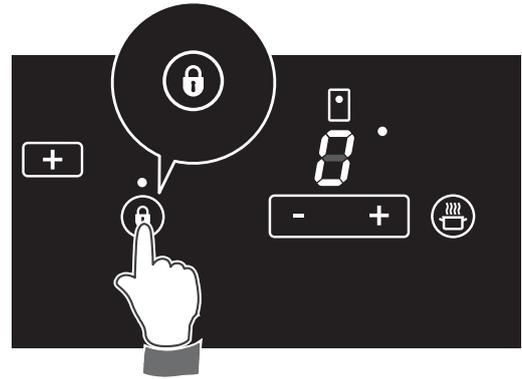
Any time the cooktop is connected to the electrical supply or after a power failure (that generates a reset in the user interface), the first time the Key-Lock  is touched the sensitivity of the keyboard is readjusted.

The first touch of the Key-Lock  must be done using a bare, dry finger. Do not wear gloves.

It is also important to consider that the calibration process requires a low level of ambient light in the area of the touch keys. If the environmental light conditions are excessive (e.g. halogen hood light/s on), the user interface calibration is suspended and the cooking zones displays show " F " and " L " alternating - error message " FL " until normal light conditions are restored.

In this case the direct environmental light/s must be switched off before calibrating the cooktop; then, after completing the process, the light/s can be switched on again.

- The touch control is switched off automatically (and a warning beep sounds every 10 seconds):
 - if one or more keys are touched for more than 10 seconds;
 - if an object is positioned on the touch control area;
 - in the case of spillage of liquids on the control keys.
- When the touch control reaches an ambient temperature above a preset temperature the heating elements are automatically switched off (the displays show " F " and " c " alternating - error message " Fc "). In this case let the cooktop cool down before using again.



How to turn the touch control on and off

Switching ON

Press the key **ⓘ** and keep it pressed until the touch control is lit.

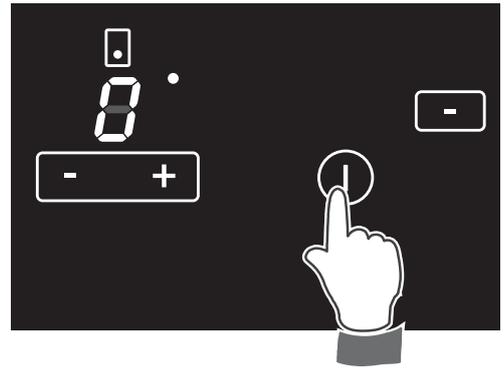
The displays of the cooking zones read "0".

- If the safety key-lock protection is active, the touch control can be turned ON only after having deactivated this protection.
- Auto switch-off: If a cooking zone is not turned ON within 10 seconds, the touch control will automatically switch off.

Switching OFF

The touch control may be switched OFF at any time by pressing the key **ⓘ**.

If any cooking zones are turned ON, they will be turned OFF.



14 Using your cooktop

Using the cooking zones

To turn ON a cooking zone the touch control must be switched ON (see section "How To Turn the Touch Control ON and OFF").

Press the key **+** and keep it pressed until the desired power level, ranging between **1** and **9** is set. As an alternative, press the key **-**. The choice starts from level **9** (maximum level) down to **1** (minimum level).

To reset the power level press the key **-** and keep it pressed until power level zero (**0**) or alternatively press the keys **-** and **+** at the same time.

Afterheat in cooking zone/s

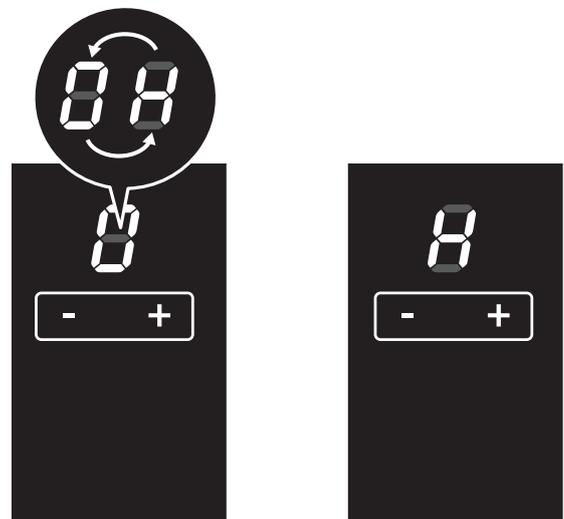
When switching off a cooking zone (power level **0**), if the temperature of the zone is too warm to be touched the display will show alternately "**H**" and "**0**".

Whenever the touch control is switched off, the residual heat is shown by a static "**H**". Avoid touching the hob surface over the cooking area. Please pay special attention to children.

It is still possible to start cooking again; just set the required power level.

"**H**" is turned OFF when the cooking zone temperature drops below a preset temperature.

Cooking zone power level	Front zone Watt power	Rear zone Watt power
1	75 W	100 W
2	150 W	200 W
3	300 W	300 W
4	400 W	500 W
5	500 W	700 W
6	600 W	900 W
7	800 W	1100 W
8	1000 W	1600 W
9	1400 W	2200 W



Booster function (rear cooking zone only)

This function allows the cooking zone to operate at the Booster maximum power (above the nominal power) for maximum 10 minutes; it could be used, for example, to rapidly heat up large amount of water.

This function is available for the rear cooking zone only.

To activate the Booster function, the touch control must be switched ON (see section "How to Turn the Touch Control ON and OFF").

With the zone at any power level (0...9), just touch the key  until the rear zone display shows "P".

At the end of the Booster program (10 minutes) the rear zone is automatically set to the power level "9".

With the zone at the Booster level:

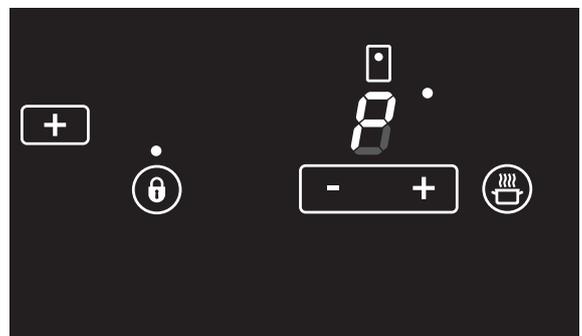
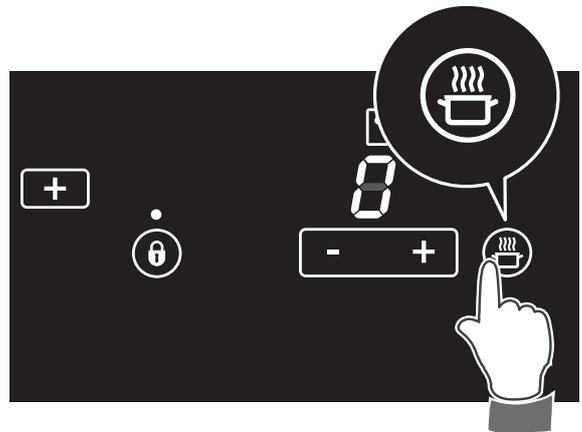
- if touching again the key  - a beep sounds, the heat up program is cancelled and the power level is reduced to "9";
- if touching the key  - an error beep sounds but no change occurs;
- if touching the key  - a beep sounds, the heat up program is cancelled and the power level is reduced to "9".

Induction heaters power management

The maximum power of the cooktop is limited to 3600 W.

This means that the electronic interface automatically manages the power levels of the heaters in order to not exceed the maximum power limit (see also table on the previous page).

- Both the zones can be used, at the same time, from power levels "1" to "9";
- With the front zone set to power level "7", "8" or "9", if setting the Booster program on the rear zone the power level of the front zone is automatically reduced to "5".
- With the Booster program set on the rear zone, if setting the power level "7", "8" or "9" on the front zone the power level of the rear zone is automatically reduced to "9".



16 Using your cooktop

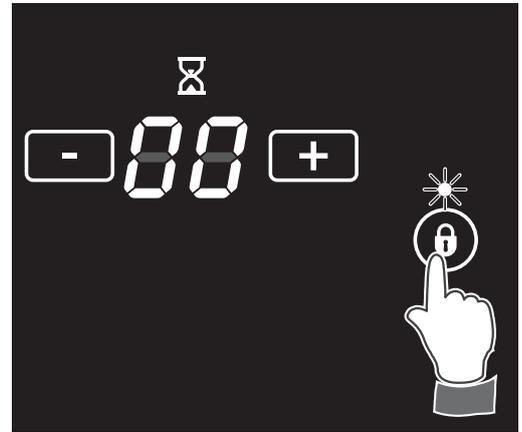
Safety key-lock to protect children

This function locks the touch-control keys against unwanted activation.

To activate the key-lock press the key ; the indicator light above the key symbol will light up.

- Cooking zone/s operating (power level already set) - with the key-lock protection active it is only possible to switch off the cooktop.
- Cooktop off - with the key-lock protection active it is not possible to use the cooktop. To use the cooktop deactivate this protection.

To deactivate the key-lock protection just press the key ; the indicator light above the key symbol will go out.



Program for automatic switching off of one cooking zone

This function permits to set a timer from 1 to 99 minutes for automatic turning OFF of one cooking zone only.

Note: It is not possible to set this program for both the cooking zones.

With the touch control switched ON:

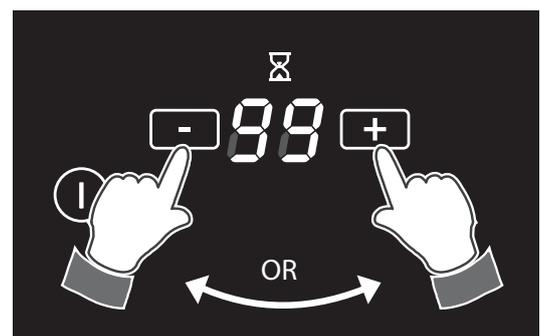
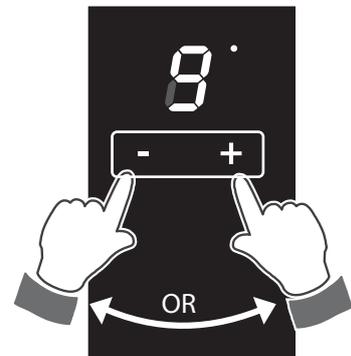
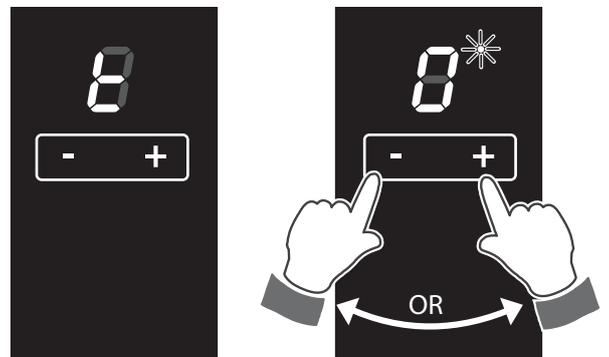
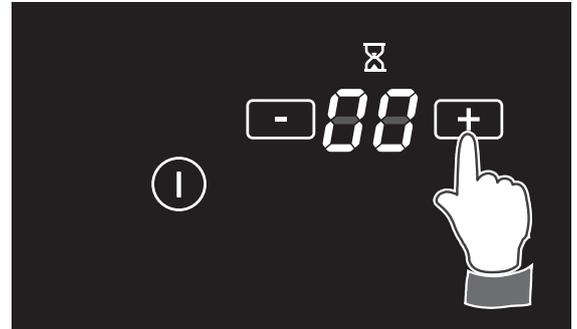
- Press the timer keys [-] or [+] ; a beep sounds and the timer display shows "00". The displays of the cooking zones show "⏸" (timer).
- Within 10 seconds, select the cooking zone to be programmed by using the cooking zone keys [-] or [+] ; a beep sounds and the indicator next to the heater display starts blinking.
- Set the desired power level by using the cooking zone keys [-] or [+] ; the indicator next to the heater display is steadily lit (not blinking).
- Within 10 seconds, set the timer by using the timer keys [-] or [+] to increase or reduce the value (when touching the keys, the indicator next to the heater display is blinking). If the selected time is "00", the timer is switched off automatically after 10 seconds.
- The countdown starts 10 seconds after the last selection. The time can be changed at any time by using the timer keys; the countdown stops and then the timer changes the stop time.

Now the program for automatic switching off is complete.

At the end of the countdown the cooking zone will switch off automatically, an acoustic signal (beep) will sound (for one minute only), "00" will flash on the timer display and the indicator next to the heater display will blink.

Press any button of the touch control to reset the timer.

Note: The program for automatic switch off can be cancelled at any time by resetting the timer to "00".



Induction cooking system

When your induction hob is switched on and a cooking zone has been selected, the electronic circuits produce induced currents that instantaneously heat the bottom of the pan which then transfers this heat to the food.

Cooking takes place with hardly any energy loss between the induction hob and the food.

Your induction hob operates only if a correct pan with the right features is placed on a cooking zone. Please refer to "Cookware for Induction Cooking".

Cookware for induction cooking

The induction cooking system operates only if using correct cookware suitable for induction cooking. The bottom of the pan has to be ferromagnetic to generate the electromagnetic field necessary for the heating process (meaning a magnet has to stick to the bottom of the pan).

Pans made from the following materials are not suitable:

- glass, wood, porcelain, ceramic, stoneware;
- pure stainless steel, aluminium or copper without magnetic bottom.

To check if a pan is suitable or not:

- Test the bottom of the pan with a magnet: if the magnet sticks, the pan is suitable.
- If a magnet is not available pour a small amount of water inside the pan and place the pan on a cooking zone. Switch on the cooking zone: if the set power level flashes on the cooking zone display, the pan is not suitable (then after 1 minute, the power level automatically returns to "0").

Induction Cooking Zone	Minimum Pan Diameter Recommended (referred to the bottom of the pan)
Front zone, Ø 145 mm	80 mm
Rear zone, Ø 210 mm	130 mm

Important!

- ***The cooking zones will not operate if the pan diameter is too small. To correctly use the cooking zones follow the indications given in the table above.***
- ***The pan shall always be centred over the middle of the cooking zone. It is possible to use oversized pans but its bottom shall not touch the other cooking zone.***
- ***Always use pans with thick, completely flat bases.***
- ***Do not use pans with concave or convex bottom; these could cause overheating of the cooking zone.***

Note: Some types of pans could cause noise when used on an induction cooking zone. The noise does not mean any failure on the appliance and does not influence the cooking operation.

Operation time limit of cooking zones

Each cooking zone is automatically switched OFF after a maximum preset time if no operation is performed.

The maximum preset time limit depends on the set power level, as illustrated in this schedule.

Each operation on the cooking hob by using the keys - + will reset the maximum operation time at its initial value.

Cooking Zone Power Level	Operation Time Limit
1	10 hours
2	5 hours
3	5 hours
4	4 hours
5	3 hours
6	2 hours
7	2 hours
8	2 hours
9	1 hour
P Booster (rear zone only)	10 minutes

Cleaning the ceramic hob

- Before you begin cleaning make sure that the hob is switched off.
- Remove spillages and other types of incrustations.
- Dust or food particles can be removed with a damp cloth.
- If you use a detergent, please make sure that it is not abrasive or scouring. Abrasive or scouring powders can damage the glass surface of the hob.
- All traces of the cleaner must be removed with a damp cloth.
- Dust, fat and liquids from food that has boiled over must be removed as soon as possible.
- If they are allowed to harden they become increasingly difficult to remove. This is especially true in the case of sugar/syrup mixtures which could permanently pit the surface of the hob if left to burn on it.
- If any of these products has melted on the ceramic surface, you should remove it immediately (when the surface is still hot) by using a scraper to avoid any permanent damage to the surface of the hob.
- Do not put articles on the hob which can melt: i.e plastic, aluminium foil, sugar, sugar syrup mixtures etc.
- Avoid using a knife or other sharp utensil as these may damage the ceramic surface.
- Do not use steel wool or an abrasive sponge which could scratch the surface permanently.

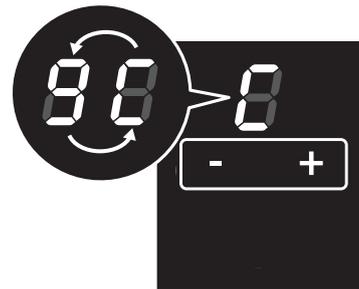
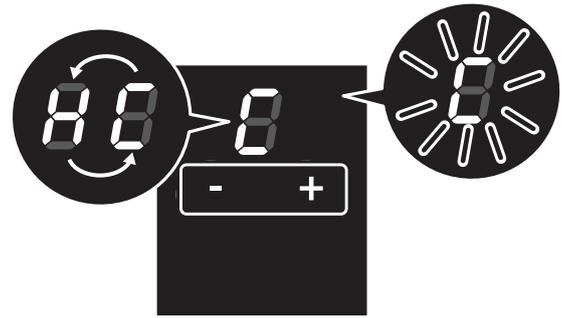


Thermal protection

The induction cooktop is fitted with safety devices to protect the electronic system and each cooking zone from overheating.

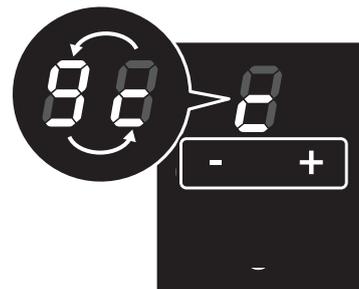
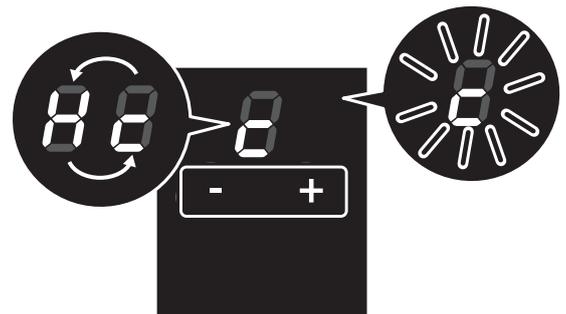
Overheating of cooking zone

- **Cooking zone OFF:** the cooking zone display shows "H" and "E" alternating or just "E" blinking.
- **Cooking zone ON:** the cooking zone display alternates between set power level and "E". No power is delivered to the cooking zone. Let the cooking zone cool down before using.



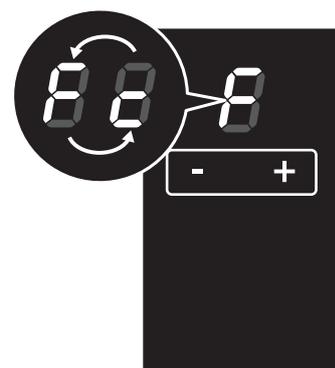
Overheating of induction generator

- **Cooking zone OFF:** the cooking zone display shows "H" and "E" alternating or just "E" blinking.
- **Cooking zone ON:** the cooking zone display alternates between set power level and "E". No power is delivered to the cooking zone. Let the cooking zone cool down before using.



Overheating of the touch controls

- When the touch control reaches an ambient temperature above a preset temperature the heating elements are automatically switched off (the displays show "F" and "E" alternating - error message "FE"). In this case let the cooktop cool down before using again.



22 Troubleshooting

Error code on the display/s

If an error message appears on the display/s (the display/s show/s "F" and another character alternating - e.g. "F" and "R", "F" and "0",):

- 1 Disconnect the cooktop from the mains.
- 2 Reconnect the cooktop and turn it on.
- 3 Wait for about two minutes and if the error code does not appear the cooktop can be used.
- 4 If the error code does not disappear repeat step from 1 to 3.
- 5 If the problem continues, disconnect the cooktop from the mains and contact your Authorised Service Centre.

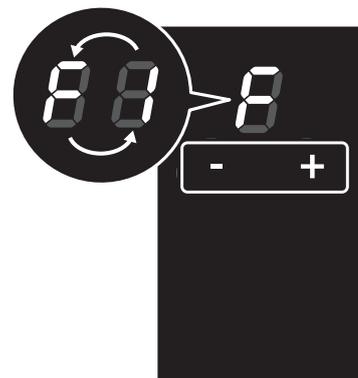
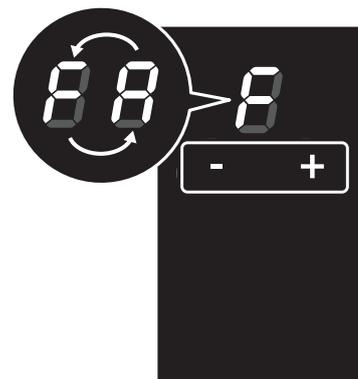
Important!

In the case of error message "F" and "L", see section 'Using your cooktop'.

Display/s off or not correctly operating

If a display or the displays are only partially lit or not lit.

- 1 Switch off the cooktop and disconnect it from the mains.
- 2 Reconnect the cooktop and turn it on.
- 3 Wait for about two minutes and if the problem does not appear the cooktop can be used.
- 4 If the problem does not disappear repeat step from 1 to 3.
- 5 If the problem continues, disconnect the cooktop from the mains and contact your Authorised Service Centre.



该灶台面的设计制造符合以下规范和规格：

- EEC指令“低压” 2006/95的安全要求；
- EN 60335-1 家用电器的通用要求
- EN 60335-2-6 家用烹饪电器的特殊要求
- EEC指令“EMC” 89/336的安全要求：
- EN 55014-1, EN 55014-2, EN 61000-3-2, EN 61000-3-3电磁兼容性要求

制造商：

Fisher & Paykel Appliances Italy S.p.a
 Via Fabbian Matteo, 7
 31030 Borso del Grappa (TV)
 意大利

注册进口商：

质量证明书

青岛海尔国际贸易有限公司
 中国青岛市
 海尔路
 海尔工业园
 266101

产品详情

型号	序列号
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经销商	郊区
市镇	国家

www.fisherandpaykel.cn

Fisher & Paykel

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The product specifications in this booklet apply to the specific products and models described at the date of issue. Under our policy of continuous product improvement, these specifications may change at any time. You should therefore check with your Dealer to ensure this booklet correctly describes the product currently available.



Rangehoods

Wall Canopy

HC60PCHTX1 Brushed Stainless Steel 60cm wide



Key Features

- Number of fan speeds
- Dishwasher safe aluminium mesh filters
- Easy to reach controls at front of unit
- Lighting

Dimensions

H 648-1068 x W 600 x D 450

Product Info

This rangehood's classic style is designed to complement any kitchen. Touch button controls are placed for easy use at the front of the hood, operating a powerful centrifugal fan which efficiently removes cooking odours and vapours. Micromesh filters trap all the grime and are easily cleaned in the dishwasher, while powerful halogen lights provide great coverage, illuminating the entire cooking surface.

Finishes

-  Brushed Stainless Steel

Cleaning

- Dishwasher safe aluminium mesh filters²
- Easy clean drip tray

General Features

- Able to be recirculated
- Controls Soft touch buttons
- Easy to reach controls at front of unit
- Lighting 2 x 20W Halogen

Installation accessories

- Charcoal filters
- Chimney extension
- Ducting accessories

Performance Features

- Air movement M³/hr (max) 812
- Decibel rating (dBA) max 65
- Number of fan speeds 3
- Type of fan Centifugal

Warranty

- 2 year parts and labour warranty

Dimensions

- Overall height of product (mm) 1068
- Overall width of product (mm)600
- Overall depth of product (mm)450
- Max height of decorative chimney flue (mm)1036
- Width of decorative chimney flue (mm)225
- Depth of decorative chimney flue (mm)200
- Height of control panel/handle 32
- Size of air outlet150

Contact Details

Customer Care Centre
Fisher & Paykel Appliances
P.O. Box 58732
Botany Manukau 2163
New Zealand
Phone: 0800 FP CARE (0800 37 2273)
Fax: +64-9-2730656

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Fisher & Paykel

Wall canopy
HC60PCHTX1 & HC90PCHTX1 models

**Installation instructions
and User guide**

NZ AU

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Important!

SAVE THESE INSTRUCTIONS

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2 Safety and warnings

Important!

- Please read the entire set of instructions before installing the wall canopy.
- This wall canopy is not intended for use by young children or infirm persons without supervision.
- Young children should be supervised to ensure that they do not play with the wall canopy.
- There must be adequate ventilation of the room when the wall canopy is used at the same time as appliances burning gas or other fuels. (A partial vacuum in the room could result in too high a concentration of gas in the air).
- You must read the details concerning the method and frequency of cleaning.
- There is a fire risk if cleaning is not carried out in accordance with the instructions.
- Do not flambé under the wall canopy.
- Exhaust air must not be discharged into an existing flue that is used for exhausting fumes from appliances burning gas or other fuels.
- The minimum distance between the cooktop surface and the filters of the wall canopy shall be 600 mm, or 650 mm if installed over a gas cooktop.
- Attention should be given to ensure that any applicable regulations concerning the discharge of exhaust air is fulfilled.
- If the supply cord of this equipment is damaged it must only be replaced by the manufacturer, its service agent or similarly qualified person in order to avoid a hazard.
- Always switch the power off prior to installation, servicing or cleaning the wall canopy.
- Never use the wall canopy without the filters in place.
- A power outlet should be within 750 mm of the motor assembly and can be either on the wall, behind the chimney or in the ceiling.
- To comply with electrical safety regulations, this canopy must be plugged into a socket near the appliance. The socket must be accessible, or have an accessible isolating switch, to enable the end user to isolate the canopy from the power for the purpose of internal cleaning or maintenance.
- Ducting accessories are not supplied. All ducting must comply with local requirements and building codes.

⚠ WARNING!



Electrical Shock Hazard

All electrical work must be done in accordance with local and/or national electrical codes as applicable. For safety, this product must be earthed. If you are unfamiliar with methods of installing electrical wiring, employ the services of a qualified electrician. Turn off power at service entrance before installing wiring or servicing this product.

⚠ WARNING!



8.8 kg
(HC60)
10.7 kg
(HC90)

Weight Hazard

The wall canopy is heavy. Please ensure adequate care is taken when installing the wall canopy to prevent personal injury. The wall canopy must be installed onto a solid wall, stud, beam or truss. Weight of the product is 8.8 kg/10.7 kg.

Contents of packaging

- 1 x wall canopy
- 2 x chimney flues with bracket
- 1 x installation instructions
- 2 x aluminium mesh filters (HC60PCHTX1)
- 3 x aluminium mesh filters (HC90PCHTX1)
- 2 x butterfly flaps
- 4 x small screws, to secure chimney flue
- 5 x 8 x 1½" wood screws
- 1 x washer (5 mm inner diameter)

Typical equipment required:

- Electric drill
- Screwdriver
- Duct tape
- Jig saw
- Ladder
- Ducting
- Tape measure
- Drill bits
- Spirit level

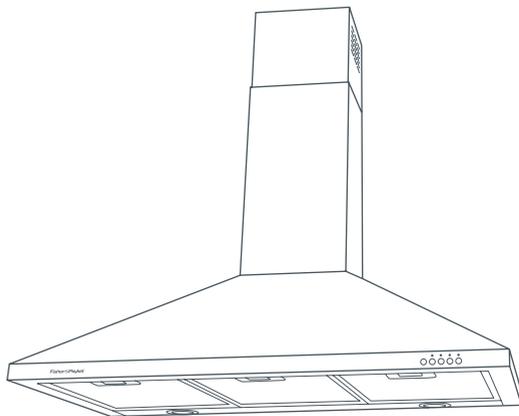


Fig.1 Wall canopy

Accessories

Accessory	Part Number
Chimney ext (740 mm) SS	790698
Light bulb	12V Halogen/Max 20W
Charcoal filter (HC60)	790681
Replacement aluminium filter (HC60)	790682
Charcoal filter (HC90)	790683
Replacement aluminium filter (HC90)	790684

4 Installation instructions

Height of wall canopy

- Where an electric cooktop is installed beneath the wall canopy, the distance between the top of the cooktop and the underside of the range hood must be a minimum of 600 mm and a maximum of 700 mm.
- Where a gas fuelled cooktop is installed beneath the wall canopy, the distance between the top of the pot rests and the underside of the rangehood must be a minimum of 650 mm and a maximum of 750 mm.

Note: your relevant gas or local building authority may specify different height requirements. Care should be taken to comply with any applicable regulations concerning the discharge of exhaust air.

Ducting options

Note: if you wish to have the flue run all the way to the ceiling, please ensure that you work your measurements out fully before attempting the installation. In some instances, extra lengths of flue or a customised flue maybe required. A 740 mm flue extension is available as an accessory part for use where ceiling height is above 2440 mm. (Part no. 790698)

Recirculation

For recirculation, please purchase charcoal filters, which are fitted in place of the aluminium filters supplied with the hood. The charcoal filters purify the air before allowing the air to return back to the kitchen through the air vents in the sides of the chimney flue.

Note: a ducting hole is not required in the wall or ceiling if the canopy is fitted with charcoal filters.

Ducting

For ducted installation, it is recommended that you use 150 mm diameter, rigid or semi-rigid ducting. To accommodate the 150 mm ducting, a ceiling hole should be carefully measured and cut out, 160 mm (min) in diameter, with a centre line 100 mm from the edge of the wall.

Efficiencies in the performance of your canopy are enhanced by the use of smooth, straight and short ducting options.

We recommend using solid, galvanised or plastic, smooth-walled ducting which helps to reduce noise and increase airflow.

The use of flexible ducting is not recommended. If there is no other option available, the flexible ducting must be pulled as tight as possible.

All ducting must comply with local requirements and building codes.

Note: we recommend an Easy Fit by Fisher & Paykel or a UNIDUCT ducting system, products that have been designed to expel air efficiently.

Preparing the wall canopy for installation

- Before installing the wall canopy, please carefully read through the installation instructions in full.
- Prior to drilling any holes, check that the area behind the surface to be drilled is clear of any electrical cables or pipes etc.
- Take care when installing the wall canopy as stainless steel is easily damaged during installation if scratched or knocked by tools.
- Protect the cooktop below, using cardboard or a similar protective cover, to prevent damage on installation.

6 Installation instructions

1 Establish the desired height of the rangehood above the benchtop according to the 'Installation height requirements' above. Measure this distance from the top of the benchtop and, using a spirit level, draw a light horizontal line on the wall. Make sure that the line can easily be erased or will be hidden after installation. This is where the bottom of the rangehood will sit (Fig.2).

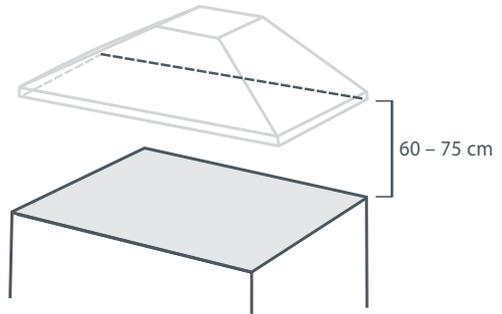


Fig.2 Establishing height of rangehood

2 Mark the position of the rangehood on the wall. Using a spirit level, also mark a vertical line intersecting the horizontal line, (ensuring that the line can easily be erased or will be hidden after installation) showing the position where the centre of the rangehood will be. This is normally over the centre of the cooktop (Fig.3).

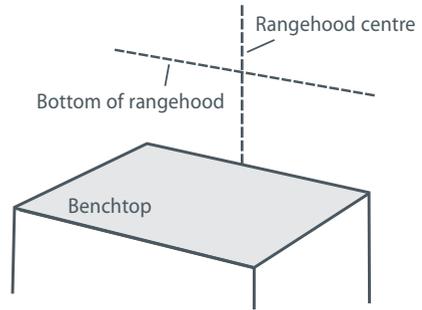


Fig.3 Marking the position of the rangehood on the wall

3 Remove the grease filters (this is to make installation easier). Press inward on the catch, found on the handle, and pull the filter downward (Fig.4).

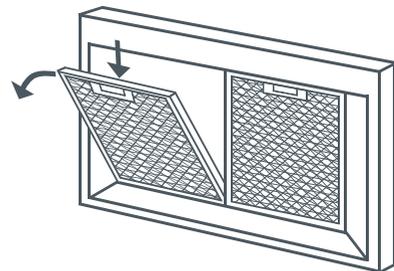


Fig.4 Removing the grease filters

4 Determine location of the fixing "keyholes" on the wall. The hood is secured to the wall by two "keyholes" located above the motor behind the air exit opening. From the point where the horizontal and vertical lines drawn earlier intercept, use a spirit level and pencil and draw another horizontal line 290mm above the first horizontal line (ensuring that the line can easily be erased or the line will be hidden after installation) as shown in Fig.5. This now indicates where the top of the "fixing keyholes" are. Where the vertical line meets the top horizontal line (just drawn), measure and mark both sides of the vertical line, showing where to drill.

5 Drill holes and secure the rangehood to the wall. Depending on the wall type (concrete, drywall etc) drill/screw appropriate fittings in the two locations just marked. The rangehood should now be able to be hung on these bolts/screws through the two keyholes in the hood.

6 Create additional means of attachment. Keyholes alone are insufficient means of attachment. Drill two extra holes in the back panel, put screws in with an anchor (if required) to ensure proper attachment and fix the rangehood by these screws as well, as shown in Fig.6. Ensure all fixings are secure.

7 If ducting externally, assemble and fit ducting as per manufacturer's instruction.

Optional: If desired, the one-way butterfly valve can now be fitted to the exit opening of the rangehood by simply snapping the two pieces into place.

8 Test the operation of the rangehood. Plug the rangehood in and test its operation on all speed levels. This will ensure that any imperfections in the installation, such as unwanted sounds or lack of suction can be addressed before the flue is in place. Over 95% of service calls are a result of faulty installation. Please be aware that in the event of a service call for a faulty installation, you will be charged as this is not covered under the manufacturer's warranty.

9 Position and secure the flue. Secure the top mounting bracket at the highest possible point on the ceiling using a single screw through the supplied bracket. Ensure all ducting is fitted and electrical connections are secured correctly and switched on. Place the bottom part of the flue onto the rangehood and slide the upper flue piece inside the lower piece so the tabs "hug" the folded edge of the flue. Raise the upper part of the flue to the required height and, using the four screws supplied, secure the upper flue to the bracket on the wall.

Installation is now complete.

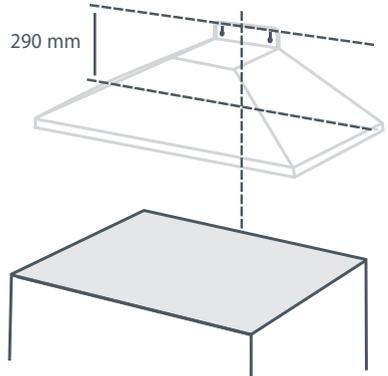


Fig.5 Determining location of the two fixing "keyholes"

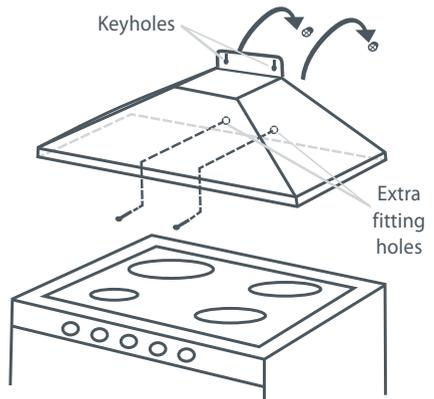


Fig.6 Creating additional means of attachment

8 Getting started quickly

Control panel

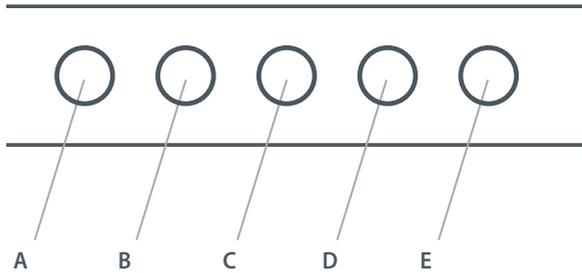


Fig.7 Control buttons

A = ALL OFF

B = Low speed motor ON/OFF

C = Medium speed switch ON/OFF

D = High speed switch ON/OFF

E = Lights ON/OFF

Caution!

Never use abrasive or oil based liquid cleaners.

General maintenance

The manufacturer is not liable for any damage caused by not following these instructions.

The wall canopy should be cleaned regularly using warm water with soap or mild liquid detergents. This ensures that no build-up of grease occurs as these deposits are corrosive. Do not use abrasives or harsh detergents/cleaning fluids.

Note: in areas of high humidity and coastal environments, cleaning should be carried out frequently.

Grease deposit container

Your wall canopy is fitted with a clear container located underneath the motor housing, that is only visible when the grease filters are removed.

Over time, oil, fat and grease, that is normally deposited inside the motor casing, is directed into this container for easy cleaning.

This unique design will help ensure your wall canopy remains in peak condition by minimising the amount of fat or grease collected in the motor.

Note:

- This container should be cleaned as necessary, usually on an annual basis.
- Always ensure the container is in place prior to using the wall canopy.
- Do not attempt to block the hole in the motor casing.

Aluminium filters

The grease filters must be periodically cleaned (at least every two months).

Remove the grease filters and wash them either by hand using hot soapy water or place them in the dishwasher using mild detergent. Badly smoked filters may be cleaned with “cookware cleaners”.

Note: some discolouration of the frame may occur.

Charcoal filters

Charcoal filters are designed to remove grease and odours from cooking vapours, prior to the cleansed air re-entering the kitchen (when the wall canopy is in recirculating mode). Charcoal filters are disposable items and it is recommended that these should be replaced every three to six months depending on use.

Note:

- Fully saturated charcoal filters can become a barrier to air movement, impeding the wall canopy's performance.
- In the event of fire, fully grease laden filters could be flammable and therefore regular replacement is recommended.
- In ducted installations, conventional aluminium filters are recommended.

For replacement charcoal filters, ducting accessories, spare parts and service, please contact your local supplier or Fisher & Paykel Customer Care Centre.

Light bulb replacement

(Halogen bulb 12 Volts/20 Watt)

- 1 Switch off the power to the canopy hood.
- 2 Use a small bladed screwdriver to prise off the light cover, taking care not to damage the surrounding material.
- 3 Remove the defective bulb from the canopy hood.
- 4 Replace with a new bulb using a cloth. Do not touch the bulb with fingers as this will shorten the life of the bulb.
- 5 Snap the cover back into place.

Note: replacement bulbs are not covered by warranty.

You automatically receive a 2 year Manufacturer's Warranty with the purchase of this Product covering parts and labour for servicing within the country of purchase.

Fisher & Paykel undertakes to:

Repair or, at its option, replace without cost to the owner either for material or labour any part of the Product, the serial number of which appears on the Product, which is found to be defective within TWO YEARS of the date of purchase.

This Warranty DOES NOT cover

- A** Service calls which are not related to any defect in the Product. The cost of a service call will be charged if the problem is not found to be a Product fault. For example:
 - 1. Correcting the installation of the Product.
 - 2. Instructing you how to use the Product.
 - 3. Replacing house fuses or correcting house wiring or plumbing.
 - 4. Correcting fault(s) caused by the user.
 - 5. Noise or vibration that is considered normal, eg drain/fan sounds, refrigeration noises or user warning beeps.
 - 6. Correcting damage caused by pests, eg rats, cockroaches, etc.
 - 7. Replacement light bulbs.
- B** Defects caused by factors other than:
 - 1. Normal domestic use or
 - 2. Use in accordance with the Product's User Guide.
- C** Defects to the Product caused by accident, neglect, misuse or Act of God.
- D** The cost of repairs carried out by non-authorized repairers or the cost of correcting such unauthorised repairs.
- E** Normal recommended maintenance as set out in the Product's User Guide.
- F** Repairs when the appliance has been dismantled, repaired or serviced by other than a Fisher & Paykel Authorised Repairer or the selling dealer.
- G** Pick-up and delivery.
- H** Transportation or travelling costs involved in the repair when the Product is installed outside the Fisher & Paykel Authorised Repairer's normal service area.

This Product has been designed for use in a normal domestic (residential) environment. This Product is not designed for commercial use (whatsoever). Any commercial use by a Customer will affect this Product's Warranty.

Service under this Manufacturer's Warranty must be provided by a Fisher & Paykel Authorised Repairer (refer to the 'Customer care' section at the back of this book). Such service shall be provided during normal business hours. This Warranty certificate should be shown when making any claim.

Note

This Warranty is an extra benefit and does not affect your legal rights.

Please keep this User Guide in a safe place.

Before you call for service or assistance...

Check the things you can do yourself.
Refer to your User Guide and check:

- 1 Your appliance is correctly installed.
- 2 You are familiar with its normal operation.



If after checking these points you still need assistance, please refer to your nearest Fisher & Paykel Authorised Repairer, or contact us through our local website listed on the back cover.

In New Zealand if you need assistance...*

Call your Fisher & Paykel retailer who is trained to provide information on your appliance, or if we can be of any further help, please contact our Customer Care Centre,

Toll Free: 0800 FP CARE or 0800 37 2273 **Fax:** (09) 273 0656

Email: customer.care@fp.co.nz

Postal address: PO Box 58732, Botany, Manukau 2163

If you need service...*

Fisher & Paykel has a network of independent Fisher & Paykel Authorised Repairers whose fully trained technicians can carry out any service necessary on your appliance. Your dealer or our Customer Care Centre can recommend a Fisher & Paykel Authorised Repairer in your area.

In Australia if you need assistance...*

Call the Fisher & Paykel Customer Care Centre and talk to one of our Customer Care Consultants.

Toll Free: 1 300 650 590

Fax: (07) 3826 9298

Email: customer.care@fp.com.au

Postal Address: PO Box 798, Cleveland QLD 4163

If you need service...*

Fisher & Paykel has a network of qualified Fisher & Paykel Authorised Repairers responsible for servicing only Fisher & Paykel branded appliances. Our Customer Care Centre can recommend a qualified Fisher & Paykel Authorised Repairer in your area.

*If you call, write or contact our website please provide: your name and address, model number, serial number, date of purchase and a complete description of the problem. This information is needed in order to better respond to your request for assistance.

Product details

Fisher & Paykel Appliances, Ltd

Model/Serial No.

Date of Purchase _____ **Purchaser** _____

Dealer _____ **Suburb** _____

Town _____ **Country** _____

www.fisherpaykel.co.nz
www.fisherpaykel.com.au

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Fisher & Paykel**Clothes Washers****WA 5.5kg**

WA55T56GW1 White 5.5 kg

**Key Features**

- Allergy
- Load sensing
- Favourite
- Auto water level
- Auto-lint Disposal

Dimensions

H 1020 - 1050 x W 560 x D 560

Product Info

We are proud to introduce this fully featured Autowasher. Powered by the unique and reliable Smart Drive System while incorporating speciality washing cycles such as 'Allergy' and 'Easy Iron' the WA series is both advanced and reliable.

Finishes

-  White

Capacity

- 5.5 Kg Capacity
- Capacity 7.5 kg

Consumption Data

- Energy rating 2.0 Stars
- Energy Usage 664 kWh/year
- Water rating 3.0 Stars (WELS)
- Water Usage 108L/wash

Other Features

- 3 Spin Speeds (330, 670, 1000rpm)
- Adjustable Alert Beeps
- Auto-lint Disposal
- Auto out of balance correction
- Controlled temperature mixing chamber
- Delay start (hours) 1, 3, 9
- Eco - water saver cycle
- Fabric Softener dispenser
- Rinse options 5
- Soak option
- Spin hold option

- Stainless Steel Bowl
- Wash temperature controls⁵
- Water levels (manual)⁵
- Water saver option

System Features

- Agitator actions¹⁶
- Auto water level
- Direct Drive Motor
- Lid lock
- Load sensing
- Smart Drive System

Warranty

- Manufacturers Warranty (years)²

Wash Cycles

- Allergy
- Easy iron
- Favourite
- Handwash
- Heavy Duty
- Regular

Dimensions

- Depth⁶⁵⁰ mm
- Height (lid open)¹⁴¹⁰⁻¹⁴⁴⁰ mm
- Height to highest point on console¹⁰²⁰⁻¹⁰⁵⁰ mm
- Width⁶⁵⁰ mm

Contact Details

Customer Care Centre
Fisher & Paykel Appliances
P.O. Box 58732
Botany Manukau 2163
New Zealand
Phone: 0800 FP CARE (0800 37 2273)
Fax: +64-9-2730656

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Fisher & Paykel

Clothes washer

**Installation instructions
and User guide**

NZ AU PAC

Intelligence working for you

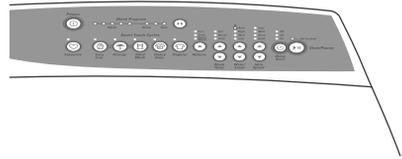
smart drive[™]

75 years of laundry experience has led to the development of one of the world's most advanced wash systems, the *Smart Drive*[™].

Unlike conventional machines, *Smart Drive*[™] clothes washers use intelligence to adapt the wash action and water levels to save on water and electricity use; making it kinder on your wallet and the environment.

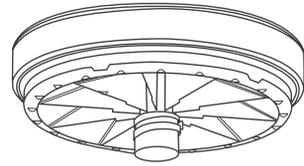
Intelligent electronics

A powerful microprocessor controls every aspect of the *Smart Drive*[™], allowing it to continually monitor and respond to each wash. It contains over 10,000 lines of instructions in its 'brain' – the result of many years of testing and fine-tuning, to give you the best possible performance.



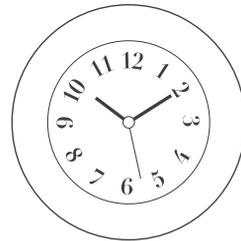
Direct drive motor

Our revolutionary direct drive motor is capable of infinite wash actions, continuously adjusting its speed to the movement of your clothes, removing dirt while caring for the fabric, delivering the ultimate wash.



Reliability

The *Smart Drive*[™] has no mechanical brake, pulleys or gears, which means fewer moving parts and greater reliability.



Saves time

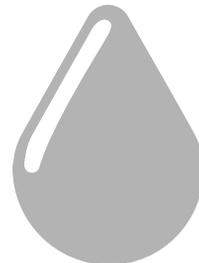
With a top spin speed of 1000 rpm, *Smart Drive*[™] reduces clothes drying time by up to 30%.

Energy conservation

The unique wash action means a typical load uses only the same amount of electricity as a 100-watt light bulb left on for an hour.

Eco

Designed to make every drop count, using up to 25% less water than a traditional rinse.



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Important!

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2 Installation instructions

Unpacking

To ensure the best performance from your new *Smart Drive™* please follow the instructions below.

Removing the packaging

- 1 Remove the outer packaging.
- 2 Tilt the machine backwards and walk it off the bottom packer one foot at a time.
- 3 Remove the bottom packer from under the machine by pulling it out the front.
- 4 Lift the lid and remove the bowl packer from the bowl.
- 5 Remove the hoses and accessories.
- 6 Keep the bottom packer and bowl packer in case they are required for future transit.

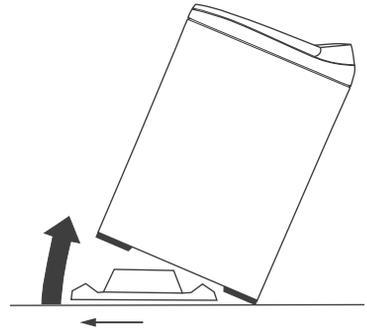


Fig.1 Tilt washer backwards to remove packer

Important!

Please ensure that the bottom packer has been removed before operating your machine.

Location

Your washer must be installed on a level surface, and not on any textured floor coverings (eg carpet, rugs) to ensure that the opening at the bottom of the machine is not obstructed.

In your clothes washer you will find:

- 4 rubber inserts for the levelling feet (joined together).
- 1 hose guide.
- 2 inlet hoses.

Drain hose

- 1 Carefully pull the drain hose out from the back of the machine by pulling the exposed part of the hose downward and outward.
- 2 To guide the drain hose over the tub or standpipe the hose guide MUST be fitted to the drain hose.

To prevent syphoning:

The drain hose should not extend more than 20 mm from the end of the guide.

The height of the standpipe or tub should be between 850 – 1200 mm.

The drain hose can be trimmed to length.

- 3 Place the drain hose in the tub or standpipe.

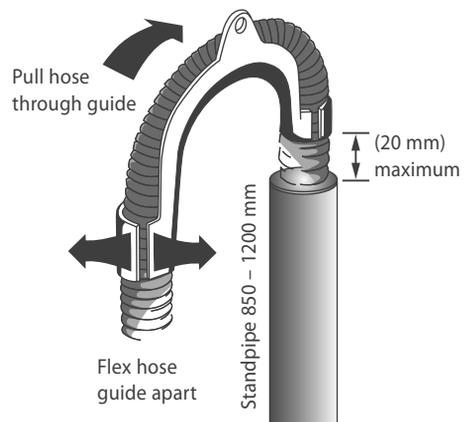


Fig.2 Fitting the drain hose guide

Inlet hoses

- 1 Connect the straight ends of the inlet hoses to the taps. There are washers fitted in both ends.
- 2 Connect the elbow ends of the inlet hoses to the machine inlet valves. Inlet valves are marked on the back of the machine
 H=Hot C=Cold
- 3 Ensure you have correctly connected hot to hot, and cold to cold.

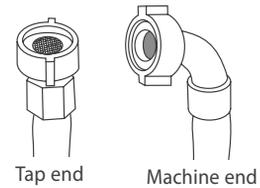


Fig.3 Inlet hose ends

Cold supply only:

If you only have a cold water supply, an inlet valve cap (blanking cap) **MUST** be connected to the hot inlet valve. The cap prevents water leaking out of the hot valve. The cap is available from your Fisher & Paykel Dealer or Authorised Repairer, Part No. 388491. This appliance incorporates backflow protection complying with AS3500.1. No further backflow protection is required for connection to the water supply.

Levelling

It is **IMPORTANT** to level the machine to ensure even spin performance.

- 1 Separate the four rubber foot inserts from the moulding and fit into the feet on the base of the machine.
- 2 Move the machine to its final position (we suggest a minimum clearance of 20 mm each side).
- 3 Adjust the feet (wind down) so the machine is level and cannot rock.

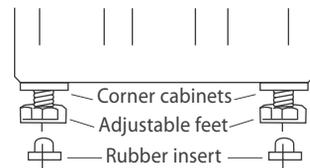


Fig.4 Adjusting levelling feet

To check if your machine is level:

Look down on the wash bowl and make sure it sits slightly forward of centre. Close the lid. Visually check that the lid fits evenly on both sides (see Fig.5). If not, adjust one of the front feet slightly until it matches. The diagram on the top and bottom are not correct.



Correct



Incorrect

To check levelling look down on the wash bowl

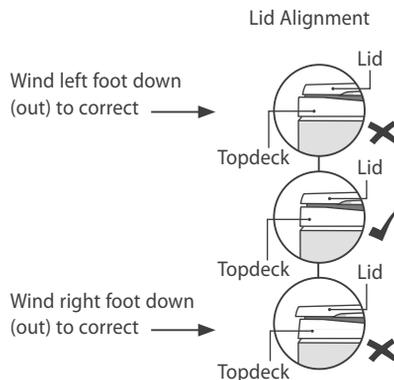
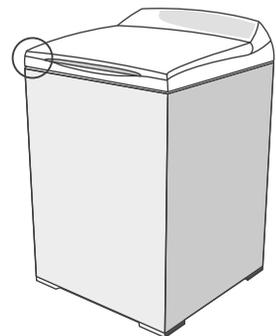


Fig.5 To assess levelling check lid alignment



- 4 Turn on the water and check all hose connections for leaks. Make sure there are no kinks in the hoses.
- 5 Uncoil power cord, remove and discard the plastic pin cover and plug into wall socket.

4 Installation instructions

Water supply

- For best operating conditions your hot water should be approximately 65°C. Your cold water should not exceed 35°C or your hot water exceed 75°C. Temperatures above these may cause the machine to fault or cause damage to the machine.
- If you have an uncontrolled water heating source (eg a wet back or solar heating system) you should fit a Safe Valve. This will ensure the hot water temperature remains within safe limits.
- Inlet water pressure: Max.1 MPa (150 psi) Min. 34 Pa (5 psi)
- Inlet water flow rate: Min. 3 litres/min
- Minimum height of taps to clear the top of the machine is 1150 mm.

Draining

- Regularly check that your standpipe or tub is free from lint or other obstructions, which may affect how your machine works or may cause flooding.
- In multi-storey apartments or any upper floor, the machine should be installed on a drained floor.
- Draining must comply with local by-laws.

Clothes washer safety

- This clothes washer is not intended for use by children and persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Your *Smart Drive™* can be opened while it is filling and agitating. Supervise children at all times to ensure they do not play with the washer.

⚠ WARNING!



Electrical Shock Hazard

If you are using an extension cord or a portable electrical outlet device (eg multi-socket outlet box), ensure that it is positioned so that it does not come into contact with water or moisture.

Failure to do so may result in death or electrical shock.

Accessories and spare parts

Available from your Fisher & Paykel Dealer or Authorised Repairer.

Inlet Valve Cap	Part No. 388491
Hose Inlet Long (2m)	Part No. 422680
Hose Inlet Large Bore	Part No. 426123
Drain Hose Extension	Part No. 425627p
Power Cord	If the power cord of your clothes washer is damaged it must be replaced by a Fisher & Paykel Authorised Repairer, as it is not a standard power cord.

Thank you for buying a Fisher & Paykel *Smart Drive™* washing machine. We are very proud of this washer and trust it will serve you well for many years.

At Fisher & Paykel we aim to provide innovative products that are simple to use, ergonomic and energy efficient. Thousands of tonnes of washing and 75 years of laundry experience have been programmed into your washing machine to help give you the best possible performance.

We hope you enjoy your new washing machine, we have certainly enjoyed designing it.

Before you do your first wash

You owe it to yourself and your *Smart Drive™* to have it installed correctly by a technician from a Fisher & Paykel Authorised Repairer.

Before you start, it is a good idea to go through the following checklist:

- 1 Has the basepacker been removed?
- 2 Is the hot hose connected to the hot valve marked 'H'? Is the cold hose connected to the cold valve marked 'C'?
- 3 Is the drain hose threaded through the 'U bend' (with no more than 20 mm extended) and on to your standpipe?
- 4 Are the rubber inserts secured into the feet on the base of your machine and is the machine levelled? Refer to 'Installation instructions', page 3.

If you have bought a PRIDE model it is a good idea to check the warm fill temperature. (Refer to page 24).

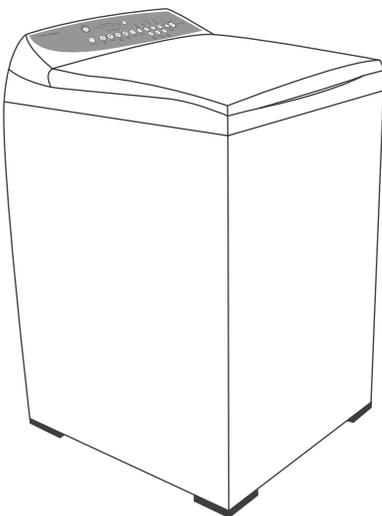


Fig.6 EXCELLENCE washer

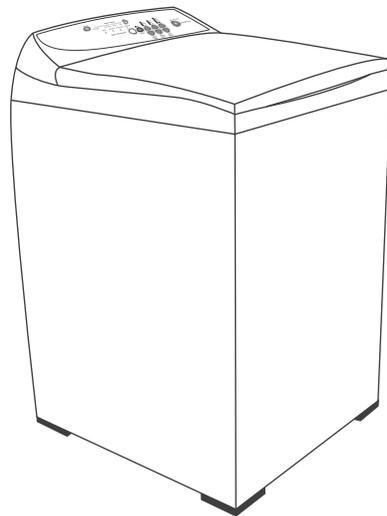


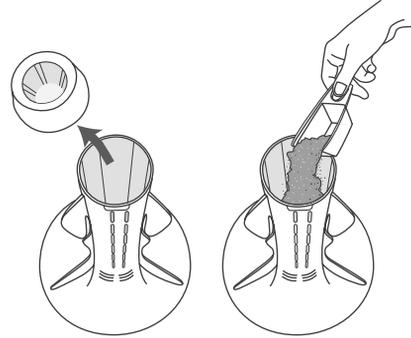
Fig.7 PRIDE washer

6 Using your EXCELLENCE washer

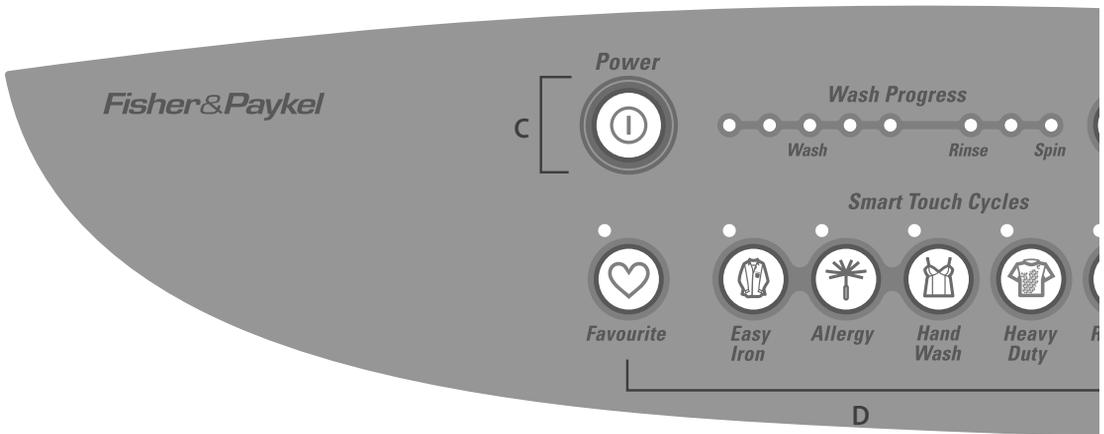
- Place the load evenly around the agitator (refer to 'Sorting' and 'Loading', page 19).
- Remove fabric softener dispenser.

A. Detergent

- Follow the instructions on the detergent package.
- Use the mark on the agitator, nearest to the top of the clothes, as a guide to the correct amount of detergent to use (refer to 'Detergent', page 20).
- Pour the detergent down the centre of the agitator stem.
- Replace the fabric softener dispenser (this stops small articles falling down the centre of the agitator).



EXCELLENCE – WA75T65GW1, WA65T60GW1, WA55T56GW1



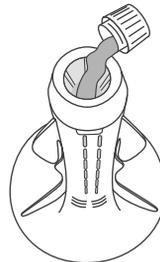
B. Fabric softener

- If you wish to use fabric softener, place it in the dispenser on the top of the agitator.

Important!

Fabric softener must not be used if you have selected the ECO or QUICK WASH option.

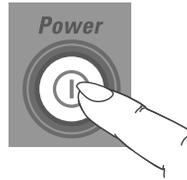
(Refer to 'Fabric softener', page 21).



Using your EXCELLENCE washer 7

C. Power

- Press POWER to turn the machine on.



D. Wash cycles

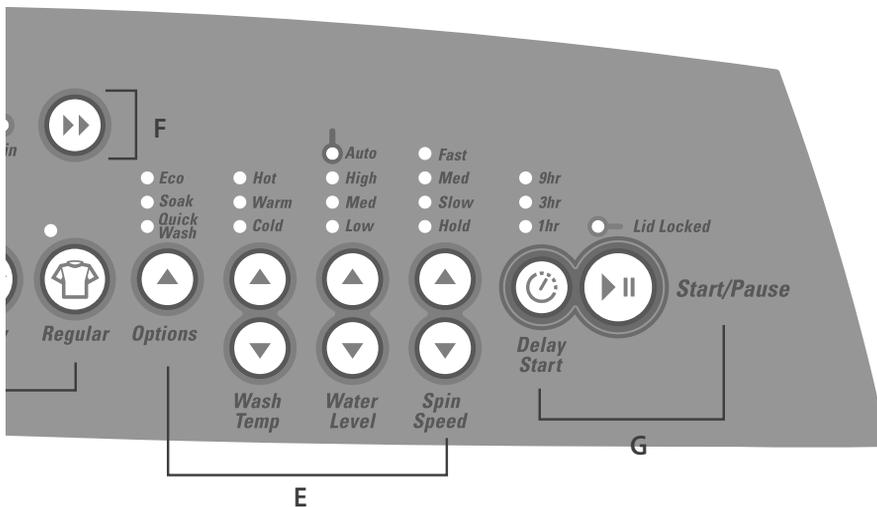
- Select the desired wash cycle by pressing the button.

E. Wash options

- Select the WASH TEMPERATURE and other wash options (refer to pages 12 – 16).

F. Advance

- Use to advance through to the desired part of the wash cycle (refer to page 12).



G. Start

- Press START/PAUSE to start the machine.

If you wish to stop your EXCELLENCE washer

- Press START/PAUSE.
- If it is during spray rinse or spin there is a slight delay while the bowl is coasted to a stop and the lid is unlocked.

Important!

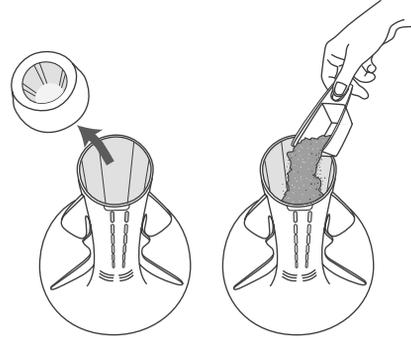
For best fabric and colour care remove your clothes as soon as the cycle has finished.

8 Using your PRIDE washer

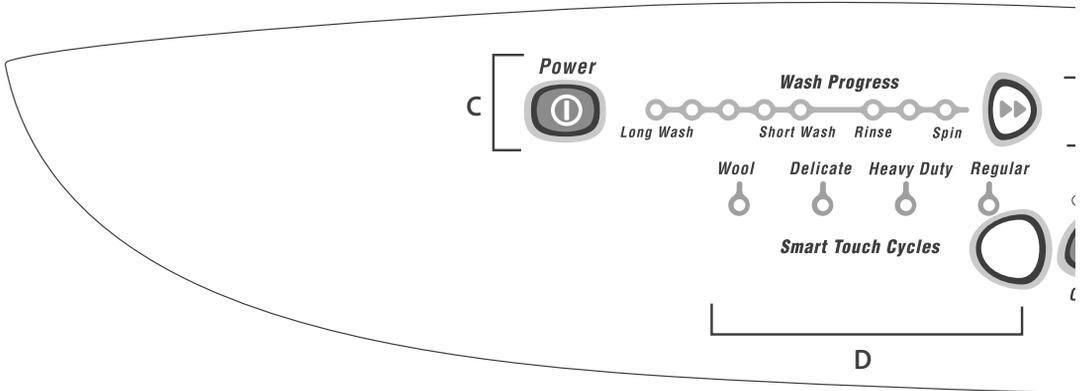
- Place the load evenly around the agitator (refer to 'Sorting' and 'Loading', page 19).
- Remove fabric softener dispenser.

A. Detergent

- Follow the instructions on the detergent package.
- Use the mark on the agitator, nearest to the top of the clothes, as a guide to the correct amount of detergent to use (refer to 'Detergent', page 20).
- Pour the detergent down the centre of the agitator stem.
- Replace the fabric softener dispenser (this stops small articles falling down the centre of the agitator).



PRIDE – WA55T56MW1 (MW512)



B. Fabric softener

- If you wish to use fabric softener, place it in the dispenser on the top of the agitator.

Important!

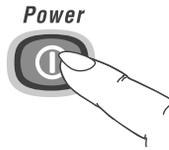
Fabric softener must not be used if you have selected the ECO option.

(Refer to 'Fabric softener', page 21).



C. Power

- Press POWER to turn the machine on.



D. Wash cycles

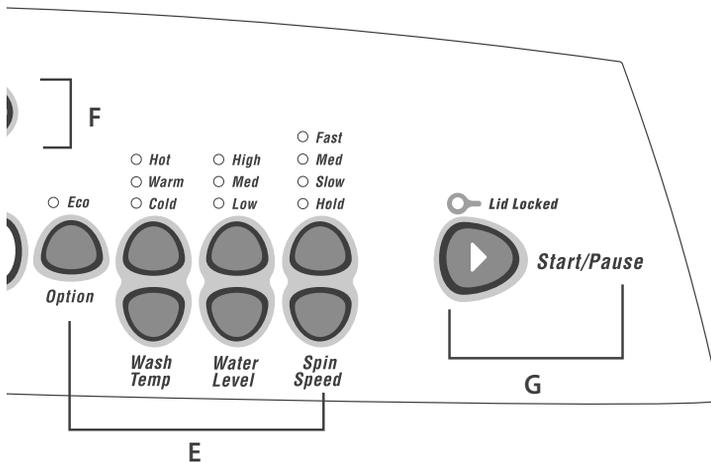
- Select the cycle you want by pressing the SMART TOUCH CYCLES button located below the REGULAR option. Scroll through the cycles until the light for the one you want is lit.

E. Wash options

- Select the WASH TEMPERATURE and other wash options (refer to pages 12 – 16).

F. Advance

- Use to advance through to the desired part of the wash cycle (refer to page 12).



G. Start

- Press START/PAUSE to start the machine.

If you wish to stop your PRIDE washer

- Press START/PAUSE.
- If it is during spray rinse or spin there is a slight delay while the bowl coasts to a stop and the lid is unlocked.

Important!

For best fabric and colour care remove your clothes as soon as the cycle has finished.

10 Lid lock

Your *Smart Drive™* has a lid lock, which locks when your machine is spinning. This ensures the lid cannot be opened during hazardous parts of the cycle, providing added safety for you and your family.

The LID LOCK light (above the START/PAUSE button) comes on when the lid is locked to tell you when you cannot open the lid. In short it means you can open the lid while your *Smart Drive™* is filling, agitating and draining, but not while it is spinning.

- When the LID LOCK light is on, the lid is locked.
- When the LID LOCK light is off, the lid is not locked and the lid can be opened.
- If the LID LOCK light is flashing the lid lock is in process of locking or unlocking (ie while the machine coasts down or START/PAUSE has been pressed). During this stage the lid still cannot be lifted.

Important!

If the lid is left open, the machine will be unable to lock and the cycle will be halted. The machine will play a tune and the LID LOCK light will flash until the lid is closed and START/PAUSE is pressed.

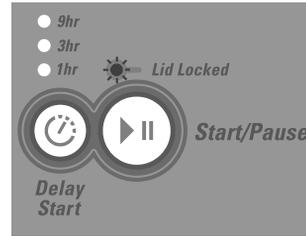
The lid lock remains unlocked for the majority of the cycle allowing you to add clothes, dissolve detergent or to add fabric softener (if you do not want to use the Automatic Fabric Softener Dispenser).

The chart below shows the stages when the lid is locked.

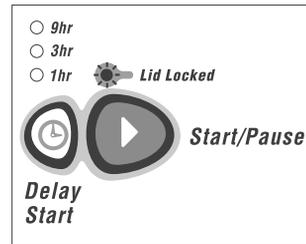
Fill	Unlocked
Agitate	Unlocked
Spray Rinse	Locked
Deep Rinse	Unlocked
Spin	Locked

Important!

- *Keep children away from the machine, especially when you are using hot water, as the lid can be opened during fill and agitate.*
- *DO NOT put anything down the slot in the top deck of your machine.*
- *DO NOT try to disable the lid lock.*



EXCELLENCE



PRIDE

Fig.8 LID LOCK light

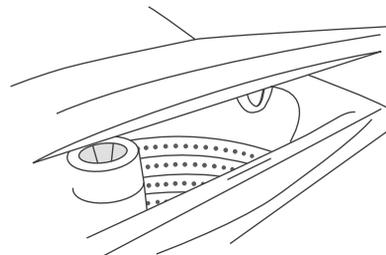


Fig.9 Lid lock

Default settings

EXCELLENCE model

	REGULAR	HEAVY DUTY	HAND WASH	ALLERGY	EASY IRON
Wash time	12 min	15 min	6 min	12 min	9 min
Wash action	REGULAR	HEAVY DUTY	HAND WASH	REGULAR	REGULAR
Wash temp	WARM-COLD	WARM	WARM-COLD	HOT	WARM-COLD
Rinse	Spray rinse + cold deep rinse	Spray rinse + cold deep rinse	2 cold deep rinses	2 cold deep rinses	2 cold deep rinses
Spin speed	FAST	FAST	SLOW	FAST	SLOW
Spin time	6 min	6 min	4 min	6 min	2 min

PRIDE model

	REGULAR	HEAVY DUTY	DELICATE	WOOL
Wash time	12 min	15 min	6 min	6 min
Wash action	REGULAR	HEAVY DUTY	DELICATE	DELICATE
Wash temp	WARM	WARM	WARM	WARM
Rinse	Spray rinse + cold deep rinse	Spray rinse + cold deep rinse	2 cold deep rinses	Spray rinse + cold deep rinse
Spin speed	FAST	FAST	SLOW	MEDIUM
Spin time	6 min	6 min	4 min	6 min

Model variations

EXCELLENCE model – Fully featured, with REGULAR, HEAVY DUTY, HAND WASH, ALLERGY and EASY IRON cycles, and a FAVOURITE cycle.

PRIDE model – REGULAR, HEAVY DUTY, DELICATE and WOOL cycles.

Basic cycle descriptions

- REGULAR cycle (with the ECO option) has been designed for normally soiled, everyday washing, eg sheets, towels, T-shirts.
- HEAVY DUTY cycle is for heavily soiled durable garments, eg overalls, jeans, tea towels.
- HAND WASH cycle is designed for your most delicate garments.
- ALLERGY cycle has been designed for those with skin and other sensitivities.
- EASY IRON cycle is for items susceptible to creasing, eg shirts, dress trousers.
- DELICATE cycle uses a slow, gentle agitation designed to care for your delicate items, eg lingerie, blouses.
- WOOL cycle is for machine washable woollens.

12 Wash options and advancing the cycle

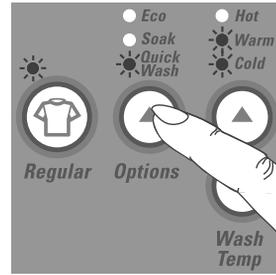
To select the wash options

EXCELLENCE model

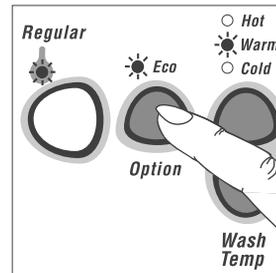
- 1 Select the wash cycle, temperature, water level and spin speed (refer to page 7).
- 2 Press the OPTIONS button if you want to choose ECO, SOAK or QUICK WASH (refer to pages 14 and 15).
- 3 Press START/PAUSE.

PRIDE model

- 1 Select the wash cycle, temperature, water level and spin speed (refer to page 9).
- 2 If you wish to save water press the ECO option button (refer to page 14).
- 3 Press START/PAUSE.



EXCELLENCE



PRIDE

Fig.10 Selecting wash options

The wash progress lights

The wash progress lights show all the tasks your *Smart Drive™* will do during the wash cycle. As each task is completed a light goes out, so you can tell at a glance how far the cycle has to go.

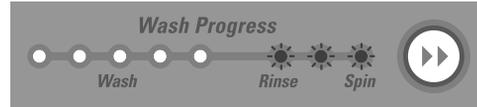


Fig.11 Wash progress lights

Note: while EXCELLENCE model is shown, PRIDE model is identical

To advance the wash cycle

- 1 Press POWER.
- 2 Press the button with the 'two arrows' repeatedly to advance the cycle, to the desired position.
- 3 Press START/PAUSE.

Note: each wash progress light equals 3 minutes of agitation. The ECO option wash progress lights may in some cases wash for longer. This is dependent on the water level. The QUICK WASH option shortens the agitation time for each progress light (EXCELLENCE model only).

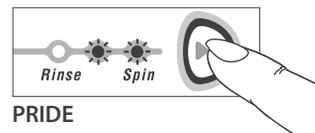


Fig.12 Advancing the wash cycle

Clothes care safeguards

To avoid accidentally damaging your clothes there are a few options that your *Smart Drive™* will not accept. For example, you cannot select a HOT wash on HAND WASH or EASY IRON cycles (EXCELLENCE model) or DELICATE or WOOL cycles (PRIDE model), or choose the ECO option on anything other than the HEAVY DUTY or REGULAR cycles (both models).

Manual water level selection

The agitator has five levels marked on its stem that can be used to help you select the correct water level. Select the correct water level by using the mark nearest to the top of the load.

- The levels marked on the agitator do not correspond exactly to the level of the water. They indicate the level of dry clothes suitable for the water level.
- Your *Smart Drive™* may occasionally add water during agitation. This is to maintain the water level due to the release of air trapped in the garments.
- The medium/high and medium/low settings are available on EXCELLENCE model only.
- Out of balance loads, tangling or splash-over can be caused by selecting a water level that is too high.

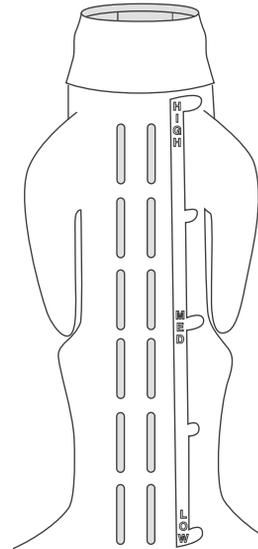


Fig.13 Water level guide on agitator

Auto water level

EXCELLENCE model only

Your *Smart Drive™* can automatically select the appropriate water level for the load.

- 1 Place your clothes in the machine.
- 2 Select the wash cycle (select AUTO if not automatically selected).
- 3 Press START/PAUSE.

During fill, the machine will pause occasionally to sense the water level. The machine will check if the water level is correct by using a series of two different agitate strokes. A slow stroke to sense the load and an agitate stroke to mix the load. (This may take over a minute.) If it detects that the water level is not high enough, it will fill with more water and check the level.

- When washing an unusual load, eg large bulky garments or pillows, we recommend you manually select the water level and select the HAND WASH cycle (EXCELLENCE model) or the DELICATE cycle (PRIDE model).
- Manually select the water level if there is already water in the bowl.



Fig.14 Selecting AUTO water level

Note: if you feel the AUTO water level does not fill to the correct level, you can adjust the level the machine selects (refer to 'Changing pre-set options', pages 22 and 25).

14 Wash options – saving water and time

Eco

EXCELLENCE and PRIDE model

Press the ECO option in order to save water. The ECO option uses an Eco Spray rinse which has been specially designed to use at least 25% less water than a traditional rinse. Use this option when you want to use less detergent and less water. However, If you have low water pressure or sensitive skin it is better to use a traditional rinse.

The ECO option has not been designed to be used with fabric softener as it does not have a second deep rinse to dispense the softener correctly. Fabric softener should not be used if this option is selected.

Note: the ECO option is only available on the REGULAR and HEAVY DUTY cycles. If you try to select these options on the HAND WASH, ALLERGY or EASY IRON cycles (EXCELLENCE model), or the WOOL or DELICATE cycles (PRIDE model), your *Smart Drive™* will skip over the option. ECO will take slightly longer than a normal spray and deep rinse.

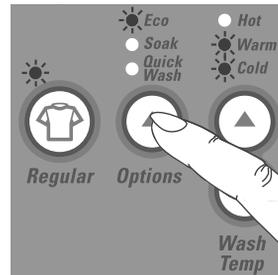
There are some wash loads that may not suit being washed using the ECO option. For instance, loads that have a lot of sand or sawdust in them or garments where the colour still runs from them.

Quick wash

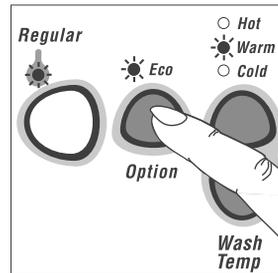
EXCELLENCE model only

Our EXCELLENCE model provides an excellent opportunity to save on water and time. Use the QUICK WASH option when you want to save time and reduce the amount of water used during the REGULAR, HEAVY DUTY, HAND WASH or EASY IRON wash cycles.

The QUICK WASH option has not been designed to be used with fabric softener as it does not have a second deep rinse to dispense the softener correctly. Fabric softener should not be used if this option is selected.

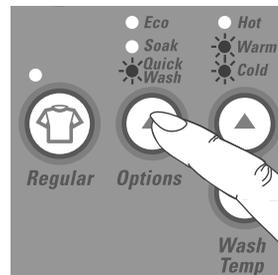


EXCELLENCE



PRIDE

Fig.15 Selecting the ECO option



EXCELLENCE

Fig.16 Selecting the QUICK WASH option

Soak

EXCELLENCE model only

Use the SOAK option to soak clothes at the end of the wash phase or when you wish to re-use the wash water.

When you select SOAK your *Smart Drive™* will soak for a period of 2 hours before completing RINSE and SPIN. During SOAK your *Smart Drive™* will agitate for a few seconds every minute.

Nappy sanitisers/bleach

Nappy sanitisers and bleach are very corrosive to metal surfaces. These should not be used in your machine.

Important!

DO NOT use your *Smart Drive™* to soak items in bleach or sanitiser, or tip the contents of the nappy bucket into your machine. The chemicals in these products can damage your washer. Rinse and wring items out thoroughly before placing them in your machine.

Spin Hold

EXCELLENCE & PRIDE model

Use the SPIN HOLD option to:

- Remove drip dry garments from a mixed load before the wash goes into SPIN.
- Minimise the clothes creasing when they are left to sit in the bottom of the bowl at the end of the cycle.

When you have selected SPIN HOLD, your *Smart Drive™* will pause at the end of RINSE, beep and the SPIN light will flash to tell you that it is waiting for another instruction.

Press START/PAUSE to begin the spin.

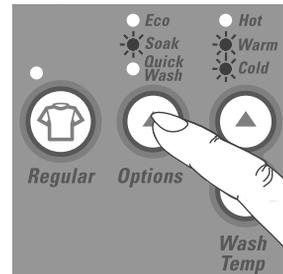
Delay Start

EXCELLENCE model only

DELAY START will delay the start of the wash cycle for 1, 3 or 9 hours.

Press DELAY START once for a delay of 1 hour. Press again for 3 hours, a third time for 9 hours (and again to return to normal).

- Once you press DELAY START your *Smart Drive™* will begin the delay period, you do not have to press START/PAUSE.
- Be careful if using DELAY START for non-colourfast clothes as dyes may run if the clothes are damp.
- Your *Smart Drive™* will not beep at the end of the cycle if DELAY START is selected.



EXCELLENCE

Fig.17 Selecting the SOAK option



EXCELLENCE

Fig.18 Selecting the SPIN HOLD option

Note: while EXCELLENCE model is shown, setting of the PRIDE model is identical

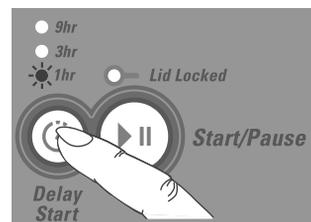


Fig.19 Selecting DELAY START

16 Wash options

Washing bulky items

Forcing large items into the machine may result in them being damaged during washing. Make sure there is enough room in the machine for items to move when being washed.

Some items float up during the wash (eg duvets/ doonas and pillows). If they sit too high they may touch stationary parts of the machine during agitate or spin. To minimise the chance of this happening, bulky items should be pushed down below the water level after fill and pushed to sit below the medium high water level mark on the agitator before spinning. Select a SLOW spin.

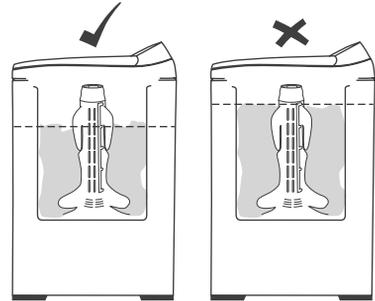


Fig.20 Bulky items should sit below the medium high water level mark.

Important!

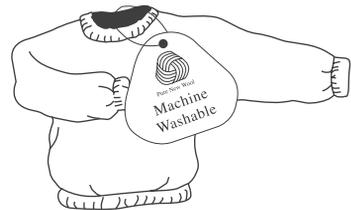
To prevent an out of balance load or splash-over we recommend washing these items on the **HAND WASH cycle (EXCELLENCE model) or the DELICATE cycle (PRIDE model).**

If you wish to re-spin the load at a faster speed make sure the load is sitting below the medium-high mark before spinning.

Washing woollens

Many woollen items carry a MACHINE WASHABLE care claim. The fibres of these woollens have been treated to prevent felting when they are machine washed.

- Check the care label.
- Use a wool detergent.
- Use the specially designed **HAND WASH cycle (EXCELLENCE model) or WOOL cycle (PRIDE model)**. For your more durable woollens you may want to use the **EASY IRON cycle (EXCELLENCE model only)**.
- Hand washed woollens may be spun in your *Smart Drive™*.
- To dry woollens lie them flat on a towel and pat into shape. Dry out of direct sunlight.



Most handcrafted garments are not made of machine washable wool and we recommend that you wash them by hand only.

Note: some wool underlays and sheepskin products can be washed in a washing machine but could produce excessive amounts of lint that may cause pump blockages.

FAVOURITE cycle

EXCELLENCE model only

The FAVOURITE cycle lets *you* design the wash cycle. It can be any wash cycle with any of its wash options and it can start from any point in the cycle. For instance, it may be a cycle to wash your gym gear or it may be a rinse and spin to finish washing the nappies.

To set your favourite cycle

- 1 Press POWER.
- 2 Press the FAVOURITE cycle button. Hold down for 2 seconds.
- 3 You will hear 2 quick beeps and the FAVOURITE light will flash.
- 4 Select your most preferred ('favourite') cycle, (eg REGULAR, ALLERGY).
- 5 Select the wash options (eg COLD wash, SOAK). Use ADVANCE if you want part of a cycle (eg to rinse nappies).
- 6 Press FAVOURITE again to store your favourite cycle.

To change your FAVOURITE cycle simply repeat these steps.

Note: your *Smart Drive*™ will remember your FAVOURITE cycle even when it is turned off at the wall. It is not possible to program a delayed start into the FAVOURITE cycle.

To use your favourite cycle

- 1 Press POWER.
- 2 Press FAVOURITE.
(Your favourite cycle and wash options will be automatically selected).
- 3 Press START/PAUSE.

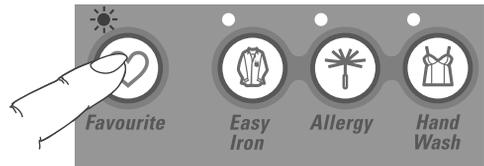


Fig.21 The FAVOURITE cycle

18 Customising the wash cycles

To customise a cycle

EXCELLENCE model only

You can program your *Smart Drive*™ to remember the wash options you prefer for each wash cycle. For instance, you may want to set the REGULAR cycle to a COLD wash or set HEAVY DUTY to include a SOAK.

- 1 Press POWER.
- 2 Press the wash cycle button. Hold down for 2 seconds.
You will hear 2 quick beeps and the wash cycle light will flash.
- 3 Select your wash options (eg COLD wash, SOAK).
- 4 Press the wash cycle again to store your customised cycle.

To change your customised wash cycle simply repeat these steps.

When you are customising a wash cycle you can shorten or lengthen the agitation time.

- To shorten the agitation time, press the ADVANCE button to reduce the number of wash progress lights.
- To increase the agitation time keep pressing the ADVANCE button until all the wash progress lights are on (see page 12).

Note: unlike the FAVOURITE cycle you cannot customise a wash cycle to start at the RINSE or SPIN stage. On HEAVY DUTY and HAND WASH you can only decrease the wash time.



Fig.22 Customising a wash cycle

Sorting

To get the best wash results it pays to sort your clothes before washing.

Care labels

The care label will tell you about the fabric of the garment and how it should be washed.

Soil

Sort clothes according to the type and amount of soil. Some soils suit warmer washes, eg oily soils, while others are best washed in cold water, eg mud, blood.

Colour

Sort white fabrics from coloured fabrics.

Lint

Wash lint givers and lint collectors separately. Where possible, turn lint collectors inside out.

Loading

Check pockets

Loose items can damage both your *Smart Drive™* and your clothes.

Close zippers, hooks and eyes

This is to make sure that these items do not snag on other clothes.

Mend any torn garments or loose buttons

Tears or holes may become larger during washing. Remove any loose bra wires as they can damage your washing machine and/or dryer.

Pretreat any stains

Make sure you use an appropriate surface to apply treatments. Do not use the lid or top of the machine as damage may occur to these surfaces.

Make sure the water level suits the load size

Select the correct water level by using the mark on the agitator nearest to the top of the load. Ensure that the load does not extend above the fabric softener dispenser as splashing may occur.

For a balanced load

- Place unfolded clothes firmly and evenly around the agitator.
- Do not wrap large items, such as sheets, around the agitator.
- A mixture of small and large items will wash the best.

	Machine Washable Warm 40°C max Warm Rinse Well Normal Spin
	Do not bleach
	Do not tumble dry Dry in shade
	Warm iron
	Dry Cleanable

Examples of different care label symbols.

Lint givers	Lint collectors
Towels	Synthetics
Chenille	Corduroy
Nappies	Poly cotton
	Socks

Choosing the right detergent

We recommend using domestic detergent, (powder or liquid).

Soap flakes or granulated soap powders should not be used in your *Smart Drive™*, eg Lux Soap Flakes.

When washing woollens remember to use a recommended detergent.

How much detergent?

Use the instructions on the back of the detergent packet as a guide to the correct amount of detergent to use. The correct amount of detergent will vary depending on the amount of soil in your clothes and the size of your load. Jeans and work clothes may need more detergent, while towels usually need less. The larger your machine, the more detergent you may have to add.

Adding the detergent

Liquid or powdered detergents

- 1 Remove fabric softener dispenser.
- 2 Pour liquid or powdered detergent down the centre of the agitator. Some detergents **MUST** be fully dissolved before adding to your machine to get the best wash results. Check the instructions on the detergent packet. Pre-dissolving the detergent when washing in cold water can improve its performance.
- 3 Replace fabric softener dispenser (this prevents small articles falling down the centre of the agitator).

Concentrate			
Model	5.5 kg	6.5 kg	7.5 kg
Water level	Number of scoops		
high	1 rounded	1½	1½
med high	1 scant	1 heaped	1½
medium	¾	1 scant	1
med low	½	⅔	¾
low	⅓	⅓	½

Liquid			
Model	5.5 kg	6.5 kg	7.5 kg
Water level	Number of caps		
high	1 cap	1¼ cap	1½ cap
med high	1 cap	1 cap	1¼ cap
medium	¾ cap	¾ cap	1 cap
med low	½ cap	½ cap	¾ cap
low	⅓ cap	⅓ cap	½ cap

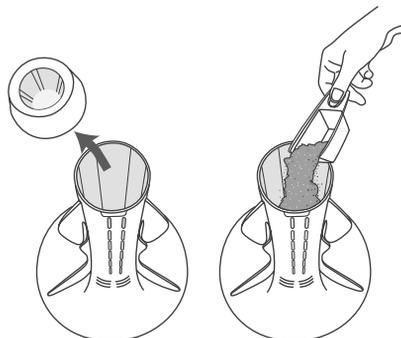


Fig.23 Adding your detergent

How the fabric softener is dispensed

The fabric softener goes into the dispenser on the top of the agitator. During the rinse the machine spins to release the fabric softener, delivering it down the agitator stem as the machine fills for the final deep rinse.

Note: ECO and QUICK WASH options are not designed to be used with fabric softener. Cycles using these options do not use a deep rinse so the machine cannot dispense fabric softener correctly.

How much fabric softener?

The ring on the dispenser cup is a guide for the amount of fabric softener to add for a full load. Smaller loads require less fabric softener.

Cleaning the dispenser

When using fabric softener, rinse your dispenser at the end of each wash.

- 1 Separate the cup from the dispenser body by pushing downward on the base of the cup.
- 2 Rinse both parts of the dispenser using warm soapy water.

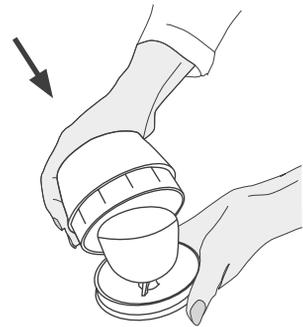


Fig.24 Push cup through dispenser with thumb to remove

Scrud

Scrud is the name given to the waxy build-up that can occur within any washer when the fabric softener comes into contact with detergent. This build-up is not brought about by a fault in the machine. If scrud is allowed to build up in the machine it can result in stains on your clothes or an unpleasant smell in your washer.

If you wish to use fabric softener we recommend:

- Using fabric softener sparingly.
- When filling the dispenser, do not splash or overfill.
- Clean dispenser as soon as the cycle has finished.
- Clean your machine regularly (refer page 27).
- Cold water washing increases the chance of this build-up occurring. We recommend a WARM or HOT wash at regular intervals, eg approximately every 5th wash.
- Fabric softener of a thinner consistency is less likely to leave residue on the dispenser and contribute to a build-up.

22 Changing pre-set options

Option adjustment mode

After using your *Smart Drive*™ you may want to fine tune some of the options to suit your wash needs.

There are a number of pre-set options, which can be altered.

In the EXCELLENCE model the following pre-set options can be changed:

- The wash temperatures.
- The RINSE option on HEAVY DUTY and REGULAR cycles.
- The COLD wash to CONTROLLED COLD.
- The number of beeps at the end of the cycle.
- The fill level selected by AUTO water level.
- The out of balance recovery routine.

In the PRIDE model the following pre-set options can be changed:

- The WARM wash temperature.
- The RINSE option on HEAVY DUTY, REGULAR and WOOL cycles.
- The out of balance recovery routine.

To enter option adjustment mode

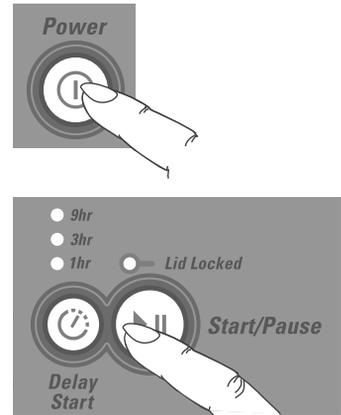
- 1 Turn machine on at the wall but do not press POWER. Press START/PAUSE and hold down, then press POWER. You will hear two quick beeps and the machine will show an unusual pattern of lights.

In this mode the lights are used to indicate the different options available.

The diagram on page 23 shows how the lights relate to the options you can change.

Pages 24 – 26 explain the different options in more detail.

- 2 Use the buttons on the panel to make your changes to the pre-set options.
- 3 Press POWER to return to normal mode.
- 4 Your *Smart Drive*™ will automatically remember your changes.



EXCELLENCE

Fig.25 Entering Option Adjustment mode

Note: while EXCELLENCE model is shown, setting of the PRIDE model is identical

- 1 Press START/PAUSE and hold down. Press POWER.
- 2 The diagram below shows how the lights relate to the options you can change. It also shows what lights will be on when you first enter the option adjustment mode.

Use this diagram to help you adjust the options on the EXCELLENCE model.

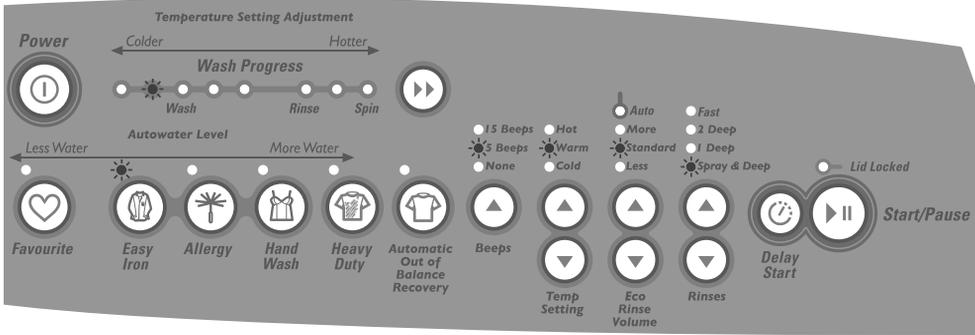


Fig.26 Option adjustment on the EXCELLENCE model

Use this diagram to help you adjust the options on the PRIDE model.

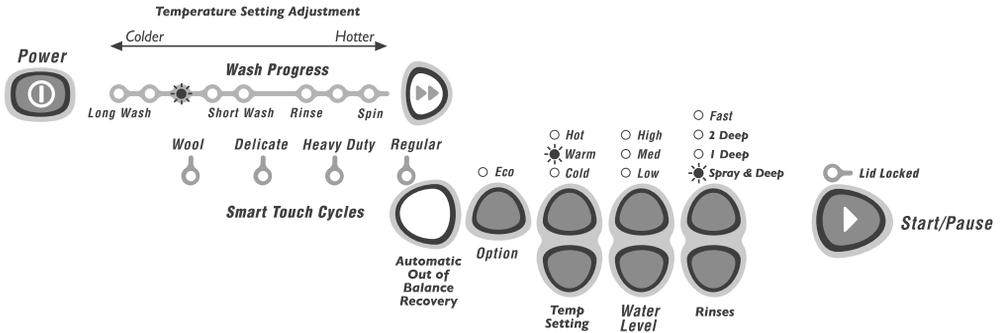


Fig.27 Option adjustment on the PRIDE model

- 3 Use the buttons on the panel to change the pre-set options.



EXCELLENCE

Fig.28 Option adjustment selection

Note: while EXCELLENCE model is shown, setting of the PRIDE model is identical

24 Changing pre-set options

Wash temperatures

On the PRIDE model the WARM temperature can be adjusted if you think it is too hot or too cold. Note: on these models the hot temperature will be the same as the hot water supply temperature.

On EXCELLENCE model all wash temperatures can be individually adjusted.

- 1 Select the WASH TEMPERATURE you want to adjust.
- 2 The wash progress lights show the temperature adjustment possible for that temperature.
 - Pressing the ADVANCE will cause the wash progress light that is on to change.
 - Advancing the wash progress light will increase the wash temperature. If you keep pressing the ADVANCE, the light will scroll back to the coldest setting available for that wash temperature.

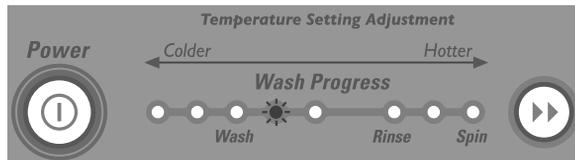


Fig.29 Adjusting the temperature setting

Note: while EXCELLENCE model is shown, the setting of the PRIDE model is identical

Note: if you have a PRIDE model and still can't get the temperature you require, advance the progress light (while in the options adjustment mode) across to SPIN and manually adjust the flow of the taps.

Rinse options

On the HEAVY DUTY and REGULAR cycles (EXCELLENCE model) and on the HEAVY DUTY, REGULAR and WOOL cycles (PRIDE model) you can change the pre-set rinse option.

The default rinse option on these cycles is a spray rinse followed by a deep rinse. The first step of the default rinse can be replaced with a short spin, or a deep rinse, by selecting another option.

If you have a problem with impurities in your water supply you may get a better result if you change the rinse option to 2 DEEP rinses. If you wish to conserve water, change the rinse option to 1 DEEP rinse. If you want to conserve even more water, choose the ECO option.

Rinse options		
	Rinse 1	Rinse 2
MED spin light on	Deep rinse	Deep rinse
SLOW spin light on	Short spin	Deep rinse
HOLD light on (default)	Spray rinse	Deep rinse

Controlled cold

EXCELLENCE model only

If your cold water temperature is very low you will not get a very effective wash. The CONTROLLED COLD option solves this problem by adding a small amount of hot water to raise the temperature of the wash. We have called this “CONTROLLED COLD”.

- 1 Select COLD wash temperature.
- 2 The wash progress lights show the temperature adjustment possible.
 - When the first progress light is on, the machine will fill with cold water only.
 - Press the ADVANCE button to select the second light and your *Smart Drive™* will control the temperature to approximately 20°C. Each following light equals approximately a 1°C temperature rise.

Note: if you always use COLD or CONTROLLED COLD water, we recommend that a WARM or HOT wash be used regularly, eg every 5th wash should be at least a warm one.

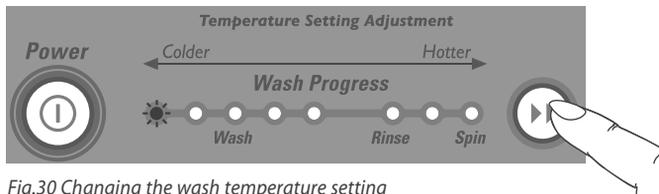


Fig.30 Changing the wash temperature setting

End of cycle beeps

EXCELLENCE model only

The beeps signalling the end of the cycle can be increased or decreased. Press the options button up to increase beeps or down for no beeps.

Auto water fill level

EXCELLENCE model only

If you are not satisfied with the level that your *Smart Drive™* fills to on AUTO water level, you can increase or decrease the fill level that AUTO will select.

Note: if you feel there is not enough water for the load, we recommend you check by pausing the machine and pushing the clothes down to see how much spare water is at the bottom of the bowl. Clothes often float and your *Smart Drive™* can sense the water under the clothes.

Light on	Option
FAVOURITE	less water
EASY IRON	factory setting
ALLERGY	more water +
HAND WASH	more water ++
HEAVY DUTY	more water +++

26 Changing pre-set options

Out of balance recovery routine

When your *Smart Drive*™ is spinning it can sense if the wash load is out of balance and will stop and re-try spinning up to three times. If it still senses an unbalanced load there are two options the machine can take.

Automatic recovery option

Your *Smart Drive*™ will try to automatically correct the out of balance load. It will fill with water and agitate to redistribute the load before trying to spin up again.

Machine stops option

Your *Smart Drive*™ will stop, give a short burst of beeps every five seconds, and the RINSE or SPIN light will flash. You must redistribute the load more evenly yourself (use this option if you wish to conserve water).

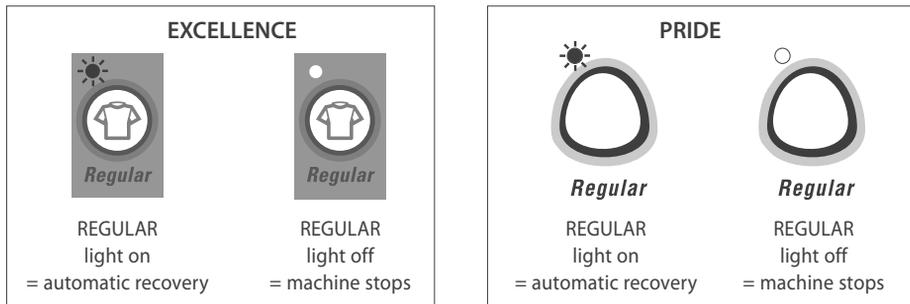


Fig.31 Adjusting the Out of balance recovery routine

Machine information

Specifications

Model	Capacity	Depth	Width	Height*	Height (lid open)
WA75T65GW1	7.5 kg	650 mm	650 mm	1020 – 1050 mm	1410 – 1440 mm
WA65T60GW1	6.5 kg	600 mm	600 mm	1020 – 1050 mm	1360 – 1390 mm
WA55T56GW1	5.5 kg	560 mm	560 mm	1020 – 1050 mm	1320 – 1350 mm
WA55T56MW1 (MW512)	5.5 kg	560 mm	560 mm	1020 – 1050 mm	1320 – 1350 mm

- Electrical Supply: 220 – 240 V, 50 Hz Sinusoidal, 165 W
- Inlet Water Pressure: Max. 1 MPa (150 psi) Min. 34 Pa (5 psi)
- Inlet Water Flow Rate: Min. 3 litres/min
- Standpipe Height: 850 – 1200 mm

Note: exact height of your *Smart Drive*™ is dependent on how far the feet are inserted onto the base of the machine.

* Height is measured to the highest point on the console.

When you have finished

- Turn off the taps to prevent the chance of flooding should a hose burst.
- Turn off the power at the wall.

Cold water washing

If you always use cold water, we recommend that a WARM or HOT wash be used at regular intervals, eg every 5th wash should be at least a warm one.

Cleaning your *Smart Drive*™

- Clean with a soft damp cloth and wipe dry. Do not use scouring cleaners as they can damage the paint, plastic and panel surfaces.
- Clean the fabric softener dispenser after each cycle using warm soapy water.
- You can remove the lid for cleaning. Open the lid fully, hold one side with one hand and gently tap the other side with an upward motion.
To replace the lid, hold the lid vertically and align both hinges before pushing down firmly.
- To remove the agitator for cleaning, unscrew the nut down the centre of the agitator by turning anti-clockwise.

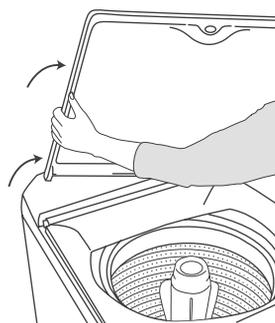
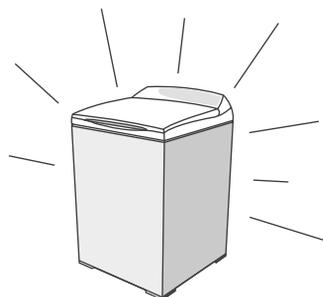


Fig.32 Removing the lid

Important!

The agitator must be fully pushed onto the shaft when refitting. Tighten the nut firmly by hand. Ensure the agitator is not loose.

Cleaning the inside of your *Smart Drive*™

If you use fabric softener or do regular cold water washing, it is important that you occasionally clean the inside of your machine.

- Fill your machine with hot water. Add about two cups of a powdered detergent.
- Let it agitate for 10 – 15 minutes.
- Stop the machine (press START/PAUSE), **open the lid** and leave it to soak overnight.
- After soaking, drain the machine (advance to SPIN) and then run the machine through a REGULAR cycle.

We do not recommend that you wash clothes during this procedure.

Products that might damage your *Smart Drive*[™]

- Concentrated bleaches, nappy sanitisers and hydrocarbon solvents (eg petrol and paint thinners) can cause damage to the paintwork and components of your washer. (Be careful when washing garments stained with solvents as they are flammable. DO NOT put them in your dryer).
- Do not use pre-treatment sprays or liquids on or near your washer as they can damage your machine's control panel and plastic surfaces.
- Use of dyes in your washer may cause staining of the plastic components. The dye will not damage the machine but we suggest you thoroughly clean your washer afterwards. We do not recommend the use of dye strippers in your washer.

Smart Drive[™] sounds and beeps

Your *Smart Drive*[™] will make sounds that you will not have heard from other clothes washers.

- During drain you will hear the pump in your machine turn off and on quickly about every 10 seconds. This is part of your *Smart Drive*[™] automatic lint removal system.
- While draining your machine may give several low thuds. Your machine is checking that the water has drained before spinning.
- Your *Smart Drive*[™] will beep at the end of the cycle and if you have used SPIN HOLD or SOAK.
- If your machine is beeping continuously or giving a musical series of beeps refer to page 31.

Automatic lint system

Your *Smart Drive*[™] has a self-cleaning lint system. It automatically separates the lint from the wash water, trapping the lint between the inner and outer bowls and flushes it out at the end of the wash.

- Full loads are more efficient than part loads.
- Use the ECO option (refer to page 14).
- Adjust the RINSE option on REGULAR and HEAVY DUTY cycles (EXCELLENCE model), and REGULAR, HEAVY DUTY and WOOL cycles (PRIDE model) to one deep rinse (refer to page 24).
- Adjust AUTO water level to fill with less water (EXCELLENCE model only, page 25).



Recycling the wash water

EXCELLENCE model only

Your *Smart Drive*™ also offers several ways of reusing the wash and rinse water.

- 1 Select SOAK on the first wash cycle.
- 2 Remove the clothes at the end of the wash phase and add the second load to the wash water.
- 3 Select the wash cycle for the second load. You may need to add extra detergent.
- 4 Remove the second load at the end of the cycle.
- 5 Replace the first load, select RINSE and complete the cycle.

Recycling the water from a deep rinse

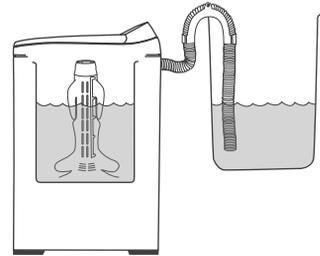
- 1 Select SPIN HOLD on the first wash cycle (Note: you cannot use the ECO option when recycling the water from a deep rinse).
- 2 Remove the clothes at the end of the rinse and add the second load to the rinse water.
- 3 Select the wash cycle for the second load.
- 4 Remove the second load at the end of the cycle.
- 5 Replace the first load and spin dry.

Manual suds save with syphon back

If you have a large tub near your washing machine and a separate drain outlet you can set up another method of reusing the water.

(The tub should hold a minimum of 100 litres or have an overflow).

- 1 Select SOAK on the first wash cycle.
- 2 At the end of the wash phase place the drain hose in the tub.
- 3 Cancel SOAK (press ADVANCE button). The suds water will be pumped into the tub. Do not leave your machine until pump out is completed.
- 4 Once your tub is filled return the drain hose to the drain. This must be done before the machine starts spinning.
- 5 Allow the machine to complete the rest of the cycle. Remove the first wash load and place the second load in the machine.
- 6 To syphon back the suds place the end of the drain hose in the tub, ensure that the end is near the bottom of the tub.
- 7 Advance to SPIN and allow the machine to pump for a few seconds to clear air from the drain hose, then press POWER to turn the machine off.
- 8 The suds water will syphon back into the machine. It will take several minutes to syphon back the water.
- 9 RETURN HOSE TO DRAIN.
- 10 Select second wash cycle.



Note: You will only be able to syphon back into the machine until the water level is equal to that in the tub.

Fig.33 Reusing water using syphon back method

The above method can also be used to recycle the water from a deep rinse. Select SPIN HOLD in place of SOAK.

Note: for any of the above methods, manually select the water level for the second wash load. AUTO water level may fill to a level too high for the clothes load if there is already water in the wash bowl.

Your *Smart Drive*™ is capable of diagnosing its own problems. If your *Smart Drive*™ gives a musical series of beeps every 5 seconds it is telling you that it has a problem which you can solve using the checklist below.

* The beeps are the same sound your washer makes when you turn it on at the wall.

Musical series of beeps* every 5 seconds and... possible solutions

HOT water temperature light is flashing.

Hot water supply is not hot enough to maintain the wash temperature you have selected. Select a lower wash temperature.

Inlet hose filters may be blocked.

There may be a kink in the hose.

Hot tap has not been turned on.

Inlet hoses are connected to the wrong taps.

COLD water temperature light is flashing.

Cold tap has not been turned on.

Inlet hose filters may be blocked.

There may be a kink in the hose.

Inlet hoses are connected to the wrong taps.

Cold water temperature exceeds recommended limits (see 'Installation instructions', page 4).

The flow rate of the supply water is too slow.

HOT and COLD water temperature lights are flashing.

The taps have not been turned on.

Inlet hose filters may be blocked.

The hoses may be kinked.

The drain hose is too low or the drain hose is pushed into the standpipe too far and the water is siphoning out of the machine (see 'Installations instructions', page 2).

The flow rate of the supply water is too slow.

HIGH water level light is flashing.

The machine is overloaded and can not agitate. Ensure the machine is stationary. Remove items until the remaining ones can move freely.

Select a higher water level.

The first RINSE progress light or SPIN progress light is flashing.

The machine has a suds build-up (too much detergent may have been used for the amount of soil in the load). Wait for suds to dissolve (about 20 min). Rinse clothes using a deep rinse.

32 If your *Smart Drive*™ beeps for help

LID LOCK light is flashing.

Make sure the lid is closed.

Press START/PAUSE (refer to page 10).

If the symptom persists call your Fisher & Paykel Dealer or Authorised Repairer.

First RINSE or SPIN progress light is flashing as well as the SPIN SPEED light.

Wash load is out of balance. Ensure the machine is stationary. Manually redistribute the load. Check the machine is level (refer to page 3).

Single beep every second and... possible solutions

Some lights are on but the pattern of lights is unfamiliar.

- 1 Turn your machine off at the wall,
- 2 Wait for 60 seconds and turn it back on.
- 3 Check the machine is level (refer to page 3).
- 4 Remove load and retry.
- 5 Put through a deep RINSE and SPIN.
- 6 If the fault re-occurs repeat Step 1.

If the machine still will not work call your Fisher & Paykel Dealer or Authorised Repairer to arrange service (refer to page 37).

Pressing POWER does not turn the machine on.

Is the power switched on at the wall?

Switch the power off at the wall and wait 60 seconds before turning the power on again.

Could your household power supply be at fault? Try plugging in another electrical appliance.

Pressing START/PAUSE does not start the fill.

Are both hot and cold taps turned on?

Are the inlet hose filters blocked?

Is DELAY START on?

Filling continuously.

Check that the machine is not syphoning (refer to page 2 in the 'Installation instructions').

Not spinning properly.

Is the load out of balance? Refer to pages 13, 16 and 26.

Check the machine is level and does not rock (refer page 3).

It may have suds build-up (refer to 'RINSE light or SPIN light flashing', page 31).

Spin speed sounds slower than it should.

The clothes are unevenly distributed in the bowl, your *Smart Drive*™ has compensated by lowering the spin speed.

Machine is continually going out of balance.

Check the machine is level and does not rock (refer to page 3).

Too much water for load (refer to page 13).

Too much or too little water when filling on AUTO water level.

It still may be in the AUTO water level mode (refer to page 13).

Some loads do not suit AUTO water level, eg pillows, bedding, large bulky garments.
Manually select the water level.

Auto fill needs adjusting (refer to pages 22, 23 and 25).

Noises.

Banging – load is out of balance (refer pages 13, 16 and 26).

Other noises – refer page 28.

Small puddle of water coming from under the machine.

The water level is too high for the amount of clothes. This has caused excessive splashing.
Use a lower water level (refer to page 13).

Large bulky, garments (eg pillows, duvets) can cause splashing. Wash on DELICATE cycle (PRIDE model) or HAND WASH cycle (EXCELLENCE model) (refer to page 16).

If the problem persists contact your Fisher & Paykel Dealer or Authorised Repairer (refer to page 37).

34 Wash problems

Listed below are possible causes and solutions to some common wash problems.

Creasing.

Overloading the washer or dryer.

Choose an EASY IRON or HAND WASH cycle (EXCELLENCE model), or a DELICATE cycle (PRIDE model) as these cycles have been designed to minimise creasing.

Try selecting a slower spin speed.

Do not leave wet clothes to sit in the washer or laundry basket.

Poor soil removal.

Warm wash water is too cold. Refer to 'Changing pre-set options', page 24.

Not enough detergent for load size or amount of soil.

White clothes are better washed separately. Separate light and heavily soiled items, as clothes can pick up soil from dirty wash water.

Cold water wash is too cold (refer to 'Controlled cold', page 25, EXCELLENCE model only).

Select the wash temperature according to soil type. For example, blood and mud are better washed in cold water, while oily soils wash better in warmer water.

Overloading the washer.

Loads made up of articles of varying sizes will wash better (eg full loads of sheets may not wash as well).

Hard water requires more detergent than soft water.

Linting.

Wash lint givers (eg towels, flannelette sheets) separately from lint collectors (eg synthetic fabrics).

Overloading the washer.

Not enough detergent to hold the lint in suspension.

Overdrying in a dryer can cause a build-up of static electricity in synthetic fabrics and cause them to attract lint.

Detergent residue.

Overloading the washer.

Try using less detergent.

Some detergents need to be pre-dissolved, check the detergent instructions.

Cold ambient temperatures, cold washes and/or short agitation times may not let the detergent dissolve properly. Try pre-dissolving the detergent.

Black or grey marks on clothes.

A build up caused by the interaction of fabric softener and detergent can flake off and mark clothes (refer to 'Scrud' page 21).

Insufficient detergent, for the amount of soil on the clothes, can result in grey marks on clothes (refer to 'Detergent' page 20).

Dye transfer.

Wash and dry non-colourfast clothes separately.

Non-colourfast clothes left sitting in a washer or laundry basket can transfer dye to other clothes.

Tangling.

Washing with too much water (ie underloading) can cause the clothes to tangle around one another.

Do not load the washer by wrapping clothes around the agitator.

Before you call for service or assistance...

Check the things you can do yourself.
Refer to your User Guide and check:



- 1 Your appliance is correctly installed.
- 2 You are familiar with its normal operation.
- 3 You have read the problem solving at the back of the book.

If after checking these points you still need assistance, please refer to your nearest Fisher & Paykel Authorised Repairer, or contact us through our local website listed on the back cover.

In New Zealand if you need assistance...*

Call your Fisher & Paykel retailer who is trained to provide information on your appliance, or if we can be of any further help, please contact our Customer Care Centre,

Toll Free: 0800 FP CARE or 0800 37 2273 **Fax:** (09) 273 0656

Email: customer.care@fp.co.nz

Postal address: PO Box 58732, Botany, Manukau 2163

If you need service...*

Fisher & Paykel has a network of independent Fisher & Paykel Authorised Repairers whose fully trained technicians can carry out any service necessary on your appliance. Your dealer or our Customer Care Centre can recommend a Fisher & Paykel Authorised Repairer in your area.

In Australia if you need assistance...*

Call the Fisher & Paykel Customer Care Centre and talk to one of our Customer Care Consultants.

Toll Free: 1 300 650 590

Fax: (07) 3826 9298

Email: customer.care@fp.com.au

Postal Address: PO Box 798, Cleveland QLD 4163

If you need service...*

Fisher & Paykel has a network of qualified Fisher & Paykel Authorised Repairers responsible for servicing only Fisher & Paykel branded appliances. Our Customer Care Centre can recommend a qualified Fisher & Paykel Authorised Repairer in your area.

*If you call, write or contact our website please provide: your name and address, model number, serial number, date of purchase and a complete description of the problem. This information is needed in order to better respond to your request for assistance.

Product details can be found on the top left hand side of the console or back panel of the washer cabinet.

Product details

Fisher & Paykel Appliances, Ltd

Model/Serial No.

Date of Purchase _____ **Purchaser** _____

Dealer _____ **Suburb** _____

Town _____ **Country** _____

www.fisherpaykel.co.nz
www.fisherpaykel.com.au

Fisher & Paykel

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The product specifications in this booklet apply to the specific products and models described at the date of issue. Under our policy of continuous product improvement, these specifications may change at any time. You should therefore check with your Dealer to ensure this booklet correctly describes the product currently available.

NZ AU PAC

F&P PN - 421384

09.2009

TECHNICAL DATA

Section B. Roller Blind Componentry



Features:

- ***RollEase® controllers - Glass reinforced nylon plastic conforming to Military Specification MIL M-24519***
- ***RollEase® Pin end sets - Glass reinforced nylon plastic conforming to Military Specification MIL M-24519***
- ***All metal brackets - Powder coated steel***
- ***Endless ball chain - ABS***
- ***Metal ball chain - Chrome plated steel***
- ***Winhouse 60mm Ultra Power***
 - ***Nylon with 20% glass fibre for strength***

Technical Data is updated regularly, please visit our website to download the latest information

Window Treatments COMPONENTRY

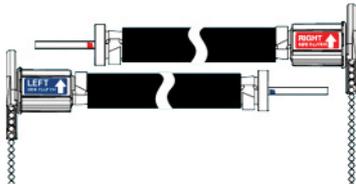
Architectural Specifications:

Skyline - SL20 (50mm tube)



Assisted lift system:

- multi weights of lift
- two pull directions

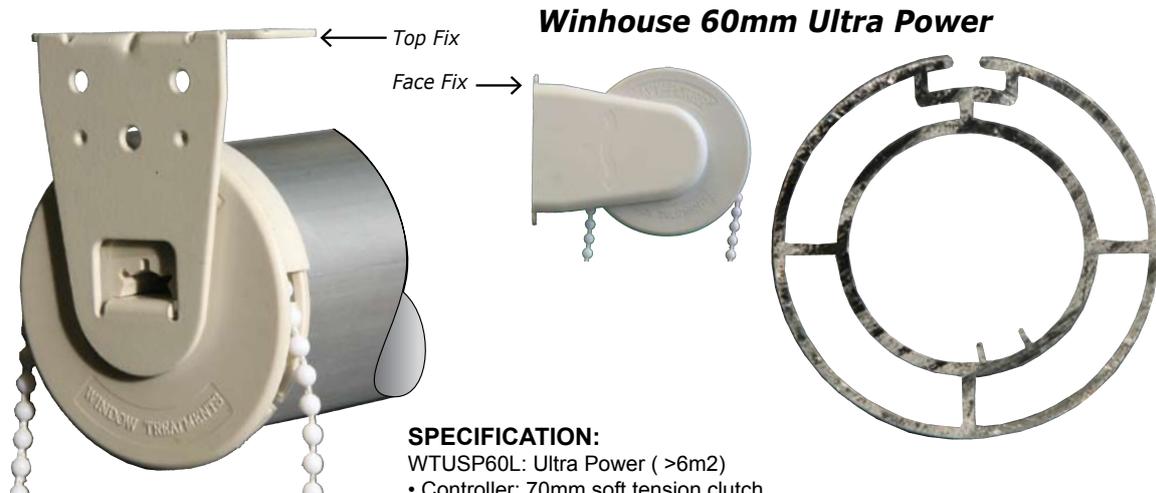


Multi Blind Universal Bracket



Features:

- No special brackets or end plugs required.
- Reduces pull force on heavy shades to approximately 2, 7kg, even on shades weighing up to 13.5Kg.
- Value priced alternative to motorization.
- Sleeved spring provides smooth and quiet operation



Winhouse 60mm Ultra Power

SPECIFICATION:

- WTUSP60L: Ultra Power (>6m²)
- Controller: 70mm soft tension clutch.
- Tube: 60mm, 4 spoke, twin wall inner tube, anti flex aluminium profile 606T3X. 3kg per one linear metre.
- Ultra Power Lift square pin end with adjustable tension lift proportional to drop multi link option up to 10kg.

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www.window-treatments.co.nz

Sec.B.-3
09.2010

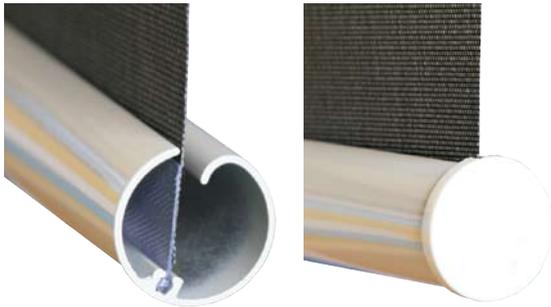
Window Treatments COMPONENTRY

Architectural Specifications:

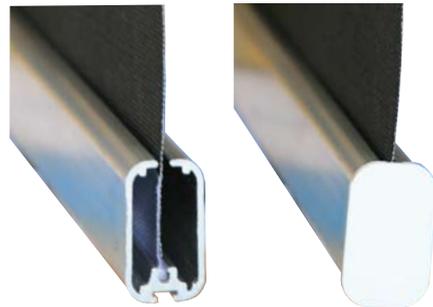
Bottom Rails and End Caps

Bottom Rail profiles:

- 27mm diameter cylindrical and, 27mm x 16mm rectangular aluminium profiles.
- Flush front fabric entry and protrusion free.
- Both shapes utilise the unique fabric fastening system.
- 8 colours available: White, Ivory, Chinchilla, Bronze, Anodised, Pearl, Anthracite, Black or a custom colour as required.
- Bottom rail friction fit End Caps are oversized (larger diameter) to the bottom rails providing an impact buffer between the aluminium rail and the window sill. End cap colours are: Black, White, Ivory, Grey and Clear



Cylindrical Bottom Rail - without and with end cap

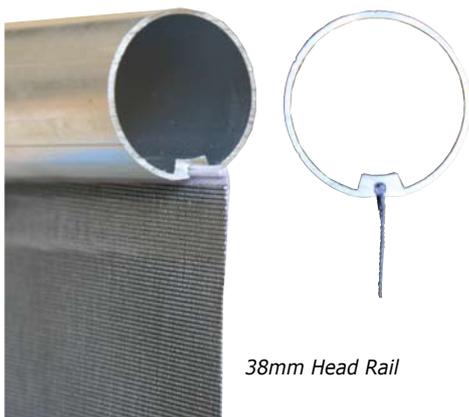


Rectangular Bottom Rail - without and with end cap

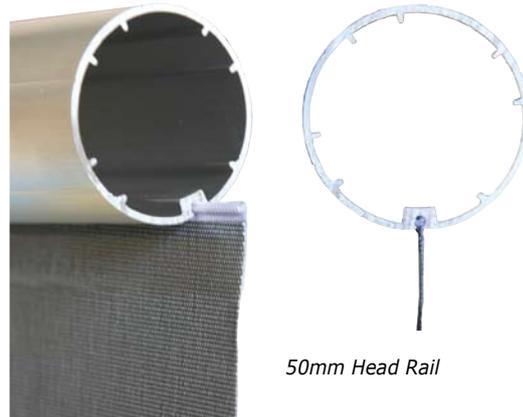
Unique Welding System

Fabric Fastening System:

Window Treatments has developed a unique method of attaching the fabric of a roller blind to the head rail and bottom rail. The new exclusive system uses a high impulse electric welding machine to weld the spline onto the fabric which is then guided into the rails through a specially formed groove.



38mm Head Rail



50mm Head Rail



Cylindrical bottom rail showing welded spline

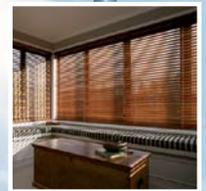
Technical Data is updated regularly, please visit our website to download the latest information

www.window-treatments.co.nz

Stylish Blinds, Shutters and Awnings

Section A. Roller Blind Fabrics

- SUNSCREEN • LIGHT FILTERING • BLOCK OUT •



Technical Data is updated regularly, please visit our website to download the latest information



M-SCREEN 8505

MERMET 

M-Screen 8505

PRODUCT FEATURES

- 35 colours and up to 4 widths: 155, 200, 250 & 310cm
- stylish range of colours
- half basket weave: excellent thermal & visual comfort, optimal transparency
- economical: 4 widths to reduce waste when making fabric panels
- excellent printing medium
- human & ecologically-friendly fabric
- intelligent fabric for internal applications



ROLLER
BLINDS



ROMAN
SHADES



DECORATIVE
PANELS



VERTICAL
BLINDS



VELUMS



SKYLIGHT
BLINDS



ROOF LIGHT
BLINDS



FLAT
STRUCTURES



SHAPED
STRUCTURES



VOLUME
STRUCTURES

www.mermet.com.au

Technical Data is updated regularly, please visit our website to download the latest information

TECHNICAL DATA

M-Screen 8505

TECHNICAL DATA

COMPOSITION	36% Fibreglass 64% PVC	
FIRE CLASSIFICATION	M1 (F) BS (GB) FR (USA) AS (AUS) C UNO (IT) B1 (CN)	NFP 92 503 476 Pt 6 Class 0 NFPA 701 - 99 TM #1 California US Title 19 AWTA Tested AS 1530 part 2 and 3 * UNI 9177 GB 50222-95
OPENNESS FACTOR	Average 5%	
UV BLOCKAGE	Between 90 & 96%	
WIDTHS	155-200-250-310cm (depending on colour)	
PATTERN	Basket weave 1 x 2	
YARN COUNT	Warp Weft	22 yarns/cm ± 5% 20 yarns/cm ± 5% ISO 7211/2
WEIGHT PER M ²	410g ± 5% ISO 2286 - 2	
THICKNESS	0.55mm ± 5% ISO 2286 - 3	
BREAKING STRENGTH	Warp Weft	> 150 daN/5cm > 150 daN/5cm ISO 1421
ELONGATION TO BREAK POINT	Warp & Weft	< 5% ISO 1421
TEAR RESISTANCE	Warp & Weft	6 ≥ 10 daN Internal procedure
RESISTANCE TO FOLD	Warp & Weft	≥ 20 daN/5cm Internal procedure
COLOUR FASTNESS TO LIGHT	7/8 Scale of 8	ISO 105 B02 White not graded
MARKING	Digital printing / Screen printing Transfer / Paint / Adhesive	
MAKING-UP	Welding (thermal, high frequency, ultrasonic) or sewing	

M-SCREEN PRODUCT INFORMATION

M-SCREEN 8505 OFFERS UNLIMITED CHOICE FOR A COLOURFUL ENVIRONMENT IN HARMONY WITH THE OUTSIDE

A true element of internal design

35 colours in the range including pastel, neutral, earthy and darks. M-Screen 8505 offers a rich palette of colours, effects of texture and infinite printing possibilities to create a custom atmosphere, organise space, play on light...

Maximum transparency

The secret lies in the uniform coating of the fibreglass yarns, the fineness of the yarn and the regularity of the basket weave, all of which offers a very clear view to the outside.

Optimised natural light

M-Screen 8505 provides all the benefits of natural light and prevents glare. Advantage: high level of comfort with no reflection on TV and computer screens. Glare is best controlled with dark colours. M-Screen 8505 blocks out up to 96% of the UV rays, the cause of fading of floors and furniture.

Thermal comfort

M-Screen 8505 reflects up to 86% of solar radiation. It prevents heat loss, helps to save energy and reduces greenhouse gas emissions.

A great communication medium

Whatever printing technique is used, legibility is perfect, even in artificial light.

Strength and peace of mind guaranteed

Made of coated fibreglass yarns, M-Screen 8505 has excellent mechanical resistance allowing it to be tensioned, and perfect dimensional stability in panels of all sizes. M-Screen 8505 is unaffected by the heat. Labeled Dekotex Standard 100, it contains no chemicals harmful to the health and safety of users. It is non-flammable and easy to maintain.

CARE INSTRUCTIONS

Remove dust with vacuum cleaner or compressed air. Do not scrub.
Do not use solvents or any abrasive substance that might damage the coating of the fabric.
Clean with a sponge or soft brush dipped in soapy water.
Rinse with clear water.
Leave the blind down until completely dry.

* Complies with the General Requirements of the Building Code of Australia for Fire Hazard Properties of materials in buildings. Not suitable for use in parts of buildings with Special Requirements, i.e. fire isolated exits; public corridors leading to a fire isolated stairway, passageway or ramp; a patient care area of health care buildings; and in a public assembly building (eg. theatre or hall) not protected with a sprinkler system.
* Available for download at mermet.com.au

MERMET AUSTRALIA PTY LTD www.mermet.com.au
67 Frankston Gardens Drive enquiries@mermet.com.au
Carrum Downs, VIC 3201 www.sunscreen-mermet.com
Mail to: PO Box 2063 Telephone +61 3 9770 3888
Carrum Downs, VIC 3201 Facsimile +61 3 9770 3811



for more detailed ecological and/or health information on this product refer to www.ecospecifier.org



The data in this document is for information only & may not be considered binding

Technical Data is updated regularly, please visit our website to download the latest information

www.window-treatments.co.nz

M-SCREEN 8505 - Thermal & Optical Properties

M-Screen 8505

THERMAL & OPTICAL PROPERTIES (ASHRAE 74-73)

COMFORT FACTORS

Average Openness Factor of 5%

COLOURS	Fabric			Fabric & glazing		Tv	modulight® rapid selection 40			
	Ts	Rs	As	1/4" Cl	1/4" H.A.		NL	EC	HP	CV
				Sc internal blind						
0205 White Canary	25	56	19	0.42	0.37	17	21	14	25	21
0705 Pearl Canary	19	41	40	0.50	0.41	14	18	21	21	22
0791 Pearl Parrot	17	38	45	0.52	0.41	13	18	22	19	22
0709 Pearl Mandarin	18	38	44	0.52	0.42	9	17	22	19	22
0703 Pearl Turquoise	13	32	55	0.54	0.43	9	16	22	19	22
0241 White Ultramarine	9	37	54	0.50	0.41	10	18	22	20	22
2041 Linen Ultramarine	12	27	61	0.57	0.44	9	16	23	17	23
0207 White Pearl	16	49	35	0.44	0.38	12	20	20	23	22
0720 Pearl Linen	19	40	41	0.51	0.41	13	18	22	19	22
0707 Pearl	15	35	50	0.53	0.42	11	16	22	19	22
0721 Pearl Lotus	18	40	42	0.51	0.41	13	18	22	19	22
0710 Pearl Sable	18	33	49	0.55	0.43	11	16	22	19	23
0771 Pearl Apricot	22	38	40	0.53	0.42	13	17	22	19	22
0210 White Sable	20	48	32	0.46	0.39	12	20	20	23	22
2020 Linen	18	51	31	0.44	0.37	12	19	20	23	22
2022 Linen Stone	23	48	29	0.47	0.39	15	20	20	23	22
0222 White Stone	22	56	22	0.41	0.36	15	21	14	25	21
0220 White Linen	21	56	23	0.41	0.36	15	21	14	25	21
0221 White Lotus	24	54	22	0.43	0.37	18	21	14	25	21
0202 White	20	63	17	0.36	0.33	15	21	14	26	20
0201 White Grey	11	43	46	0.47	0.39	11	19	21	21	22
0121 Grey Lotus	14	26	60	0.58	0.45	11	16	22	19	23
3021 Charcoal Lotus	10	15	75	0.64	0.48	10	16	23	17	23
0151 Grey Huntergreen	8	16	76	0.63	0.47	7	15	23	15	24
0141 Grey Ultramarine	8	15	77	0.64	0.48	7	15	23	15	24
3001 Charcoal Grey	6	10	84	0.66	0.49	7	14	25	12	25
3051 Charcoal Huntergreen	8	7	85	0.69	0.50	9	14	25	12	25
3041 Charcoal Ultramarine	8	6	86	0.69	0.51	9	14	25	12	25
3030 Charcoal	6	5	89	0.69	0.51	7	14	25	12	25
3006 Charcoal Bronze	6	7	87	0.68	0.50	7	14	25	12	25
3010 Charcoal Sable	7	12	81	0.65	0.49	7	15	24	15	24
3071 Charcoal Apricot	7	13	80	0.65	0.48	7	14	24	15	24
3009 Charcoal Mandarin	7	13	80	0.65	0.48	5	14	24	14	24
3081 Charcoal Parrot	6	13	81	0.65	0.48	6	15	24	15	24
3091 Charcoal Sky	6	12	82	0.65	0.48	6	15	24	15	24



Photo credits: Dimensions Display 2005 (inset, top);
Bernard Bühler - Arnaud de Saint Germes - Dynastore
(inset, bottom)

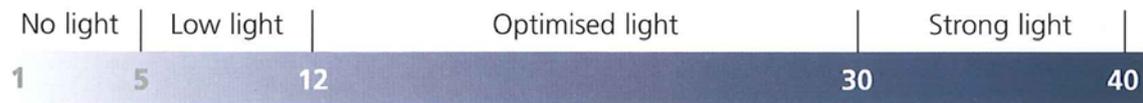
1/4" Cl: clear 1/4" glazing.
1/4" H.A.: heat absorbing 1/4" (6mm) glazing.
Samples tested by the ASHRAE 74-73 standard "Method of measuring solar-optical properties of materials".

Technical Data is updated regularly, please visit our website to download the latest information

RAPID SELECTION GUIDE

Rapid Selection Guide

NL natural light LEVEL OF INCOMING LIGHT



Tip : for the same type of fabric, light colours let through more light than dark colours.

EC eye comfort GLARE CONTROL



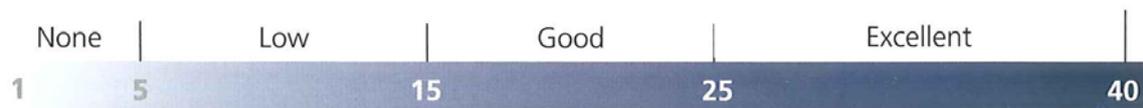
Tip : for the same type of fabric, dark colours provide better glare control.

HP heat protection IMPROVED THERMAL CONTROL



Tip : outside screens provide better thermal control than indoor screens.

CV contrast vision QUALITY OF THE VIEW TO THE OUTSIDE



Tip : the quality of visibility does not only depend on the openness or light transmission, it also depends on colour. Darker colours will provide better outward visibility.

Technical Data is updated regularly, please visit our website to download the latest information

M-SCREEN 8505 - Ecospecifier Certificate



Product Assessment Certificate

This is to confirm that the following products have been assessed and met the criteria for inclusion on ecospecifier.org. In addition, a GreenRate Green Building Scheme Pre-Assessment has been conducted and found these products are likely to contribute to the achievement of Green Building rating tool credits.

COMPANY **Mermet Australia Pty Ltd**
PRODUCTS **Intelligent Fabrics – E-Screen, T-Screen, M-Screen,
Satiné & Natte´**
VALID TO **27/06/2011**
REF NO. **0705529AU**

ecospecifier's role is:

- ✓ To provide a third party, independent and unbiased assessment of information provided by manufacturers and other sources.
- ✓ To assess products using known Australian and International Standards, independent test data, third party research and expert opinion.
- ✓ To determine if products are eco and health preferable based on the premise that:
 - they exhibit one or more eco or health preferable characteristic compared to other products in their category; or
 - they are a member of a product category that is in itself an eco or health preferred category; and
 - they do not contain 'significant' ecological or health damaging content.
- ✓ To ensure that products meet ecospecifier's assessment methodology.

Certified by ecospecifier Pty Ltd per

David Baggs | Technical Director & Principal Consultant
Chartered Architect, FAIA, ABSA, Green Star AP, LEED AP, MRoySocAS

www.ecospecifier.org

This assessment is current only to the valid date and shall not be reproduced in part at any time. Please refer to the [ecospecifier website](http://ecospecifier.org) for current detailed product listing information. © Ecospecifier 2009

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MERMET Oeko-Tex Certificate

CERTIFICATE

HOHENSTEIN

Hohenstein Textile Testing Institute
GmbH & Co. KG

Schloss Hohenstein · 74357 Boennigheim · GERMANY

Institute of the International Association for Research and Testing in the Field of Textile Ecology

The company

3G Mermet

5970 N. Main St.

Cowpens, SC 29330, USA

is granted authorization according to Oeko-Tex® Standard 100 to use the Oeko-Tex® mark, based on our test report 10.0.75602



Tested for harmful substances
according to Oeko-Tex® Standard 100

08.HUS.63264

Hohenstein

for the following articles:

Woven fabrics made of fiberglass, coated with PVC mass dyed in different colours, for window coverings and decorative applications.

The results of the inspection made according to Oeko-Tex® Standard 100, product class IV have shown that the above mentioned goods meet the human-ecological requirements of the standard presently established for decoration material and mattresses.

The certified articles fulfil the requirements of Annex XVII of REACH (incl. the use of azo-dyes, nickel, etc.) as well as the American requirement regarding total content of lead in children's articles (CPSIA; with the exception of accessories made from glass).

The holder of the certificate, who has issued a conformity declaration according to ISO 17050-1, is under an obligation to use the Oeko-Tex® mark only in conjunction with products that conform with the sample initially tested.

This authorisation is valid until 31.12.2010

Boennigheim, 25.06.2010



Prof. Dr. Stefan Mecheels
Managing Director

Dipl.-Ing. (FH) Elisabeth Weishert
Head of Test Centre

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www.window-treatments.co.nz

Sec.A.- 7
07.2010

M-SCREEN 8505 - Greenguard Certificate

GREENGUARD



Mermet Group

M-Screen

This product has been GREENGUARD Indoor Air Quality Certified® by the GREENGUARD Environmental Institute under the GREENGUARD Standard for Low Emitting Products.

Certification Details:

Certification No:	90027-6
Certification Status:	Certified
Certification Period(s):	01/2008- 11/2010
Certification Restrictions:	NONE

GREENGUARD Indoor Air Quality Standard for Low Emitting Products

GREENGUARD Indoor Air Quality Certified Products meet the following minimum emission requirements:

Category: Window Treatments

Emission Types	Measure
Individual VOCs	< 01. TLV
Formaldehyde	< 0.05 ppm (< 0.06 mg/m ³)
Styrene	< 0.07 mg/m ³
Total VOCs	< 0.5 mg/m ³
Total aldehydes	< 0.1 ppm

Listing of measured carcinogens and reproductive toxins as identified by California Proposition 65, the U.S. National Toxicology Program (NTP), and the International Agency on Research on Cancer (IARC) must be provided.

Any pollutant not listed must produce an air concentration level no greater than 1/10 the Threshold Limit Value (TLV) industrial work place standard (Reference: American Conference of Government Industrial Hygienists, 6500 Glenway, Building D-7, Cincinnati, Ohio 45211-4438).

Any pollutant regulated as a primary or secondary outdoor air pollutant must meet a concentration that will not generate an air concentration greater than that promulgated by the National Ambient Air Quality Standard (U.S. EPA, code of Federal Regulations, Title 40, Part 50).

For further product details, visit the product listing at www.greenguard.org. If you have any questions, contact the GREENGUARD Environmental Institute at 1.800.427.9681.

© 2008 GREENGUARD Environmental Institute

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M-SCREEN 8505 AWTA Flammability Certificate

AWTA PRODUCT TESTING

Australian Wool Testing Authority Ltd - trading as AWTA Product Testing
A.B.N. 43 006 014 106

1st Floor, 191 Racecourse Road, Flemington, Victoria 3031
P.O. Box 240, North Melbourne, Victoria 3051
Phone (03) 9371 2400 Fax (03) 9371 2499

TEST REPORT

CLIENT : MERMET AUSTRALIA PTY LTD
67 FRANKSTON GARDENS DRIVE
CARRUM DOWNS VIC 3201

TEST NUMBER : 7-569798-BV
ISSUE DATE : 13/11/2009
PRINT DATE : 27/11/2009

SAMPLE DESCRIPTION Clients Ref: "M-Screen 8505"
Coated woven basket weave 1x2 fabric Colour: White
Nominal composition: 36% Fibreglass 64% PVC
Nominal mass: 410g/m2 Nominal thickness: 0.55mm
End Use: Transparent fabric for Roller blinds, Roman blinds
and Panel Glides

AS 1530.2-1993 Test for Flammability of Materials

DATE TESTED: 12/11/2009
Flammability Index: 0 Range 0 - 100 for most material

	Length	Width	
Spread Factor: Range 0 - 40	0	0	
Heat Factor: Range 0 - upward	1	1	
Maximum height (d) mean	3.0	2.7	
cv	22.0	19.4	%
Time (t) mean	N/A	N/A	s
cv	N/A	N/A	%
Heat (a) mean	1.4	1.4	degC min
cv	11.5	14.4	%
No of specimens tested	9	6	

These test results relate only to the behaviour of the test specimens of the material under the particular conditions of the test, and they are not intended to be the sole criterion for assessing the potential fire hazard of the material in use

178371 1

(END OF REPORT)

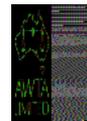
PAGE 1

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This Laboratory is accredited by the National Association of Testing Authorities, Australia, for:
-Chemical Testing of Textiles & Related Products : Accreditation No. 983
-Mechanical Testing of Textiles & Related Products : Accreditation No. 985
-Heat & Temperature Measurement : Accreditation No. 1356

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APPROVED SIGNATORY

MICHAEL A. JACKSON B.Sc (Hons)
MANAGING DIRECTOR

0204/11/06

Technical Data is updated regularly, please visit our website to download the latest information

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Sec.A.-9
07.2010

M-SCREEN 8505 - Emission Test Certificate



Consulting Enterprises in Technology

SCIENTIFIC CONSULTANTS IN RISK ASSESSMENT AND MANAGEMENT, PRODUCTS, PROCESSES, OH&S, ENVIRONMENT

Emission Test Certificate

Monday December 3rd, 2007

Supplier: Mermet Australia Pty Ltd

PO Box 2063

Carrum Downs Victoria 3201

Sample Description: M-Screen

Date Tested: November 2007

Test Method: ASTM D5116-97 "Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Material/Products".

Emission Data:

M-SCREEN

Total Volatile Organic Compound Emission Rate: 0.25 mg/m²/hr (7 days)

When this product is used in the typical manner in an office building the resulting airborne total volatile organic compound concentration can be expected to be less than 0.5 mg/m³ as specified by Green Building Council of Australia Green Star Office Interiors IEQ-11.

Dr. Vyt Garnys
PhD, BSc(Hons) AIMM, ARACI, ISIAQ
ACA, AIRAH, FMA
Managing Director and Principal Consultant

Project CV071012

Cetec Pty Ltd
ABN 44 006 873 687

2/27 Normanby Road,
Clayton North, Victoria 3168
AUSTRALIA

Telephone: (03) 9544 9111
Facsimile: (03) 9544 9122
International: (+613)

Email: info@cetec-foray.com.au
www.cetec-foray.com.au

Technical Data is updated regularly, please visit our website to download the latest information

www.window-treatments.co.nz

MERMET FABRIC WARRANTY



MERMET 

5 YEAR FABRIC WARRANTY

We are pleased to confirm that Mermet Australia Pty Ltd conditionally guarantees to **the blind maker** its internal and external range of solar control fabrics for a period of 5 years under normal conditions of use and treatment according to our technical specification combined with regular maintenance as per our care instructions.

Mermet shall not be liable for any injury, loss or damage, arising directly or indirectly out of the use of, or the inability to use the fabrics with an unsuitable blind system, improper fabric preparation or installation of hardware.

Before using internal Sunscreen fabrics, **the blind maker** shall determine the suitability of the product for its intended use and the consumer assumes all risks & liability in connection herewith.

The 5 year warranty applies only to the following properties from the date of purchase of the fabric by **the blind maker**:

- * Moisture resistance
- * Fire classification
- * Embossing, shrinking, rust, deformation
- * Uniform fading of colours under ultraviolet ray effect

All colours of Mermet fabrics are guaranteed 7/8 according to the NFG 07012 Norm which is used in France to determine the resistances to light. The colour white is not guaranteed for colourfastness.

Should the fabric not meet the above stated specifications, Mermet will replace the fabric involved. All consumer claims must be made to the original supplier of the blinds and replacement will only be made after inspection* and approval by Mermet.

*Inspection to be either at the blindmaker's premises or by return of the fabric to Mermet Australia. This document supersedes all previous documents

Mermet Australia Pty Ltd.
June 2005

www.mermet.com.au
www.sunscreen-mermet.com

ENVIROSHADE & ENVIROSHADE ALUMINIUM

Enduring Environmental & Solar Protection

Enviroshade is a Trevira-CS (PVC free) window shading fabric allowing natural control of light, heat and glare, with a view. Meticulously tested to meet international standards for green and fire retardant fabrics. Enviroshade is energy efficient and cuts down on greenhouse emissions.

This European designed and manufactured range performs beautifully in both home and office spaces and is guaranteed for 5 years.



enviroshade

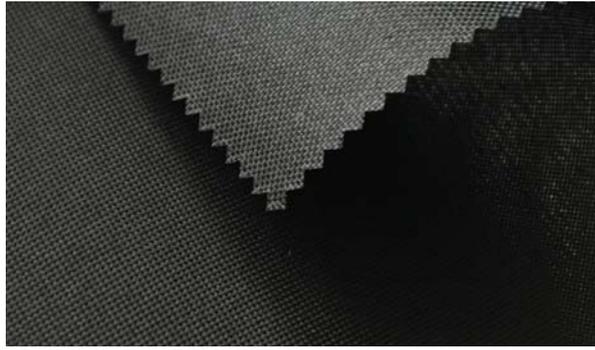
Technical Data is updated regularly, please visit our website to download the latest information

TECHNICAL DATA



Enviroshade is a 100% Trevira CS Fabric
 Permanently flame retardant
 Light and glare reduction
 UV Ray reduction
 Available in 5 colours

-Enviroshade



-Enviroshade Aluminium



technical data

	Enviroshade	Enviroshade Aluminium
Width	2,400mm	2,400mm
Fibre	100% Trevira CS	100% Trevira CS
Back Coating	-	Aluminium
Weight	155gsm approx	155gsm approx
Thickness	0.42mm approx	0.42mm approx
Light Fastness ISO 105-B02	≥ 5 - 6	≥ 7
Rubbing DIN ISO105-X12	≥ 4	≥ 3
Moisture Shrinkage % DIN 53892 B2	warp < 0.5 weft < 0.5	warp < 0.5 weft < 0.5
Care Instructions	Vacuum, Do not wash or dry clean Spongeable with damp cloth & mild detergent	Vacuum, Do not wash or dry clean Spongeable with damp cloth & mild detergent

solar properties

Enviroshade							SC	SC	SC
Colour	Ts	Rs	As	Tuv	Tv	OF	3mmCL	6mmCL	6mmHA
Icon	24	38	38	7	8	5	0.55	0.53	0.42
Arctic	46	50	4	18	38	6	0.52	0.51	0.41
Raven	21	34	45	6	7	4	0.57	0.55	0.43
Shimmer	28	40	34	9	11	5	0.54	0.52	0.42
Bronze Pearl	30	46	24	12	17	5	0.51	0.50	0.41
Enviroshade Aluminium							SC	SC	SC
Colour	Ts	Rs	As	Tuv	Tv	OF	3mmCL	6mmCL	6mmHA
Icon Alu.	8	42	50	6	7	4	0.48	0.47	0.39
Raven Alu.	7	42	51	5	7	4	0.48	0.47	0.39
Shimmer Alu.	8	43	49	6	7	5	0.48	0.46	0.39
Bronze Pearl Alu.	9	42	49	6	8	4	0.49	0.47	0.39
Arctic									



flame retardant



ecospecifier
 Product of New Zealand

Technical Data is updated regularly, please visit our website to download the latest information

www.window-treatments.co.nz

POLYESTER SCREEN

Window Treatments NZ Ltd
- Exclusive Distributor of

Polyester Screen

PRODUCT FEATURES

- 5% openness
- basket weave
 - clear view
 - stylish colours
 - economical widths
 - optimal transparency

- 3% openness
- twill weave
 - clear view
 - stylish colours
 - economical widths
 - enhanced glare control



Technical Data is updated regularly, please visit our website to download the latest information

TECHNICAL DATA

Polyester Screen

TECHNICAL DATA

COLOURS

Description Ts Rs As Tv O-F 1/8" Cl. 1/4" Cl. 1/4" H.A.

Polyester 5% - Flammability Index 4

Arch White	2001	22	67	11	19	6	0.34	0.34	0.32
Linen Sand	2002	23	54	23	20	9	0.44	0.43	0.37
Rock Grey	2005	16	43	41	15	8	0.50	0.48	0.40
Bronze	2211	11	8	81	13	9	0.72	0.69	0.50
Graphite	2212	8	11	81	9	6	0.70	0.66	0.49
Charcoal	2213	7	4	89	8	6	0.74	0.70	0.51

Polyester Screen 5%



Polyester 3% - Flammability Index 4

Chalk	5401	21	68	11	17	4	0.33	0.33	0.32
Chestnut	(LS) 5402	19	60	21	15	4	0.38	0.38	0.34
	(DS)	19	52	29	15	4	0.44	0.43	0.37
Mineral Brown	(LS) 5411	7	47	46	7	3	0.45	0.44	0.37
	(DS)	7	16	77	7	3	0.66	0.63	0.47
Grey Hammertone	(LS) 5412	7	51	42	6	3	0.42	0.41	0.36
	(DS)	7	22	71	6	3	0.62	0.59	0.45
Graphite	(LS) 5413	9	45	46	9	5	0.47	0.45	0.38
	(DS)	9	13	78	9	5	0.69	0.65	0.49

Polyester Screen 3%



Colours shown above are indicative only

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Technical Data is updated regularly, please visit our website to download the latest information

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Sec.A.-19
11.2010

LIGHT FILTERING



Light Filtering

PRODUCT FEATURES

- 100% polyester with acrylic coating
- eco friendly
- light filtering
- economical fabric widths
- colour coordinated for use with double rollers

Technical Data is updated regularly, please visit our website to download the latest information

TECHNICAL DATA

Light Filtering

TECHNICAL DATA

CHI Light Filtering Roller Blind Fabric

Yarn	100% Polyester
Weave	Jacquard
Construction	Warp: 40 / cm Weft: 14 / cm
Coating	Acrylic
Nominal Mass	190gsm
Thickness	0.28 mm
Colour Fastness to light	5 Min
Dimensional Change	-0.7% Max

Cleaning Instructions:

Fabric should be regularly dusted/vacuumed as appropriate. If commercial spot cleaners are used, they must first be tested and allowed to dry on an inconspicuous area, to ensure compatibility.



eggshell



pepper



brushwood

*Colours shown above
are indicative only*

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Technical Data is updated regularly, please visit our website to download the latest information

www.window-treatments.co.nz

Sec.A.-23
07.2010

BLOCK OUT



Blockout

PRODUCT FEATURES

- PVC free (matilda, plantation, urbanshade, palm beach, chi, alluvial, pearl essence)
- 100% block out
- excellent privacy
- eco friendly
- stylish colours & textures

Technical Data is updated regularly, please visit our website to download the latest information

TECHNICAL DATA

Blockout



TECHNICAL DATA

Product Range	Yarn	Weave	Construction		Width	Weight	Coating	Colour	Fire Retardent
			Warp	Weft	(mm)	(gsm)		Fastness	Test Report Avail
CHI Blockout	100% Polyester	Jacquard	40	/ 14	2350	340	Foamed Acrylic	5 Min	n/a
Palm Beach	70/30 spun Poly/Cotton	Dehrsuti	32	/ 11	2400	470	Foamed Acrylic	5 Min	n/a
Urban Shade	100% Polyester	Plain weave	22	/ 10	2400	410	Foamed Acrylic	5 Min	Yes
Pearl Essence	Texturised C.F. Polyester	Plain Weave	19	/ 16	2400	360	Pigmented Acrylic	6 Min	Yes
Alluvial	Texturised C.F. Polyester	Plain Weave	19	/ 16	2400	360	Pigmented Acrylic	6 Min	Yes
Matilda	Texturised C.F. Polyester	Plain Weave	19	/ 16	2400	300	Pigmented Acrylic	6 Min	Yes
Plantation	Texturised C.F. Polyester	Plain Weave	19	/ 16	2400	300	Pigmented Acrylic	6 Min	Yes
Mercury	80% Polyester/ 20% Cationic Polyester	3x1 Broken Twill	47	/ 21	2440	340	Teflon	7 Min	Yes

www.window-treatments.co.nz

Technical Data is updated regularly, please visit our website to download the latest information

www.window-treatments.co.nz

Sec.A.-25
07.2010

REFLEX™ ROLL SKYLIGHT

→ INTRODUCTION

> To answer the growing demand for a product to deliver the ultimate in solar protection and light control for ceiling, skylights or angled applications, **REFLEX™** has developed the **REFLEX™ SKYLIGHT** range of skylight cassette roller blinds in two sizes and a great variety of options to adapt to the demands of both external solar protection applications and internal “blackout” style audio visual quality light control applications.

APPLICATION

> The popular applications for this system are two fold. Firstly, integration into building facades for the ultimate control of heat and glare by protecting the glass from the outside against solar extremes, together with fully automatic controls, will deliver a complete solar control system. The cassette would ideally be installed close to the glazing and with the inclusion of aluminium side guides, and the incorporation of sun, wind and timing controls, this system will exceed all expectations for aesthetics and solar control.

Secondly, the system can be integrated into the lighting control system for internal applications such as meeting rooms, theatres, laboratories and other areas requiring complete darkening.

SPECIFICATIONS

> The most appealing feature of the **REFLEX™ SKYLIGHT** system is the range of options. The **REFLEX™ SKYLIGHT** system has options of three or four sided roller coverage (when the back of the roller will be visible) and a versatile, nylon plate mounting system allowing face, top or side fixing. The incorporation of side guiding systems utilising one of the powder coated, aluminium side guide channels - (40 x 25 mm plain for external applications or 40 x 25 mm light sealing guides for internal applications) may be necessary.

The **REFLEX™** skylight blind is intended for use in applications calling for horizontal operation where both ends of the blind have rollers within cassettes, with the inclusion of a spring tension system in the second housing, to create a full tension system for the fabric element.

All covers are powder coated or anodised 1.6 mm aluminium and the rollers are 60 mm (**RS8**) & 80 mm (**RS10**) and are all natural anodised for strength and durability.

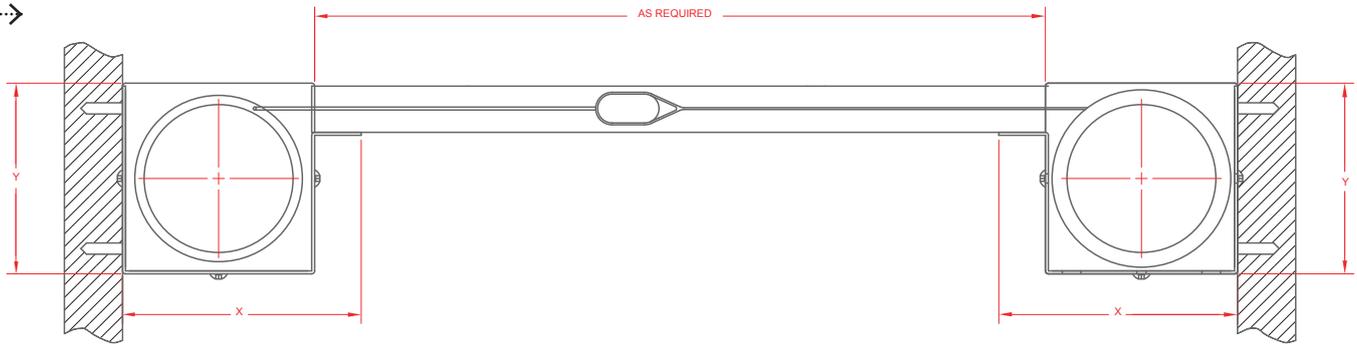
All internal and external components are completely weather proof being aluminium, nylon or stainless steel.

The system can support the many screen, solid or sheer fabric elements currently available in the market remembering that the skylight series should only use those fabrics with a suitable mechanical strength to withstand the tension loads.

The side guide channels can also be employed to allow blinds to be installed in sloping glass wall situations.

Minimum width	=	350 mm
Maximum width	=	3,000 mm
Minimum drop	=	500 mm
Maximum drop	=	3,000 mm

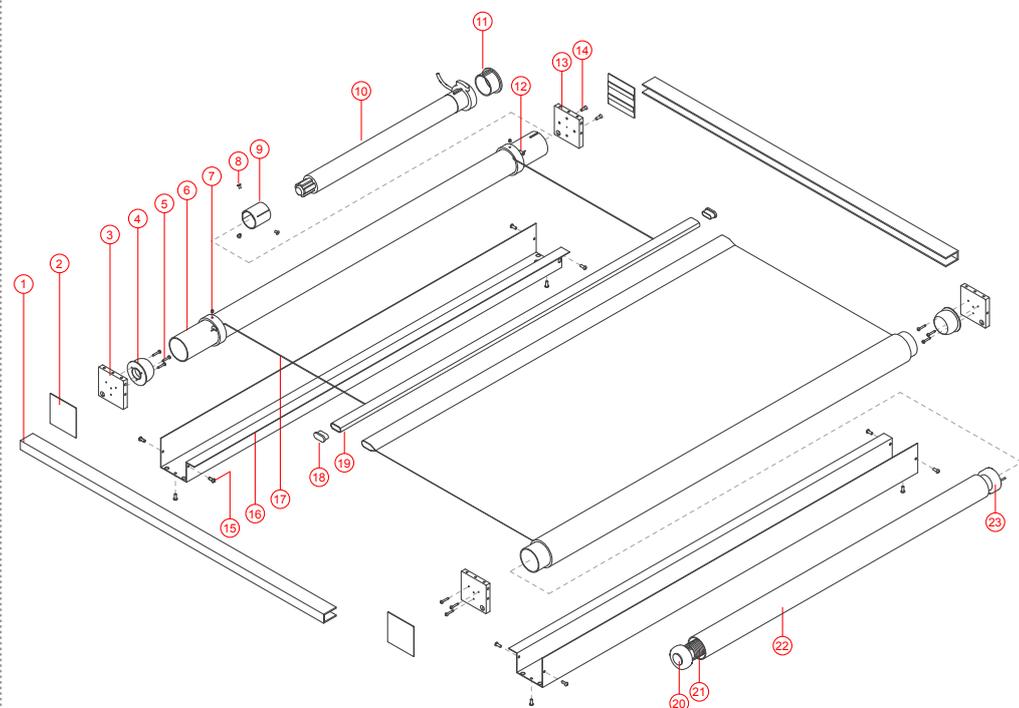
REFLEX™ ROLL SKYLIGHT



	RS8	RS10
X =	109	129
Y =	82	102

RECESS FIXING ARRANGEMENT

REFLEX™ ROLL SKYLIGHT EXPLODED



ITEM	DESCRIPTION
1.	SKYLIGHT SIDE GUIDE
2.	END COVER PLATE
3.	END PLATE - TAIL
4.	BEARING
5.	BEARING SCREW
6.	ROLLER TUBE
7.	CORD RING
8.	RIVET
9.	MOTOR WHEEL
10.	MOTOR
11.	MOTOR CROWN
12.	SCREW-ON SWAGE
13.	END PLATE - MOTOR
14.	MOTOR FIXING SCREW
15.	COVER MOUNT SCREW
16.	COVER
17.	PULL CABLE
18.	BASE RAIL END CAP
19.	BASE RAIL
20.	SPRING HEAD BOSS
21.	SPRING
22.	OUTER SLEEVE
23.	SPRING TAIL BOSS



BLADDER TANK INSTALLATION GUIDE

1. SELECTING A TANK

Our quoted lengths and widths are the dimensions when the tanks are empty. The tanks will get narrower and shorter as they fill. The quoted height is what the tanks will reach under gravity fed stormwater. The height of the tanks can also be limited – see below. The required clearance above the tank is 30mm (3cm). The quoted volume is the volume when the tank reaches its quoted height.

2. PLACEMENT AND GROUND PREPARATION

Wet Earth Bladder Tanks are specifically designed for placement under houses or verandas, but can be used in other locations as long as the following conditions are satisfied.

For under house use the most important aim is to prevent any water from getting under the house. These guidelines are designed to prevent or minimise the chances of water loss under the house.

2.1. *Level Ground*

The aim is to position the bladder tank so that it will not roll or slip. We do not recommend locating a bladder on a surface with an angle greater than 5 degrees (12:1).

Where the bladder tank is to be placed on a surface with a slope, digging a 20cm deep channel about half the width of the bladder tank along its length will provide additional stability. Care must be taken when digging near walls and supports so that these are not destabilised.

2.2. *Ground Type*

The ground surface should not have sharp edges, or be of a material that causes slipping or scratching.

Sand is an ideal surface, and in many cases soil is also good. Concrete is generally ok, but some concrete surfaces might scratch the surface of the tank over a number of years.

Tanks are supplied with a Geotextile Tank Protector which provides additional protection from puncture, slipping and scratching.

2.3. *Don't Lean*

We do not recommend that bladder tanks lean against walls or structural supports as they can weigh a significant amount when full and could contribute to movement over time.

2.4. *Minimise Sunlight*

To maximise the lifespan of your tank we encourage you to minimise direct sunlight exposure to your tank. While the tanks are UV stabilised, the heat and drying effect of direct sunlight can impact the material over time.

In most cases tanks are located under a house or veranda/deck which reduces exposure so sunlight protection is not necessary. If a part of your tank is exposed to direct sunlight we recommend covering it eg with shade cloth.

3. CONNECTING YOUR TANK

The aim of connecting your tank is to maximise water collection, while allowing water to overflow into your stormwater when your tank is full. It is also important to take into account that bladder tanks change shape as they fill and hence the fitting locations on the tank can move. All our tank inlet and outlet fittings are located on the tank ends which minimises this movement.

The following diagrams show possible ways of connecting your bladder tank. These diagrams use our Bladder Tank Pipe, which has some flexibility while being almost impossible to collapse.

Diagram 1: Connecting your tank to stormwater downpipe (example 1)

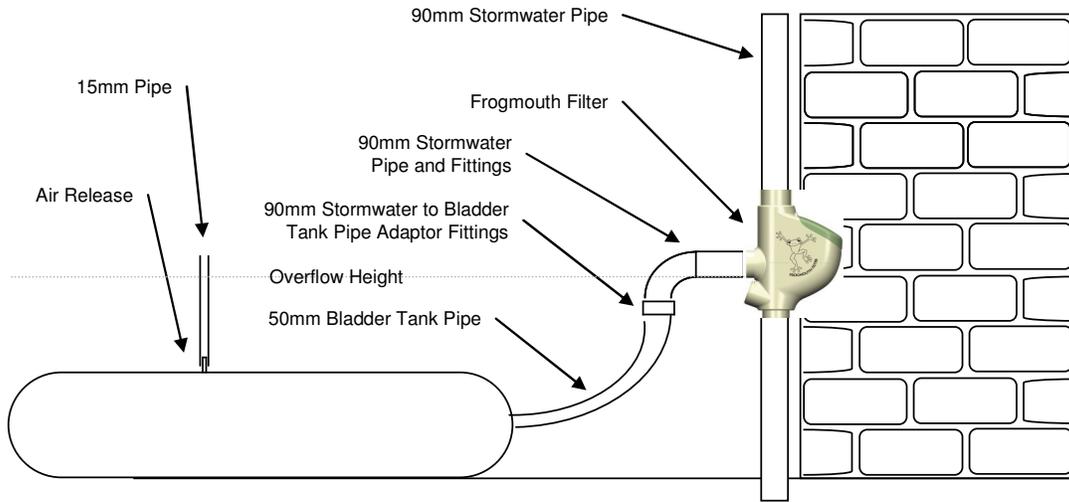


Diagram 2: Connecting your tank to stormwater downpipe (example 2)

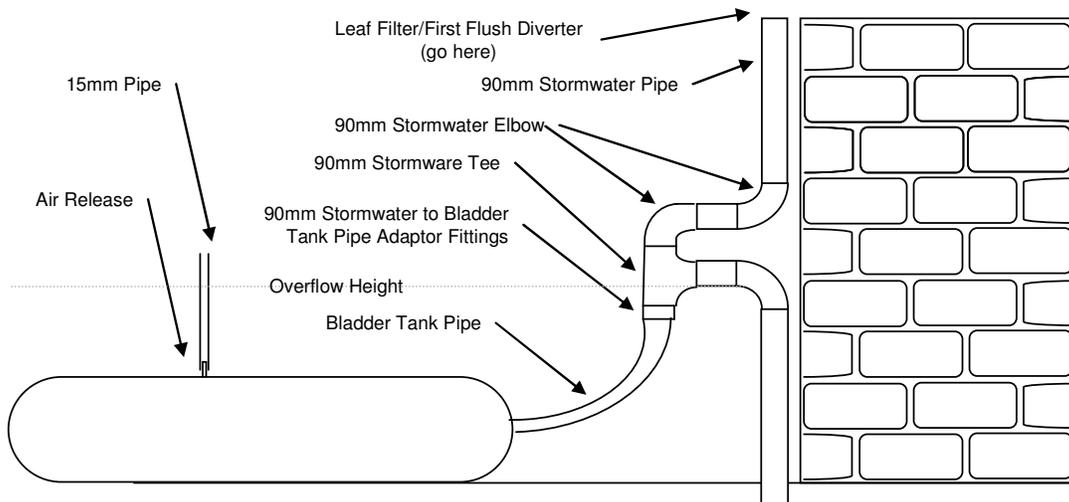
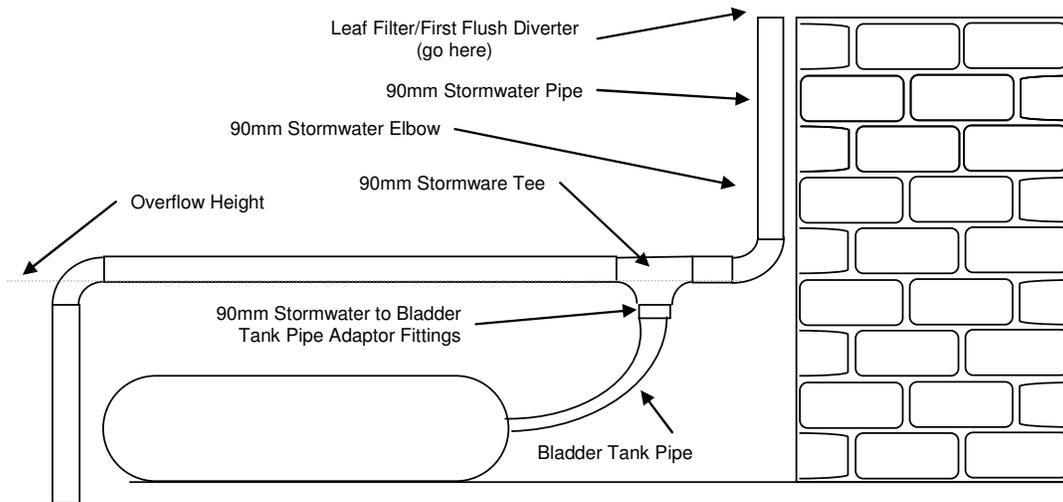


Diagram 3: Connecting your tank to stormwater downpipe (example 3)



3.1. Inlet and Outlet Fittings

Our tanks have three (3) 50mm male threaded connections. The tanks have two (2) 50mm male threaded connections on one end and a single 50mm male threaded connections on the other end. This allows for the inlet and outlet to be at the same or different ends. Tanks can also be supplied with female connections on request.

When putting thread tape on fittings you should put enough on the fitting so that it makes it hard to manually turn. In some cases this may require up to 20 turns - clockwise when thread is facing you.

3.2. Air Release

Our tanks come with a 15mm barbed fitting in the middle at the top. This fitting allows air to escape as the tank is filling. This improves the rate at which the tank can fill. To prevent any water coming out of this when your tank is full we recommend connecting some 15mm clear pipe, 12mm garden hose or 13mm poly pipe to it and making sure the top of this pipe is above your overflow level. This is shown in Diagram 1 on page 2.

3.3. Bladder Tank Pipe

Our Bladder tank pipe is unique in that it is flexible and can be shaped, yet it will not collapse. A 1m length of pipe can be bent into a circle without collapsing.

We recommend using a 1-2m length of pipe with a 90-degree bend as shown in the images above. To change the shape or straighten the pipe it is necessary to warm up the pipe. Once warmed up and reshaped the pipe will retain its new shape and will provide flexibility around that new shape. The easiest way to reshape the pipe is to leave it outside on concrete/paving in the sun for about an hour before attempting to reshape. Poring boiling water over it can also help.

To connect Bladder Tank Pipe to fittings we recommend putting some water-based lubricant (ie KY Jelly) or dish-washing detergent (less preferable) on the fitting to make it easier to slide into the pipe. You will need to dip the end of the pipe in fresh boiling water for 60 seconds. Make sure that the boiling water covers at least as much of the pipe as the fitting needs to slip into. The pipe will become soft and stay soft for about 10 seconds and should slip over the fitting.

It is important to ensure that you bladder tank pipe has a bend in it as shown in the diagrams above. This allows three-dimensional movement of the tank fitting which ensures stable connections.

3.4. Tank Height

The heights we list for the tanks are the heights at which they will achieve their quoted volume. The tanks will actually fill higher than this level. You can limit your tank to this height or lower if you do not have the height space. You do this by the height you position the overflow system (illustrated in the diagrams) so that the tank will overflow when it reaches the required height. Your overflow should be no more than 200mm above the quoted height of the tank.

Tanks should never be filled above their quoted height using a pump. Doing this will void the bladder tank warranty. Bladder tanks are designed to support gravity filling pressures and will not support pump filling pressures.

3.5. Leaf Filter and First Flush Devices

We strongly encourage the use of Leaf filters to keep leaves and other debris out of your bladder tank. Wet Earth suggests the use of the Frogmouth Filter or Leaf Eater/Leaf Beater to keep leaves out of your system. These items can be found on our website in the water tank section.

We suggest that you consider installing a first flush diverter system. Whether this is required will depend on local regulations, your location and what you plan to use your water for. Wet Earth has the Rain Harvesting First Flush Diverter on our website. Note that in many cases it is easier to use a Leaf Eater or Leaf Beater with your First Flush device than a Frogmouth Filter.

3.6. Cascading Tanks

Wet Earth Bladder tanks can easily be joined together. The tanks have a 50mm female threaded outlet fitting on each end, which allows the outlet connection to be at either end of the tank.

To connect your tanks together we recommend using our Bladder Tank Pipe. Depending on your situation you may need to use some of the following fittings. These fittings are all on our website under: Water Tanks > Flexi Bladder and Pillow Tanks - Domestic Fittings.

- NyGlass Threaded Elbow MF (male/female) 50mm (used to keep the bladder tank pipe bent)
- NyGlass Hose Tail 50mm
- 50mm Bladder Tank Pipe (per m)
- 50mm Bladder Tank Pipe Clamp

4. LEGAL

Most areas in Australia require work on stormwater systems to be undertaken by a licensed Plumber. As a result Wet Earth strongly encourages you to get a Plumber to do the actual connection to your downpipe / stormwater system.

Wet Earth thanks you for your interest in our Bladder Tanks.
If you have questions or comments on this guide then please email
sales@weteearth.com.au

Combo Water Heaters

**Stainless Steel • Mains Pressure
Wetback • Solar • Electric**

**The mains pressure cylinder with
the natural barrier against corrosion.**

Manufactured from Duplex Grade Stainless Steel, the Combo cylinder has the capacity to outlast any other brand of hot water cylinder on the market.

7 YEAR WARRANTY

“Commercial Applications may differ”

Refer to installation manual for full details

Wetback:

To comply with the NZ standards requiring that wet-back systems are open vented, the Combo mains pressure cylinder is fitted with a suitable sized closed circuit stainless steel coil. The closed circuit is charged by installing a reducing valve off the main supply. A vent is tee'd into the highest point of the circuit which allows for expansion.

Manufactured by:
Solarmaster Ltd

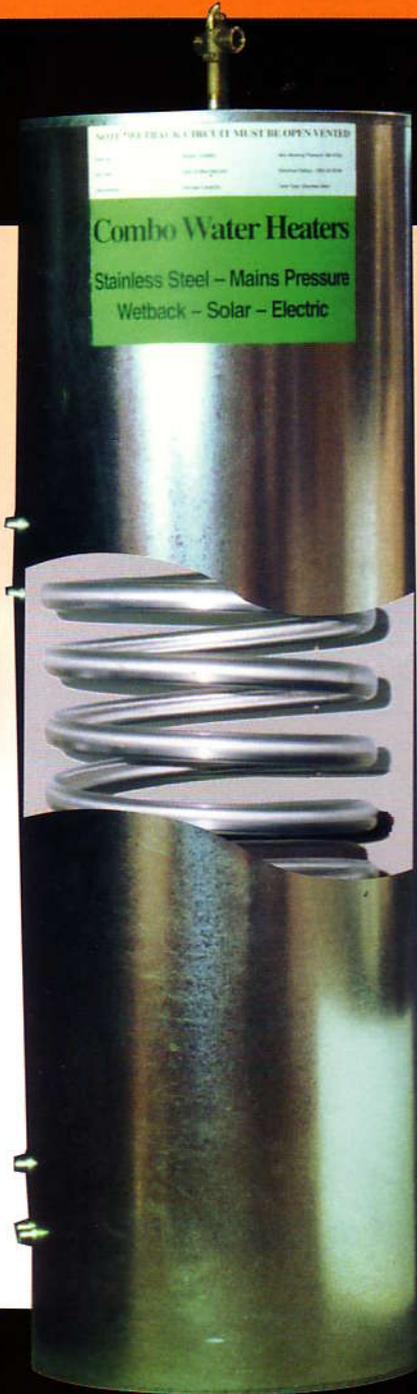
Ph: 0-9-634 0358
Fax: 0-9-636 9569
Email: info@solarmaster.co.nz



Solar:

The Combo comes with fittings compatible with both passive (Thermo Syphon) and force feed (Pump) systems.

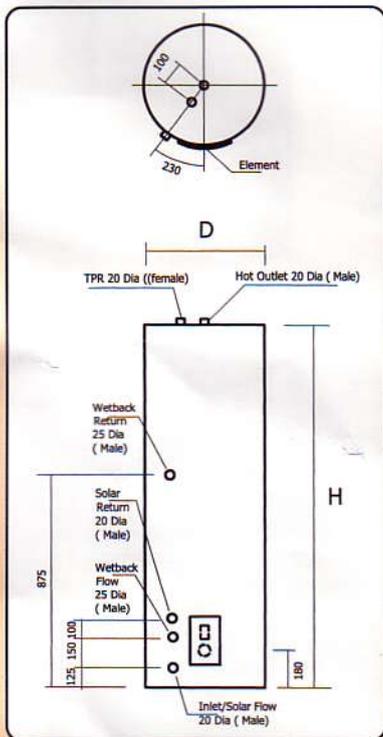
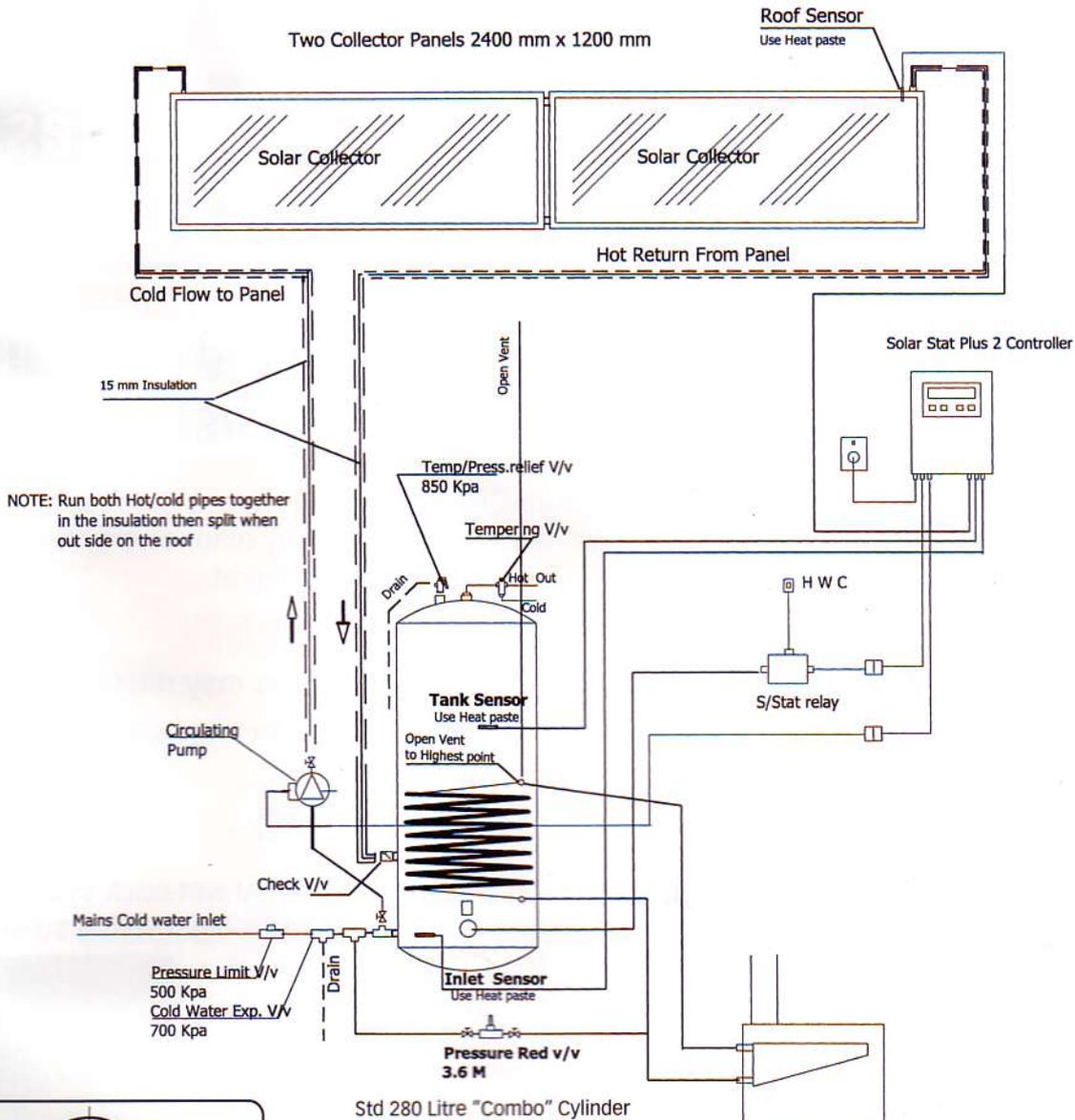
- Mains pressure wetback
- Corrosion resistant
- Solar option
- Electric option
- Maintenance free
- Mains or low pressure
- Compatible with underfloor heating



INSTALLATION INSTRUCTIONS:

Pumped System: Active - with wetback

A pumped system is more efficient than a Thermosyphon system comparing the same size panel and will allow for a more flexible piping layout within the dwelling constraints.



INSTALLATION:

The Combo Hot Water Cylinder must be installed by a qualified person in accordance with the requirements of the NZ Building Code and Solarmaster Ltd installation instructions.

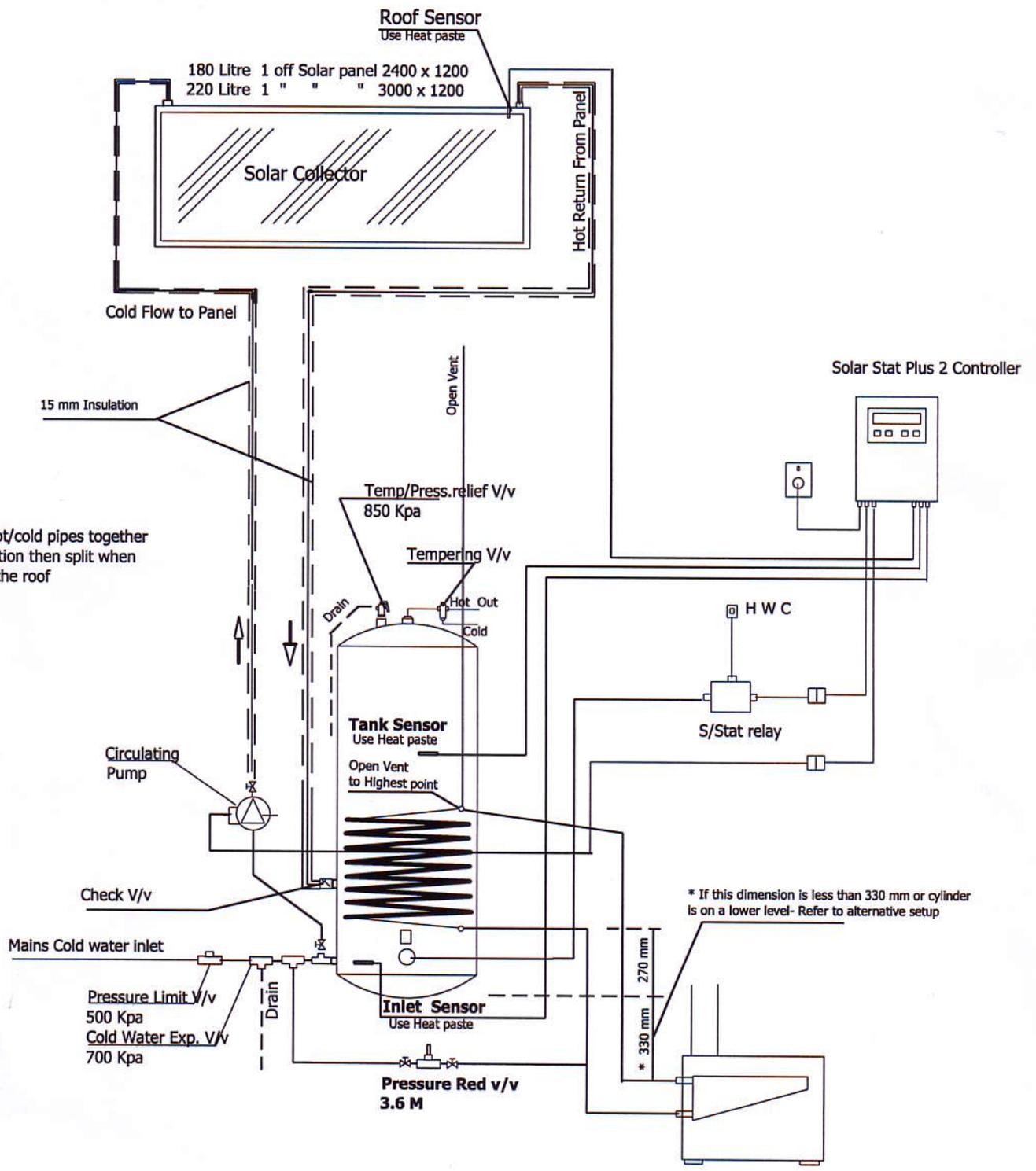
SPECIFICATIONS:

Capacity	Litre	180	220	280
Dimensions	D mm	575	575	575
	H mm	1100	1300	1650
Materials (shell)		Stainless Steel	Duplex	Duplex
Thickness	mm	2	2	2
Insulation		Polyurethane	50mm	50mm

Other sizes and capacities on request

Pumped System: Active - with wetback

A pumped system is more efficient than a Thermosyphon system comparing the same size panel and will allow for a more flexible piping layout within the dwelling constraints.

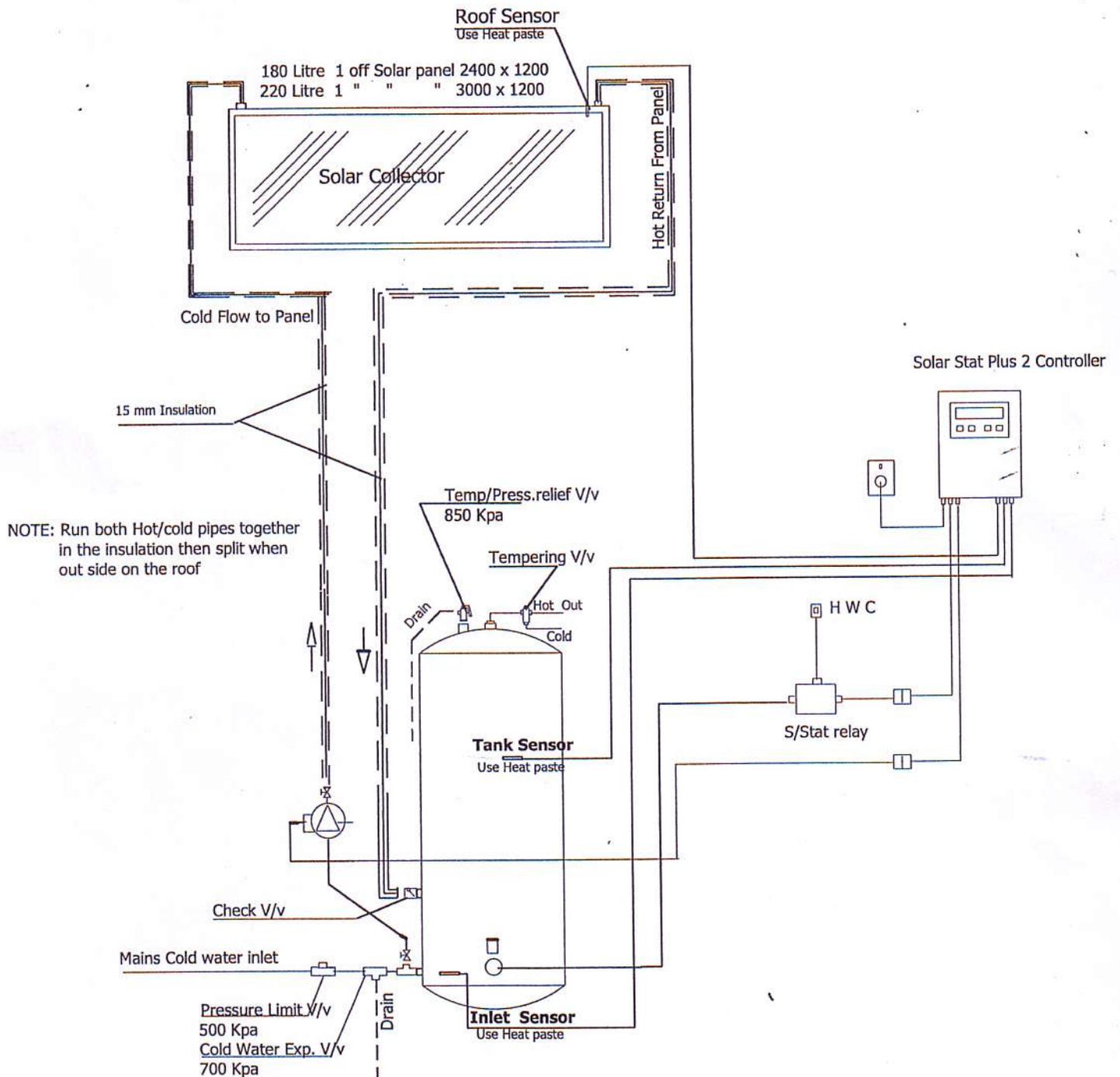


NOTE: Run both Hot/cold pipes together in the insulation then split when out side on the roof

Std 180 / 220 Litre " Combo" Cylinder

Pumped System: Active - without wetback

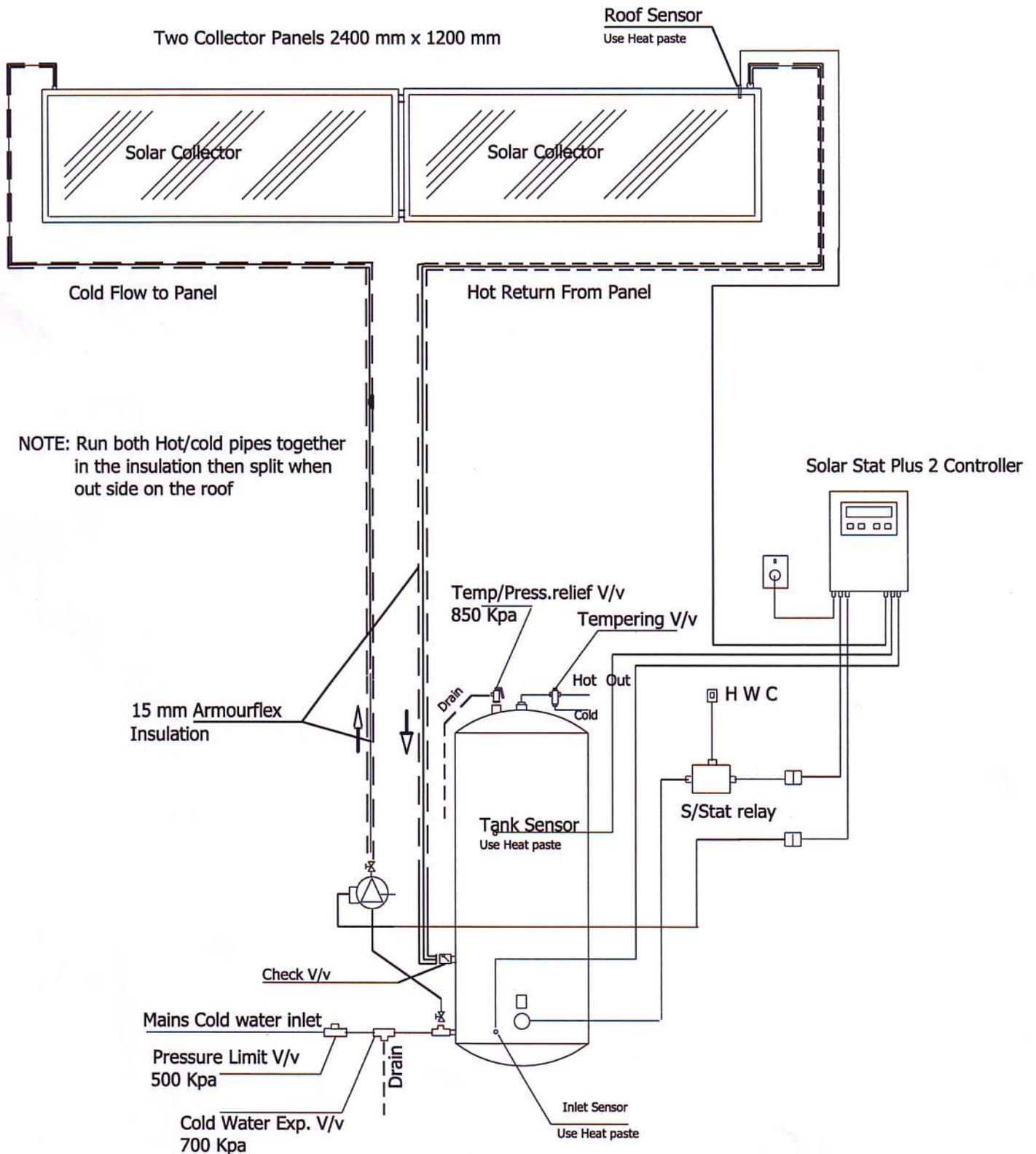
A pumped system is more efficient than a Thermosyphon system comparing the same size panel and will allow for a more flexible piping layout within the dwelling constraints.



Std 180 / 220 Litre " Combo" Cylinder

Pumped System: Active - without wetback

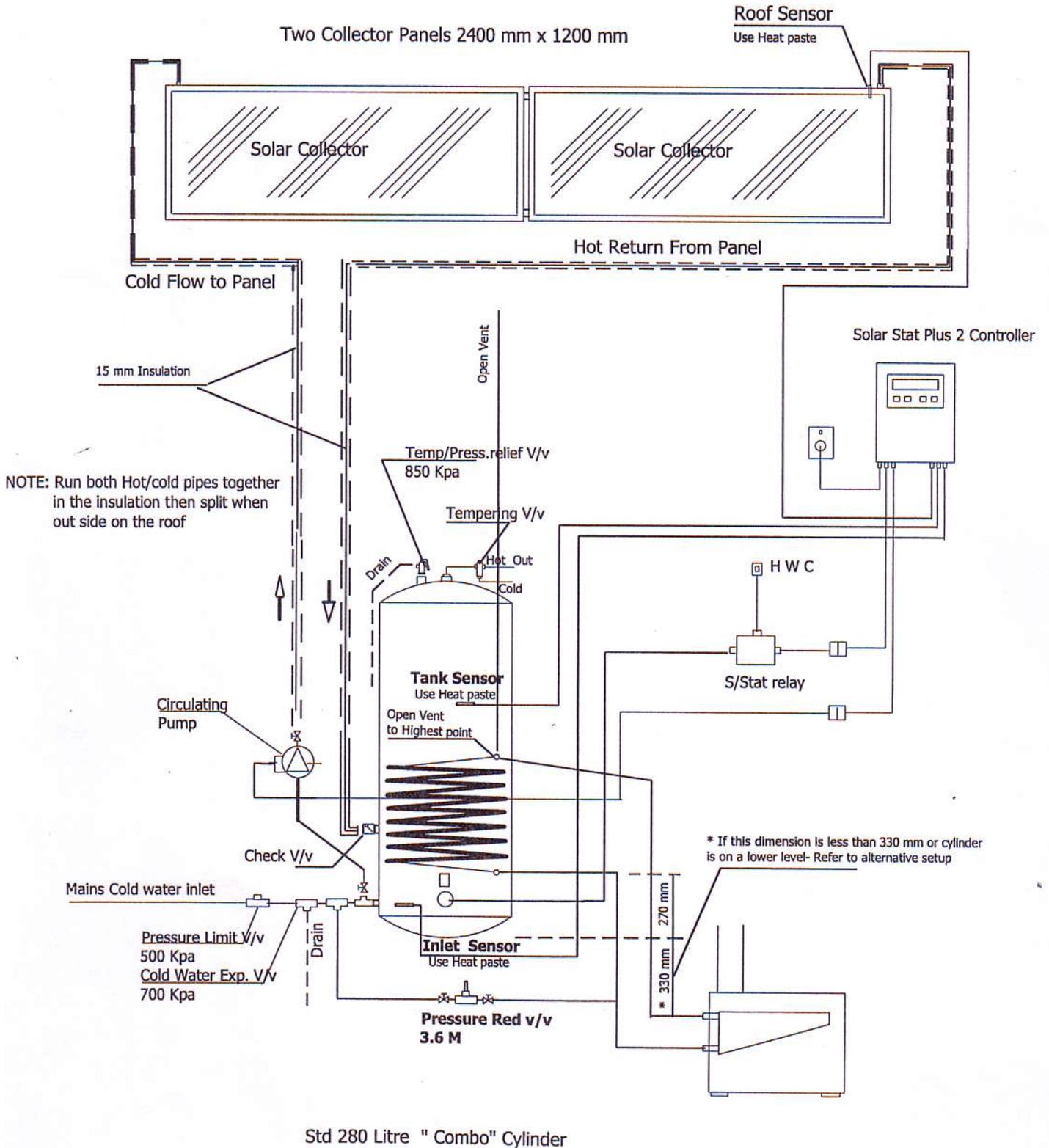
A pumped system is more efficient than a Thermosyphon system comparing the same size panel and will allow for a more flexible piping layout within the dwelling constraints.



280 L Solar only/Electric

Pumped System: Active - with wetback

A pumped system is more efficient than a Thermosyphon system comparing the same size panel and will allow for a more flexible piping layout within the dwelling constraints.



SPECIFICATION SHEET

L05410 – 2.3W Lugano LED Spot

The Lugano LED spot is available in 34 different light colours and features an anodized aluminium finish. This spot has wide beam angle and is therefore ideal to illuminate surfaces from close range. It is often used under cabinets and in kitchen hoods.

Available in anodized aluminum

Item	LED Spot light
Style	Flush mounted or surface mounted with accessory
Use	Under cabinet lighting, kitchens, wardrobes
Dimensions	Ø48mm x 14mm long
Cut out Hole Ø	Ø40mm
IP Rating	IP20
Material	Aluminium
Finish Colour	Silver,
Input Voltage	230V to LED driver - optional 12/24 volt
LED Clasification	1x 2.3 watt High Power LED
Driver Current	700ma
Colour Temperature	2800K, 3800K, 6000K, Blue
Beam Angle (-3db)	90°



Surface mount systems



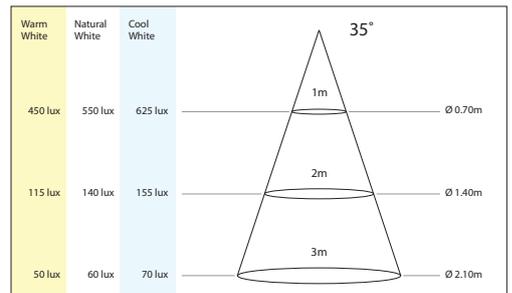
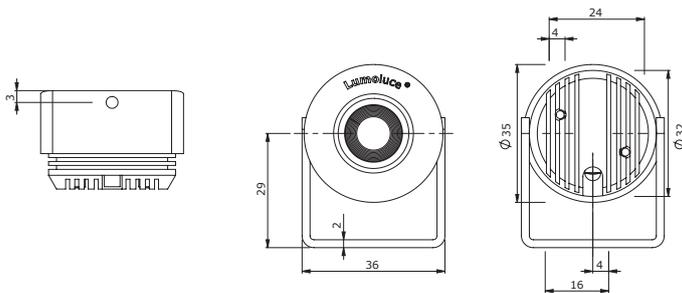
LUXI 12/24V LED spot - L05460



Type:	Spot
Dimmable:	Depends on the used driver
Size:	35 x 49 x 38 mm
Material:	Aluminium (Anodized)
Voltage power:	12 - 24V DC, 2.3 Watt
Ambient temp. (ta):	-20 to +35 °C
Max. temp. (tc):	70 °C
Expected lifetime:	50.000 h / 70%
Mounting:	Surface

Colour	Article Suffix
Aluminium (Anodized)	
White (RAL 9010)	-W

Light Colour	Power	Colour temp.	Article
● Warm White	2.3W	2800K	L05460WW
○ Natural White	2.3W	3800K	L05460NW
○ Cool White	2.3W	6000K	L05460CW





MASTER LEDbulb

MASTER LEDbulb 8-40W E27 2700K 230V A60

MASTER LEDbulb A60 12-60W, 8-40W and 6-25W, as well as the A55 6-25W delivers a dimmable glow effect for a welcoming, warm atmosphere, making it ideal for general lighting applications in the hospitality industry. Its unique design radiates warm light in all directions, making it a true alternative to the incandescent lamp. It is particularly suitable for public areas such as lobbies, corridors, stairwells, where the light is always on. Compatible with existing fixtures with an E27 holder and designed for retrofit replacement of 60W, 40W and 25W incandescent bulbs, MASTER LEDbulb delivers huge energy savings and minimizes maintenance cost without any compromise on light quality. It can be used together with most leading-edge dimmers, enabling further efficiencies while helping to create the desired atmosphere.

Product data

• Product Data

Order code	929000159602
Full product code	929000159602
Full product name	MASTER LEDbulb 8-40W E27 2700K 230V A60
Order product name	MASTER LEDbulb 8-40W E27 2700K 230V A60
Pieces per pack	1
Packing configuration	6
Packs per outerbox	6
Bar code on pack - EAN1	8727900900484
Bar code on outerbox - EAN3	8727900900491
Logistic code(s) - 12NC	929000159602
Net weight per piece	0.120 kg

• General Characteristics

Cap-Base	E27
Bulb	A60 [A 60mm]
Bulb Finish	Frosted
Rated Lifetime (hours)	25000 hr
Rated Lifetime (years)	15 an

• Electrical Characteristics

Wattage	8-40 W
Wattage Technical	8.0 W
Voltage	230 V
Line Frequency	50-60 Hz

Power Factor	0.65 -
Dimmable	Yes
Wattage Equivalent	40 W
Rated Wattage	8.0 W
Starting Time	0.5 s

• Environmental characteristics

Energy Efficiency Label (EEL)	Class A
-------------------------------	---------

• Light Technical Characteristics

Color Code	WW
Color Designation (text)	Warm White
Correlated Color Temperature	2700 K
Luminous Flux	470 Lm
Color rendering index	80
Color Temperature	2700 K [CCT 2700K]
Rated Luminous Flux	470 Lm
LLMF - end nominal lifetime	70 %

• Product Dimensions

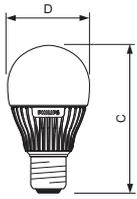
Diameter D	60 mm
Overall Length C	108 mm

• Measuring Conditions

Switching cycle	20000x
-----------------	--------

PHILIPS
sense and simplicity

Dimensional drawing



Product	C (Norm)	D (Norm)
LED 8-40W E27 WW 2700K 230V A60	108	60



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www.philips.com/lighting

2011, April 4
data subject to change



Application

- ※ Cove lighting
- ※ Architectural lights for canopy, corridor, window, archway
- ※ Backlight or edge lighting for signage
- ※ DIY lights for home use
- ※ Path and contour marking
- ※ Decorative lights for holiday, event, show, exhibition

Great advantages

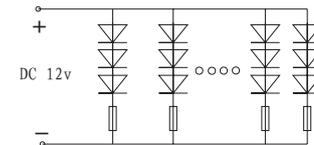
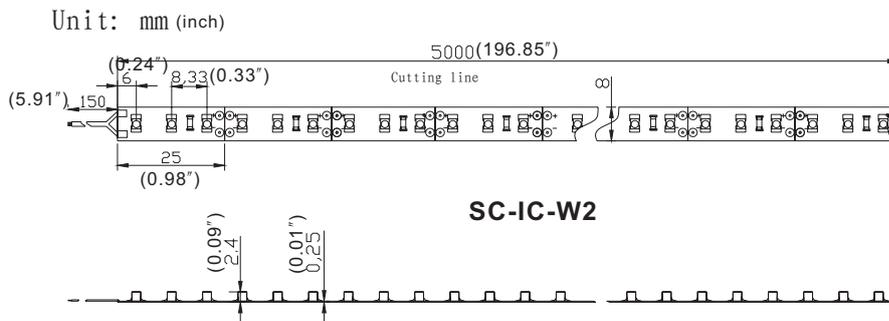
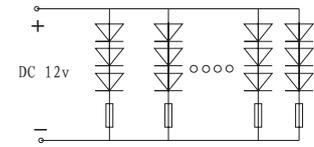
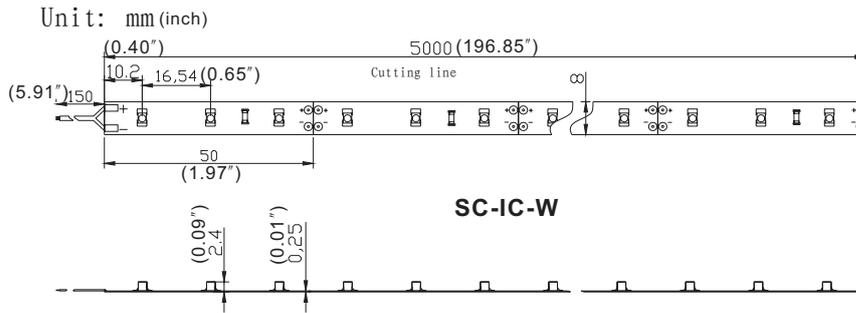
- ※ eco friendly
- ※ long life span, standard warranty 3 years
- ※ complete cut / connection accessories
- ※ no need of constant-current power feed
- ※ low power consumption
- ※ custom packing



Model Number	Color	Length (m)	LED Q'ty	LED Type	Light Output (mcd/m)	Light Output (lumen/m)	Beam Angle (degrees)	Voltage (V DC)	Current (Amps/m)
SC-IC-W	□ White	5	300	3528 SMD LED	60 X 1500	310	120	12	0.34-0.42
SC-IC-WW	□ Warm White	5	300		60 X 1200	250	120	12	0.34-0.42
SC-IC-R	■ Red	5	300		60 X 230	150	120	12	0.34-0.42
SC-IC-G	■ Green	5	300		60 X 800	220	120	12	0.34-0.42
SC-IC-B	■ Blue	5	300		60 X 150	45	120	12	0.34-0.42
SC-IC-Y	■ Yellow	5	300		60 X 280	170	120	12	0.34-0.42
SC-IC-W2	□ White	5	600		120 X 1500	620	120	12	0.68-0.84
SC-IC-WW2	□ Warm White	5	600		120 X 1200	500	120	12	0.68-0.84
SC-IC-R2	■ Red	5	600		120 X 230	300	120	12	0.68-0.84
SC-IC-G2	■ Green	5	600		120 X 800	440	120	12	0.68-0.84
SC-IC-B2	■ Blue	5	600		120 X 150	90	120	12	0.68-0.84
SC-IC-Y2	■ Yellow	5	600		120 X 280	340	120	12	0.68-0.84

IC sery also have dampproof versions-epoxy/glue gotted and silicon sleeved

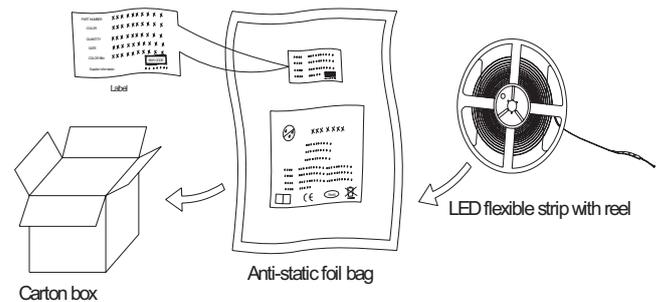
Dimension&Circuit drawings



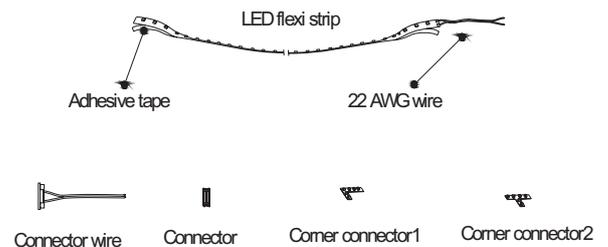
Safety Information

- The strip itself and all its components may not be mechanically stressed.
- Assembly must not damage or destroy conducting paths on the circuit board.
- Installation of LED ribbon (with power supplies) needs to be made with regard to all applicable electrical and safety standards. Only qualified personnel should be allowed to perform installations.
- Correct electrical polarity needs to be observed. Wrong polarity may destroy the strip.
- Parallel connection is highly recommended as safe electrical operation mode.
- Serial connection is not recommended. Unbalanced voltage drop can cause hazardous overload and damage the strip.
- Please ensure that the power supply is of adapters power to operate the total load.
- When mounting on metallic or otherwise conductive surfaces, there needs to be an electrical isolation points between strip and the mounting surface.
- Pay attention to standard ESD precautions when installing the strip.
- Damaged by corrosion will not be honored as a materials defect claim. It is the user's responsibility to provide suitable protection against corrosive agents such as moisture and condensation and other harmful elements.

Package



Accessories



Signcomplex Limited Warranty

Signcomplex warrants this product ("Product") against defects in material or workmanship for a period of three years from the date of purchase. If this Product is determined to be defective, Signcomplex will repair or replace the Product, at its option. This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of, or to any part of the Product. This warranty does not cover damage due to improper operation or maintenance, connection to improper voltage supply, or attempted repair by anyone than a facility authorized by Signcomplex to service the Product.

Repair or replacement as provided under this warranty is the exclusive remedy of the customer. Signcomplex shall not be liable for any incidental or consequential damages for breach of any express or implied warranty on this Product except to the extent prohibited by applicable law, any implied warranty of merchantability or fitness for a particular purpose on this Product is limited in duration to the duration of this limited warranty.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Only Signcomplex may change, amend or modify the terms of this Limited Warranty and any such change, amendment or modification shall be in writing and issued by Signcomplex. To obtain warranty service and shipping information call +86 755 2760 8650 or e-mail info@signcomplex.com. You must provide proof of purchase in the form of a bill of sale or receipted invoice which is evidence that the Product is within the warranty period to obtain warranty service. Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provision outlined in this document.

IP68 Flexmond™

IP68 Flexmond™ is a combination of SMD LEDs and extrusion technology. The SMD (Surface Mounted Diode) print the print plate on which the LEDs have been assembled directly-has been enveloped with a transparent,UV/IR-protected PVC housing. The result is a high-quality product with which you can create colorful and amazing linear light accents.It is a very efficient and multi-purpose solution for various architectural in- and outdoor applications.

SC-WID30-W/WW-24V

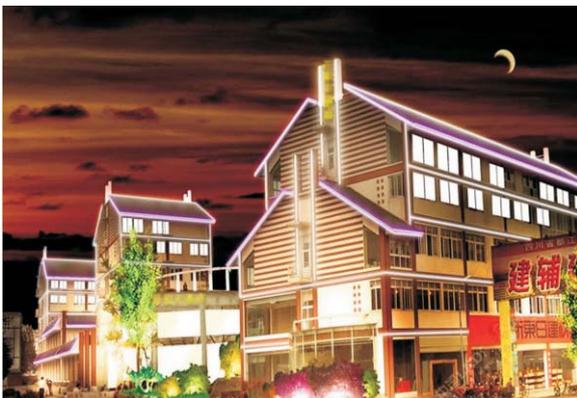
★ Features

- ※ Flexible linear lighting
- ※ Very clear SMD LEDs,designed for free cutting every 6 LEDs
- ※ Low energy consumption and high light yield
- ※ Protected against humidity: IP68
- ※ No maintenance and durable
- ※ Long extension leads
- ※ Possibilities to shorten, connect and roll, user can use DIY accessories for easy connection of cutting sections
- ※ Extremely functional and multi-purpose,UV resistant,suitable for outdoor and indoor application
- ※ Much brighter than normal rope light
- ※ Dimmable
- ※ Accessories included

✓ Great advantages

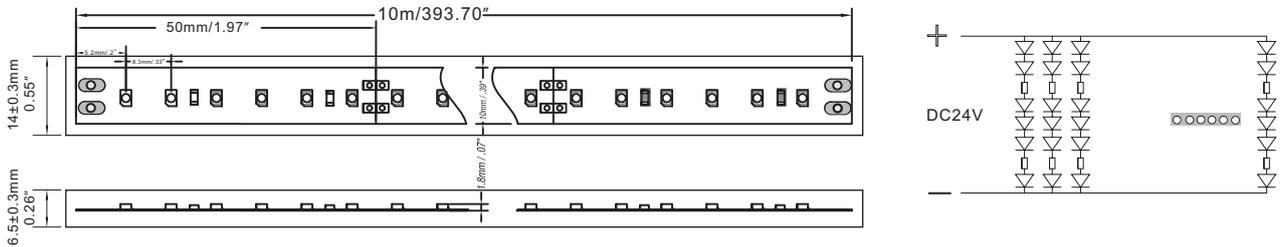
- ※ eco friendly
- ※ long life span,standard warranty 3 years
- ※ complete cut / connection accessories
- ※ no need of constant-current power feed
- ※ low power consumption
- ※ custom packing

🔧 Applications



- ※ Linear pool light
- ※ Architectural lights for canopy,corridor, window,archway
- ※ Backlight or edge lighting for signage
- ※ DIY lights for home use
- ※ Path and contour marking
- ※ Decorative lights for holiday,event,show, exhibition

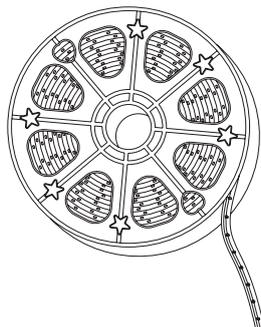
Dimensions

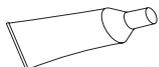


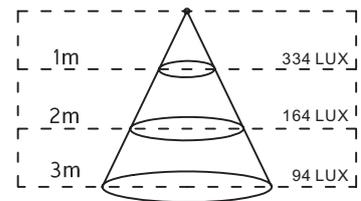
Specifications

Model #	Color	LED Q'ty/m	LED Type	Light Output (mcd/m)	Light Output (lumen/m)	Beam Angle (degrees)	Voltage (V DC)	Current (Amps/m)	Power(W/m)	Max.Connection length(m)
SC-WID30-W-24V	White	120	Power SMD TOP LED	3500x120	1022	120	24	0.8	19.2	10
SC-WID30-WW-24V	Warm White	120	Power SMD TOP LED	3000x120	775	120	24	0.8	19.2	10

Standard packing:30m per spool.

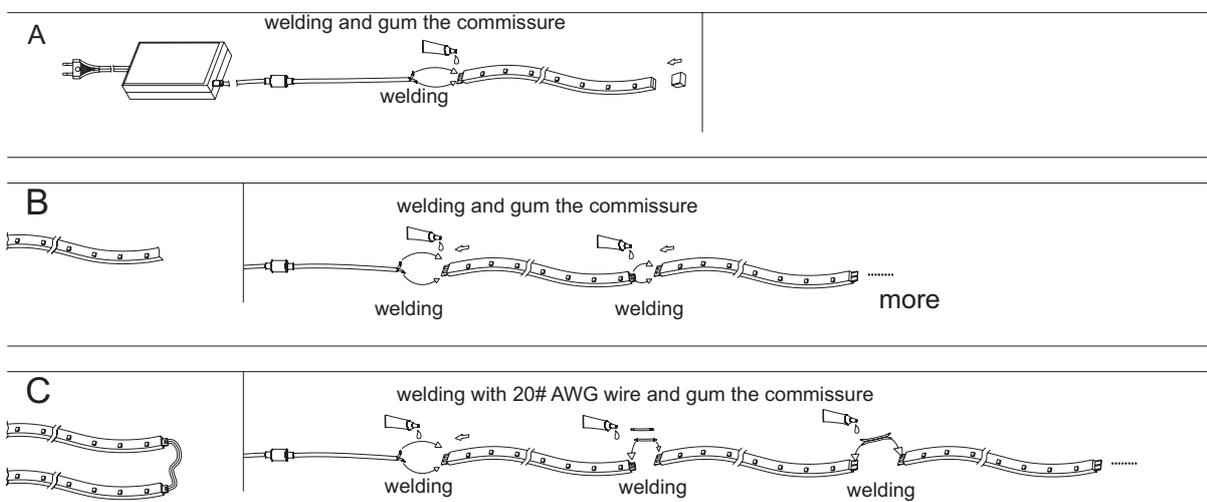


 A1	 A6	 A7	
Model number	A1	A6	A7
Item name	mounting clip	silicon end cap	silicon gel
Q'ty per reel (pcs)	120	10	1
Descriptions	for IP68 Flexmond™		

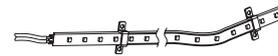
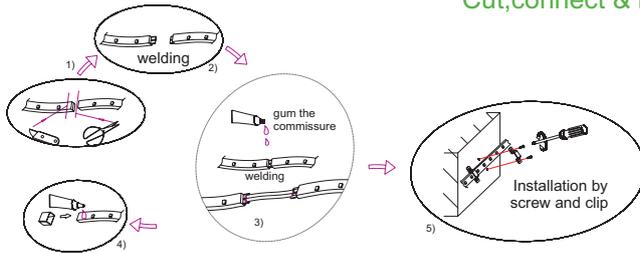


500mm/20" Luminance(white 6500K)

Link options



Cut, connect & installation



- 1) Use scissors to cut along the mark lines on PCB
- 2) Use a knife to weed the PVC encapsulation around the PCB end. Caution should be taken not to scratch the copper circuit.
- 3) Welding (with 22#AWG wire) and gum the commissure
- 4) Seal the strip with an end cap and silicon gel
- 5) Install the BID strip use bracket

Safety Information

- The strip itself and all its components may not be mechanically stressed.
- Assembly must not damage or destroy conducting paths on the circuit board.
- Installation of LED ribbon (with power supplies) needs to be made with regard to all applicable electrical and safety standards. Only qualified personnel should be allowed to perform installations.
- Correct electrical polarity needs to be observed. Wrong polarity may destroy the strip.
- Parallel connection is highly recommended as safe electrical operation mode.
- Serial connection is not recommended. Unbalanced voltage drop can cause hazardous overload and damage the strip.
- Please ensure that the power supply is of adapters power to operate the total load.
- When mounting on metallic or otherwise conductive surfaces, there needs to be an electrical isolation points between strip and the mounting surface.
- Pay attention to standard ESD precautions when installing the strip.
- Damaged by corrosion will not be honored as a materials defect claim. It is the user's responsibility to provide suitable protection against corrosive agents such as moisture and condensation and other harmful elements.
- Do not power more than 10m of IP68 Flexmond™ with merely a power supply. Otherwise the brightness will decay. Max. 10m is recommended to be powered separately.
- Caution needs to be taken while doing the connection after cutting the strip. Only authorized professionals can do the work to enable it waterproof in wet locations.

Signcomplex Limited Warranty

Signcomplex warrants this product ("Product") against defects in material or workmanship for a period of three years from the date of purchase. If this Product is determined to be defective, Signcomplex will repair or replace the Product, at its option. This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of, or to any part of the Product. This warranty does not cover damage due to improper operation or maintenance, connection to improper voltage supply, or attempted repair by anyone than a facility authorized by Signcomplex to service the Product.

Repair or replacement as provided under this warranty is the exclusive remedy of the customer. Signcomplex shall not be liable for any incidental or consequential damages for breach of any express or implied warranty on this Product except to the extent prohibited by applicable law, any implied warranty of merchantability or fitness for a particular purpose on this Product is limited in duration to the duration of this limited warranty.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Only Signcomplex may change, amend or modify the terms of this Limited Warranty and any such change, amendment or modification shall be in writing and is sued by Signcomplex. To obtain warranty service and shipping information call +86 755 2760 8650 or e-mail info@signcomplex.com. You must provide proof of purchase in the form of a bill of sale or receipted invoice which is evidence that the Product is within the warranty period to obtain warranty service. Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provision outlined in this document.



SPECIFICATION SHEET

6W Low-Energy LED Down light

Our architectural series of recessed down-lights have been designed as a replacement for existing MR16 Halogen down-lights. The Switch Lighting LED housing is designed to fit into the back of existing MR16 housings.

On our website has a selection of several housings that are suitable. Please contact us if you cannot find a housing that suits your needs as there are many other options available.

Item	Recessed Down-light
Style	Square, round, fixed or tilting
Use	interior room lighting
Dimensions	dependant on finish selected
Cut out Hole Ø	80mm
IP Rating	IP 20
Material	Aluminum
Finish Colour	Brushed alloy or powder coated white
Input Voltage	230V to LED driver
LED Classification	1 x 6 watt High Power LED
Driver Current	700ma
Colour Temperature	3000K
Lux @ 1m	450 Lux
Beam Angle (-3db)	+ - 10 deg
Field angle (-10db)	+ - 20 deg
Cut off angle (zero light)	+ - 30 deg





SPECIFICATION SHEET

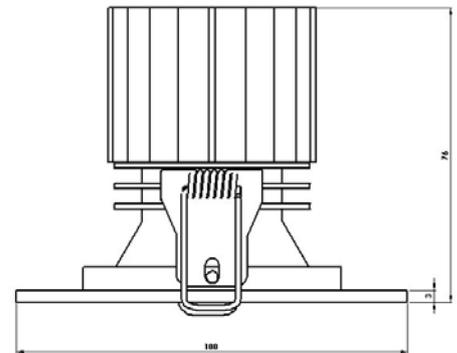


12W Low-Energy LED Down light

Our architectural series of recessed down-lights have been designed as a replacement for existing MR16 Halogen down-lights.

Ideal use for these lights are main living areas, kitchens, bathrooms (IP rated with the addition of a seal), outdoor lighting under soffits.

Item	Recessed Down-light
Style	Square or round, fixed or tilting interior room lighting, exterior under eave lighting
Use	dependant on finish selected
Dimensions	82mm
Cut out Hole Ø	IP 20 & IP54 available
IP Rating	Aluminum
Material	Natural Anodize, powder coat coloured
Finish Colour	230V to LED driver
Input Voltage	1 x 12 watt High Power LED
LED Classification	85 Ra
Colour Rendering	700ma
Driver Current	3000K
Colour Temperature	700 Lux
Lux @ 1m	+/- 20 deg
Beam Angle (-3db)	+/- 40 deg
Field angle (-10db)	+/- 60 deg
Cut off angle (zero light)	



Round Flange Shown – Square and tilting options available

SPECIFICATION SHEET

1W Low-Energy LED Spot

This discrete light can be used either for interior or exterior use. Ideal light for under cabinets, inside cabinets, shelf lighting or many other applications.

Designed to illuminate trees, shrubs or other garden features. This light is discrete and easily installed as a recessed unit or simply push into the earth with the spike option.

Ideal for balustrade lighting, simple insert into the underside of your alloy, stainless or timber handrail.

Item	Mini Light
Style	Recessed, Free standing Exterior / Interior light ideal for cabinet lighting, shelf lighting, recessing into balustrades, decks or place it anywhere in the garden.
Use	
Dimensions	Ø16mm x either 13mm long or 200mm long with spike
Cut out Hole Ø	NA
IP Rating	IP67
Material	Anodised Aluminium
Finish Colour	Silver
Input Voltage	230V to LED driver - optional 12 or 24 volt and solar power
LED Classification	1x 1W High Power LED II
Driver Current	350ma
Colour Temperature	3200K
Lux @ 1m	20 Lux
Beam Angle (-3db)	+/- 60 deg
Order Code	SL1003



Mini Light in Spike

SPECIFICATION SHEET

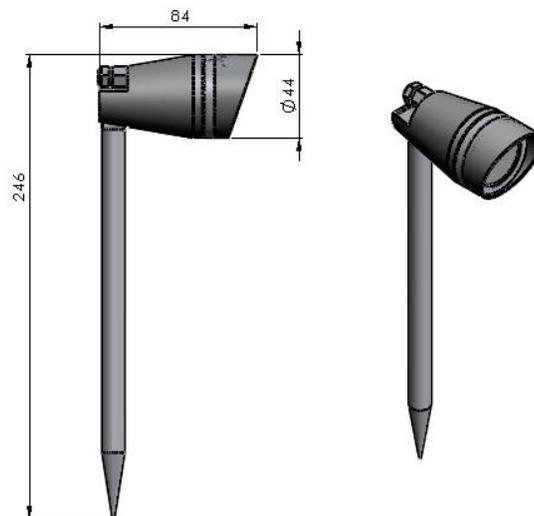
4W Low-Energy LED Garden Spot

Designed to illuminate trees, shrubs or other garden features. This light is discrete and easily installed into earth or with an optional bolt mount. The adjustable head makes lighting that feature simple and quick.

The Garden Spot comes with a hood attachment to enable the shielding of light.

Available in anodized aluminum

Item	Garden Spot
Style	Spike mounted, adjustable angle, hood or no hood
Use	Exterior light ideal for general garden lighting
Dimensions	Ø44mm x 84mm long - spike 200mm long
Cut out Hole Ø	n/a
IP Rating	IP68
Material	Aluminium
Finish Colour	Silver, Black
Input Voltage	230V to LED driver - optional 12/24 volt
LED Clasification	1x 4 watt High Power LED
Driver Current	700ma
Colour Temperature	3200K
Lux @ 1m	100 Lux
Beam Angle (-3db)	Wide or narrow available



RoHS
Ready 



SOLARLOK Photovoltaic Interconnection System

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Product Information Center (PIC)

Our PIC team are there to help with any further questions. With our experienced employees in the Product Information Center (PIC) we can offer you a reliable source of information and support for your technical queries.

To contact your local Tyco Electronics subsidiary, please refer to the address page at the back of this catalog.

Product und Machine Literature

Order quickly and easily by fax:

For Fax No. see address page entry for your specific region.

A large product range has extensive product literature. You can request flyers, catalogs and brochures for each of the product sectors of relevance to you.

Tyco Electronics Online

Internet Homepage:
www.tycoelectronics.com/solar

Electronic Internet Catalog:
<http://catalog.tycoelectronics.com>



Our website is more than an Internet guide. It is constantly being added to and is an innovative and interactive source for applications tips, product updates and technical information of all types. With our innovative StepSearch software, which has been perfected over a period of several years you can conveniently surf your way through all our products.

The SOLARLOK Concept

System Features
Junction Box

- Variable wiring options
- Easily accessible
- Simple, fast and cost-effective assembly
- Flat, low profile design
- High current carrying capacity
- Good thermal balance
- Connectorized or direct wire configurations
- Up to four outputs possible
- Up to six internal rails
- Customer-specific solutions
- TÜV and UL approved

Connector

- Simple on-site processing
- Mating safety provided by keyed housings
- Semi-automatic assembly capability possible
- Multiple plugging and unplugging cycles
- Accommodates solar cable with different insulation diameters
- High current carrying capacity
- Wide temperature operating range
- TÜV and UL approved

Solar Cable

- Dual wall insulation
- Electron beam cross-linked
- Excellent resistance to U.V., water, ozone, fluids, salt, general weathering
- Excellent resistance to abrasion
- Halogen free, flame retardant, low toxicity
- Very low smoke emissions
- Excellent flexibility and stripping performance
- Different cable diameters
- Operating Temperature from -40 °C up to +125 °C
- Voltage Rating up to 1800 V DC
- Short circuit resistant up to +250 °C
- TÜV and UL approved


Simple and Reliable System Interconnection of Individual Solar Modules Right to the DC/AC Converters

Market expansion of the formerly regulated energy supply sector, increased global environmental awareness and governments committing themselves to more stringent environmental targets have opened up new opportunities for the photovoltaic industry.

Having served a niche market in the past, the photovoltaics industry now has the opportunity to move into mass production, realizing economies of scale and gaining a greater market share of the world's energy mix.

Tyco Electronics will be contributing to the establishment of this environmentally-friendly technology with the introduction of its SOLARLOK connector system.

SOLARLOK delivers a flexible system solution for easy and reliable interconnections from photovoltaic modules to the DC/AC converter. The entire system concept is based on cost-effective and reliable processing of individual interconnection system components. This significantly reduces installation costs of the solar energy system.

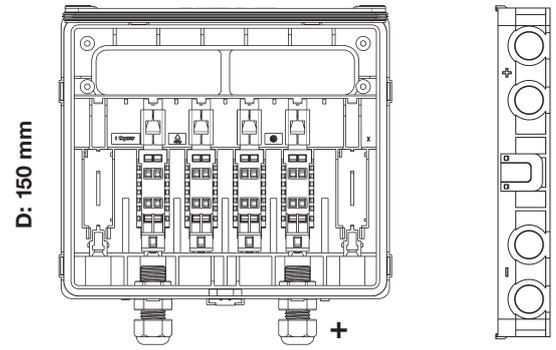
The junction box concept is based on a flexible, open system structure, which allows serial as well as parallel interconnection via direct wire connect or separable connectors. Within the junction box, up to six termination places rails are available for photovoltaic foil connection.

The male and female cable coupler was designed for high voltage and high current-carrying capacity in addition to the well-established IP 67 sealing requirement in the photovoltaic industry. Mating safety is provided by polarity keyed housings, fully shrouded contacts, reliable high cycle life, and squeeze to release connection system. In addition, a wide temperature range and fulfillment of worldwide standards for photovoltaic connection systems complement the robust product specification.

The design of the male and female receptacle for the junction box and the DC/AC converter follow the cable coupler "click philosophy" for quick and secure mating even in difficult mounting positions.

If required by the customer, the junction box can be delivered pre-configured with diodes, jumpers, plug connectors, and solar cable pigtailed.

Large Junction Box – Serial Interconnection



W: 150 mm

H: 25 mm

All mentioned versions are standard. Plus-connection see drawing.

Junction Box with Mounted Cable and Connectors

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)
1740300-2	6	5	6.0	1,000	4.0
1987294-2	6	5	8.5	1,000	4.0
1987254-2	6	5	13.0	1,000	4.0
1740077-1	4	3	6.0	1,000	4.0
1740077-3	4	3	8.5	1,000	4.0
on request	4	3	13.0	1,000	4.0

Junction Box with Connector Outlet

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)
3-1394723-0	6	5	6.0
6-1394723-5	6	5	8.5
6-1394723-6	6	5	13.0
2-1394723-4	4	3	6.0
on request	4	3	8.5
5-1394723-3	4	3	13.0

Junction Box with Extended Wiring Space

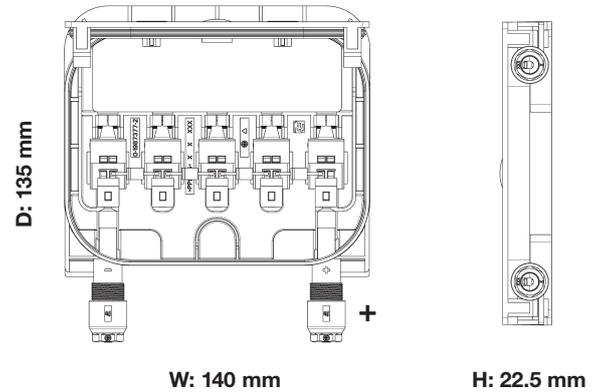


Special Versions

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)	Comments
1981988-1	6	5	8.5	1,000	4.0	Junction Box with extended wiring space
1981987-1	6	5	13.0	1,000	4.0	

Standard mounting on the panel with silicone glue (approved types see application specification).
Optional with double-sided adhesive tape (specifications of the adhesive tape can be found in the datasheets of the manufacturer).

5-Rail Junction Box – Serial Interconnection



All mentioned versions are standard. Plus-connection see drawing.
TÜV and UL pending.

Junction Box with Mounted Cable and Connectors

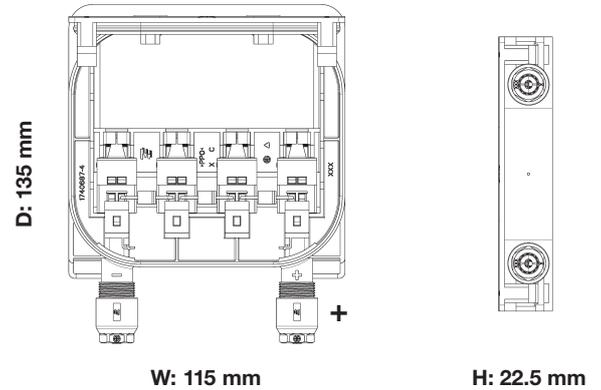
Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)
1987858-3	5	4	8.5	1,000	4.0
1987982-3	5	4	13.0	1,000	4.0

Junction Box with Connector Outlet

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)
on request	5	4	8.5
on request	5	4	13.0

Standard mounting on the panel with silicone glue (approved types see application specification).
Optional with double-sided adhesive tape (specifications of the adhesive tape can be found in the datasheets of the manufacturer).

Medium Junction Box – Serial Interconnection



All mentioned versions are standard. Plus-connection see drawing.

Junction Box with Mounted Cable and Connectors

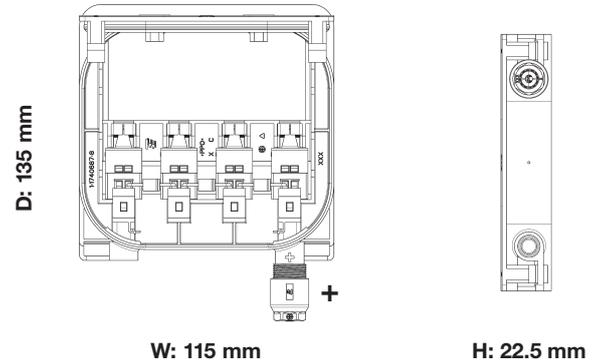
Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)
1987002-4	4	3	6.0	1,000	4.0
1740699-6	4	3	8.5	1,000	4.0
1740971-2	4	3	13.0	1,000	4.0

Junction Box with Connector Outlet

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)
1987003-3	4	3	6.0
1740700-1	4	3	8.5
1740972-1	4	3	13.0

Standard mounting on the panel with silicone glue (approved types see application specification).
Optional with double-sided adhesive tape (specifications of the adhesive tape can be found in the datasheets of the manufacturer).

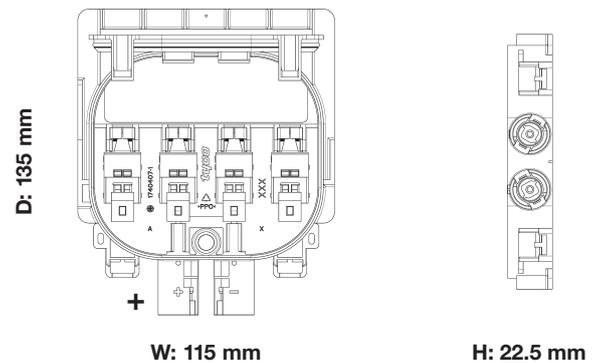
Medium Junction Box – Serial Interconnection – Special Versions



All mentioned versions are standard. Plus-connection see drawing.

Junction Box with Mounted Cable and Connectors

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)	Comments
3-1740699-9	4	3	8.5	1,000	4.0	Male Contact (neutral) right, left closed
3-1740699-8	4	3	8.5	1,000	4.0	Female Contact (neutral) left, right closed
1987994-1	4	3	13.0	1,000	4.0	Male Contact (neutral) right, left closed
1987995-1	4	3	13.0	1,000	4.0	Female Contact (neutral) left, right closed

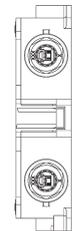
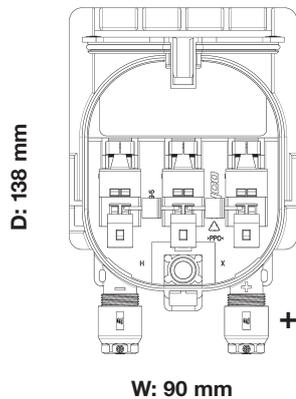


Inside Style

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)	Comments
1740657-8	4	3	8.5	1,000	4.0	with Mounted Cable
1740658-1	4	3	8.5	1,000	4.0	with Connector Outlet

Standard mounting on the panel with silicone glue (approved types see application specification).
Optional with double-sided adhesive tape (specifications of the adhesive tape can be found in the datasheets of the manufacturer).

Small Junction Box – Serial Interconnection



H: 22 mm

All mentioned versions are standard. Plus-connection see drawing.

Junction Box with Mounted Cable and Connectors

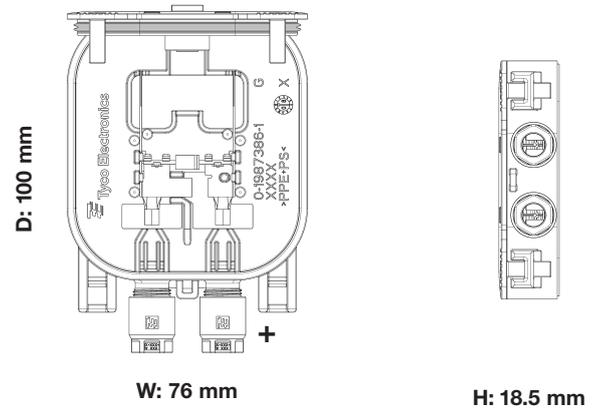
Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)
1740425-5	3	2	6.5	1,000	4.0
1987225-6	3	2	10.5	1,000	4.0
1987252-1	3	2	14.0	1,000	4.0

Junction Box with Connector Outlet

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)
1418867-6	3	2	6.5
1987459-1	3	2	10.5
1987777-1	3	2	14.0

Standard mounting on the panel with silicone glue (approved types see application specification).
Optional with double-sided adhesive tape (specifications of the adhesive tape can be found in the datasheets of the manufacturer).

Eco Junction Box – Serial Interconnection



All mentioned versions are standard. Plus-connection see drawing.
TÜV and UL pending.

Junction Box with Mounted Cable and Standard Connectors

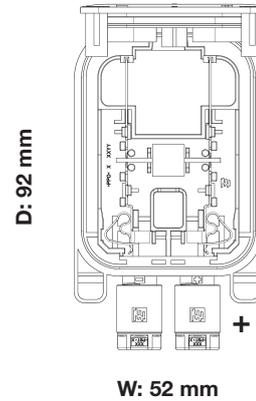
Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)	Foil Connection
1987392-1	2	1	8	1,000	4.0	Straight
1987392-2	2	1	8	1,000	4.0	Angled

Junction Box with Mounted Cable, Slim Line Connectors and Double-Sided Adhesive Tape

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)	Foil Connection
1987392-3	2	1	8	1,000	2.5	Straight

Standard mounting on the panel with silicone glue (approved types see application specification).
Optional with double-sided adhesive tape (specifications of the adhesive tape can be found in the datasheets of the manufacturer).

Slim Junction Box – Serial Interconnection



All mentioned versions are standard. Plus-connection see drawing.
UL pending.

Junction Box with Mounted Cable and Standard Connectors

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)
1971158-2	2	1	3	600	2.5

Junction Box with Mounted Cable and Slim Line Connectors

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (mm ²)
on request	2	1	3	600	2.5

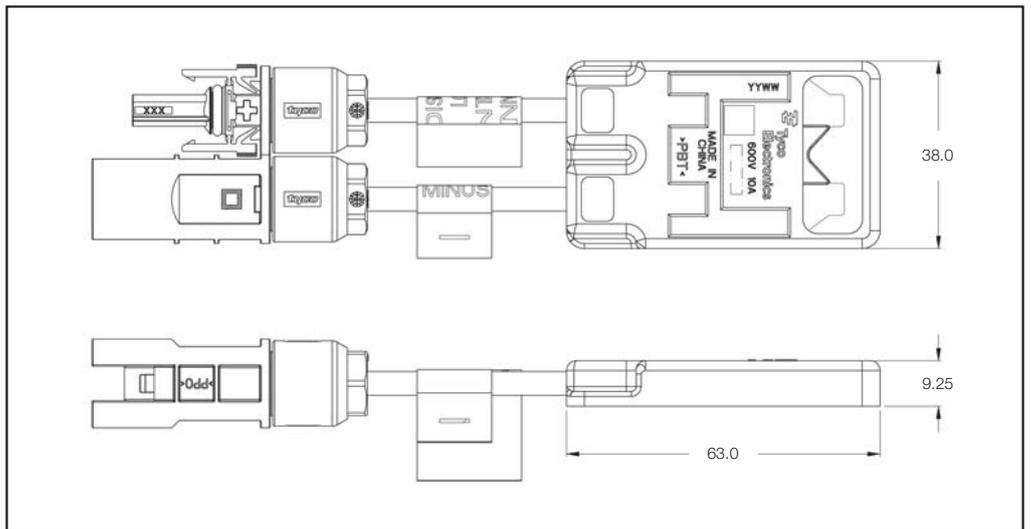
Standard mounting on the panel with silicone glue (approved types see application specification).
Optional with double-sided adhesive tape (specifications of the adhesive tape can be found in the datasheets of the manufacturer).

Micro Junction Box – Serial Interconnection

All mentioned versions are standard.
Plus-connection see drawing.



TÜV pending.



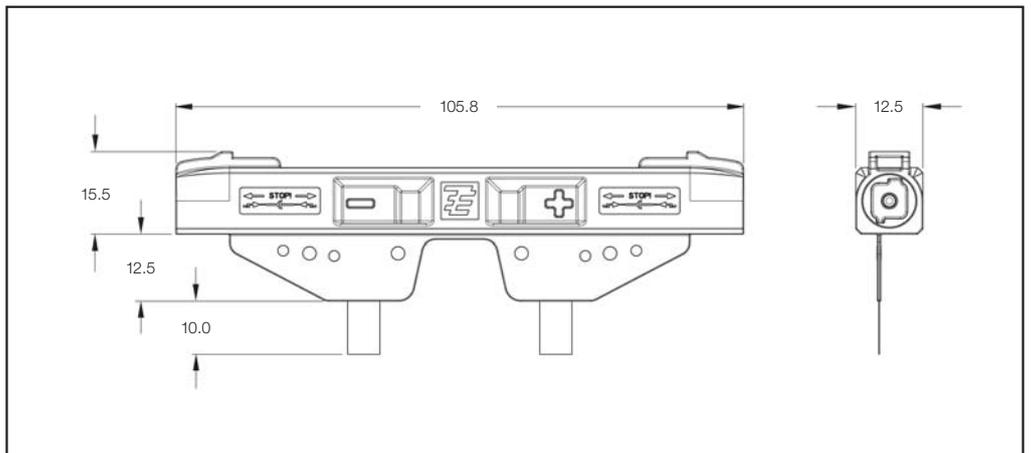
Micro Junction Box with Overmolded Cable

Part Number	Contact Rails	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Cable Length (mm)	Wire Size (AWG)
1954875-3	2	1	10	750	12

Standard mounting on the panel with silicone glue (approved types see application specification).
Optional with double-sided adhesive tape (specifications of the adhesive tape can be found in the datasheets of the manufacturer).

Junction Boxes for Building integrated PV Applications (BiPV)

Attention:
It is not permitted to use
this product and products
including it in the USA.
TÜV pending.

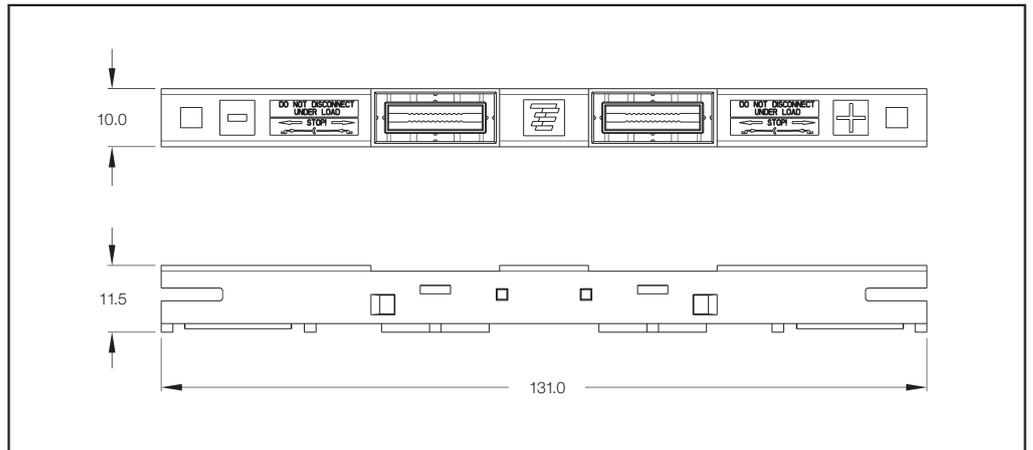


Wing-Edge Junction Box

Part Number	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Connection Type
1987293-3	1	10	with Slim Line Connector System (see Page 15)

Junction Boxes for Building integrated PV Applications (BiPV) (continued)

Connection of foil by soldering.
Required potting material
please see application
specification.



Straddle Edge Junction Box

Part Number	Diodes	Rated Current (IEC 61215, Edition 2) (Ampere)	Connection Type
1971569-1	1	11	Specific Connector System (see table below)

Accessories

Part Number	Description
1971131-1	Female Cable Coupler, Plus Contact
1971131-2	Female Cable Coupler, Minus Contact
1971133-1	Termination Connector

These specific Slim Connectors can be equipped with contacts of the SOLARLOK system on page 28.

Solar Labels

Product Features

- UV resistant
- Meet IEC61215 Edition 2.0, IEC61646 Edition 2.0
- UL- certified
- Withstand harsh outdoor environments
- Labels can be customized to customer requirements (design, logos, colors, specifications, etc.)



Product Description	Part Number	Label Description	Quantity on Roll
SOL-SD-104076-4-0.1	CN4616-000	Solar Disconnect	100
SOL-DCD-104100-4-0.1	CN4619-000	DC Disconnect	100
SOL-DPS-104019-4-0.1	CN4618-000	Warning – Dual Power Sources	100
SOL-ESH-104019-4-0.1	CN4617-000	Warning – Electric Shock Hazard	100
SOL-SD-104076-4-0.5	CL3803-000	Solar Disconnect	500
SOL-DCD-104100-4-0.5	CL3806-000	DC Disconnect	500
SOL-DPS-104019-4-0.5	CL3804-000	Warning – Dual Power Sources	500
SOL-ESH-104019-4-0.5	CL3805-000	Warning – Electric Shock Hazard	500

Combiner Box
Product Features

- Combines up to 5 PV strings
- Converts to standard wires
- Completely pre-assembled
- Plug and play design provides labor savings and minimizes installer error during installation
- Uses existing products currently produced by Tyco Electronics
- UL 1741 pending
- No approval for use outside Americas!
- Part No. 1954283-1



SOLARLOK Combiner Box Assembly is used to combine up to five strings in a pre-terminated connectorized weather-resistant enclosure to meet National Electric Code (NEC) requirements for series fusing of photovoltaic (PV) modules (solar panels).

The combiner box assembly consists of a box, cover (with hinges), transparent dead front lid (under the cover), and 10 pre-terminated SOLARLOK connectors each with a removeable seal cover. The box features 4 knockouts (for output wiring), lock tab, mounting slots, and pre-wired grounding clip.

The interior of the box holds 5 fuse blocks pre-wired to the positive SOLARLOK connectors, 5 terminal blocks pre-wired to the negative SOLARLOK connectors, and an equipment terminal block used to ground the equipment. Fuses are not included.

Part No. **1954283-1**

Cable Coupler – Standard Line



Female Cable Coupler (Kit with Screw-Machined Contact)

Part Number	Wire Size (mm ²)	Keying	Package Quantity
1394462-1	2.5	Plus	100
1394462-3	4.0	Plus	100
5-1394462-5	6.0	Plus	100
1394462-2	2.5	Minus	100
1394462-4	4.0	Minus	100
5-1394462-6	6.0	Minus	100



Male Cable Coupler (Kit with Screw-Machined Contact)

Part Number	Wire Size (mm ²)	Keying	Package Quantity
1394461-1	2.5	Plus	100
1394461-3	4.0	Plus	100
6-1394461-5	6.0	Plus	100
1394461-2	2.5	Minus	100
1394461-4	4.0	Minus	100
6-1394461-6	6.0	Minus	100
6-1394461-1	2.5	Neutral	100
6-1394461-2	4.0	Neutral	100
6-1394461-4	6.0	Neutral	100



Female Cable Coupler (without Contact – only Housing and Sealing)

Part Number	Wire Size (mm ²)	Keying	Package Quantity
1740940-3	–	Plus	2,500
1740940-4	–	Minus	2,500



Male Cable Coupler (without Contact – only Housing and Sealing)

Part Number	Wire Size (mm ²)	Keying	Package Quantity
1740939-5	–	Plus	2,500
1740939-4	–	Minus	2,500
1740939-2	–	Neutral	2,500



Cable Coupler – Slim Line



Female Cable Coupler (Kit with Screw-Machined Contact)

Part Number	Wire Size (mm ²)	Keying	Package Quantity
1987559-1	2.5	Plus	100
1-1987559-1	4.0	Plus	100
1987559-2	2.5	Minus	100
1-1987559-2	4.0	Minus	100



Male Cable Coupler (Kit with Screw-Machined Contact)

Part Number	Wire Size (mm ²)	Keying	Package Quantity
1987558-1	2.5	Plus	100
1-1987558-1	4.0	Plus	100
1987558-2	2.5	Minus	100
1-1987558-2	4.0	Minus	100
1987558-3	2.5	Neutral	100
1-1987558-3	4.0	Neutral	100



Female Cable Coupler (without Contact – only Housing and Sealing)

Part Number	Wire Size (mm ²)	Keying	Package Quantity
1987287-1	–	Plus	2,500
1987287-2	–	Minus	2,500



Male Cable Coupler (without Contact – only Housing and Sealing)

Part Number	Wire Size (mm ²)	Keying	Package Quantity
1987286-4	–	Plus	2,500
1987286-5	–	Minus	2,500
1987286-6	–	Neutral	2,500

TÜV and UL pending.

T-Branch Connector



Parallel Interconnection using T-Branch Connector (Male-to-Male)

Part Number	Keying	Package Quantity
1534611-1	Plus	20
1534611-2	Minus	20



Parallel Interconnection using T-Branch Connector (Female-to-Male)

Part Number	Keying	Package Quantity
1740277-1	Plus	20
1740277-2	Minus	20



Standard



NEC/UL certified

Safety + Clip (Optional Connector Latch Locking Clip Standard)

Part Number	Keying	Package Quantity
1534226-1	Standard	100
2106207-1	NEC/UL certified	100

Connector Dust Covers

Part Number	Remarks	Package Quantity
1987423-1	for Female Cable Coupler	100
1394739-1	for Male Cable Coupler	100



DC Converter Receptacle



With O-Ring and Metal Nut (Kit with Screw-Machined Contact)

Part Number	Wire Size (mm ²)	Keying	Package Quantity
1394738-1	2.5	Plus	100
1394738-3	4.0	Plus	100
1394738-9	6.0	Plus	100
1394738-2	2.5	Minus	100
1394738-4	4.0	Minus	100
1-1394738-0	6.0	Minus	100



With Flat Seal and Plastic Nut (Kit with Screw-Machined Contact)

Part Number	Wire Size (mm ²)	Keying	Flat Seal Color	Package Quantity
1740210-1	2.5	Plus	Black	100
1740210-3	4.0	Plus	Black	100
1740210-5	6.0	Plus	Black	100
1740210-2	2.5	Minus	Black	100
1740210-4	4.0	Minus	Black	100
1740210-6	6.0	Minus	Black	100
1740210-7	2.5	Plus	Red	100
1740210-9	4.0	Plus	Red	100
1-1740210-1	6.0	Plus	Red	100
1740210-8	2.5	Minus	Blue	100
1-1740210-0	4.0	Minus	Blue	100
1-1740210-2	6.0	Minus	Blue	100



AC Inverter Connector

Product Facts

- **Current Rating:**
25 A per Pole
- **Voltage Rating:**
400 V
- **Protection Degree:**
IP67 (mated)
- **No. of Positions:**
5 Poles
- **Temperature Range:**
-40 °C up to +50 °C
- **Wire Size Range:**
2.5–6.0 mm²
- **Approvals:**
 - VDE certified



Panel Mount Plug

Part Number	Nut	Cable Length (5 x 4.0 mm ²)	Package Quantity
1740483-1	Metal	200 mm	24
1740483-2	Plastic	200 mm	24



Free Hanging Receptacle

Part Number	Nut	Cable Length (5 x 4.0 mm ²)	Package Quantity
1740479-1	–	–	24



Complete Sets

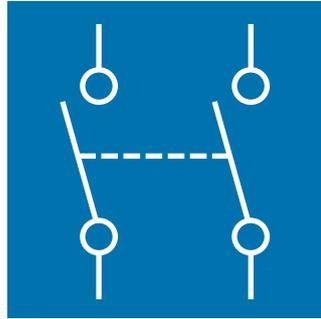
Part Number	Nut	Cable Length (5 x 4.0 mm ²)	Package Quantity
1740493-1	Metal	200 mm	24
1740493-2	Plastic	200 mm	24

Field Wiring, Switching and Protection

Product Features

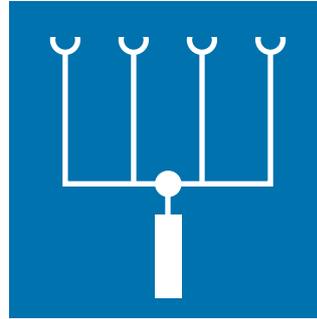
- Modular product concept
- One- /two-pole switches
- Current up to 60 A DC
- Voltage up to 1,000 V DC
- Compact, standardized design
- Proven quality
- TÜV and UL pending

Switching



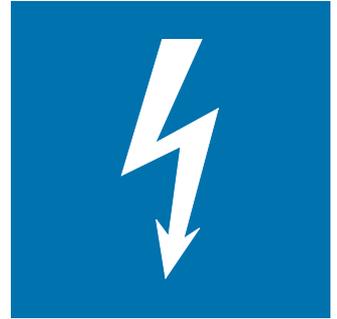
- One- /two-pole switch
- Main switch function
- Lockable
- Current up to 60 A DC
- Voltage up to 1,000 V DC

Collecting



- 2 to 6 strings input
- Cable cross section up to 6 mm²
- SOLARLOK connectors
- Current up to 60 A DC
- Voltage up to 1,000 V DC

Protecting



- Lightning protection



Your Solution



The photovoltaic integrator looks for best fit solutions to wire various types and sizes of solar generators.

The new product concept from Tyco Electronics provides this flexibility to photovoltaic integrators.

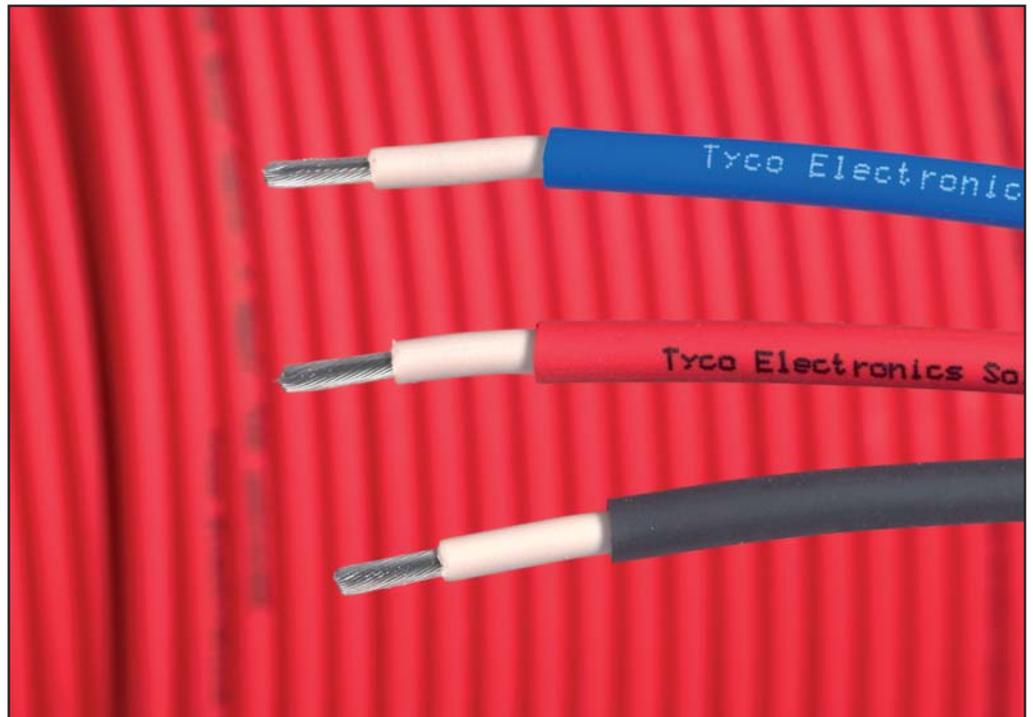
The modular product can be comprised of a switch, lightning protection, fuses or any combination of these or other commonly available components.

We can customize a product to fit your specific application. Please contact us with your requirements.

Solar Cable – TÜV and UL certified

Product Facts

- Dual wall insulation
- Electron beam cross-linked
- Excellent resistance to UV, water, ozone, fluids, salt, general weathering
- Excellent resistance to abrasion
- Halogen free, flame retardant, low toxicity
- Very low smoke emissions
- Excellent flexibility and stripping performance
- Wire size from 2.5 mm² up to 6.0 mm²
- Safety Class II
 - TÜV approved (2Pfg1169/08.2007)
 - UL approved (Subject 4703)



As part of expanding the SOLARLOK Product Line, Tyco Electronics has specified a wire that is designed to meet the harsh environmental conditions typical in the wiring of photovoltaic installations.

The flexible, dual wall, halogen free and cross linked solar wire offers long term stability and TÜV approval.

Its outstanding features include: high resistance against environmental conditions like humidity, UV-radiation and ozone.

In addition, it has excellent resistance to abrasion and temperature extremes.

The wire has a high dielectric withstand voltage and with its fine-stranded, tin plated copper conductor, it is easy to handle and to strip.

Standards

Approval:

- IEC 60228 Class 5 (stranded tin plated copper and flexible);
- TÜV certified according to 2Pfg1169/08.2007
- UL certified acc. Subject 4703



Material and Finish

- Conductor:**
Stranded tin plated copper
- Insulation:**
Electron beam cross-linked Polyolefin
- Sheath:**
Electron beam cross-linked halogen free Polyolefin
- Color:**
Black, Blue, Red

Mechanical Features

- (according TÜV requirements)
- Max. Conductor Temperature**
- Continuous:** +125 °C
- At Short Circuit:** +200 °C/5 s
- Min. Operating Temperature**
- Free Installation:** -40 °C
- Fixed Installation:** -60 °C
- Wire Size Range:**
- 2.5 mm² (AWG 14),
- 4.0 mm² (AWG 12),
- 6.0 mm² (AWG 10)
- Min. Bending Radius:**
- 5 x cable wire diameter, fixed installation

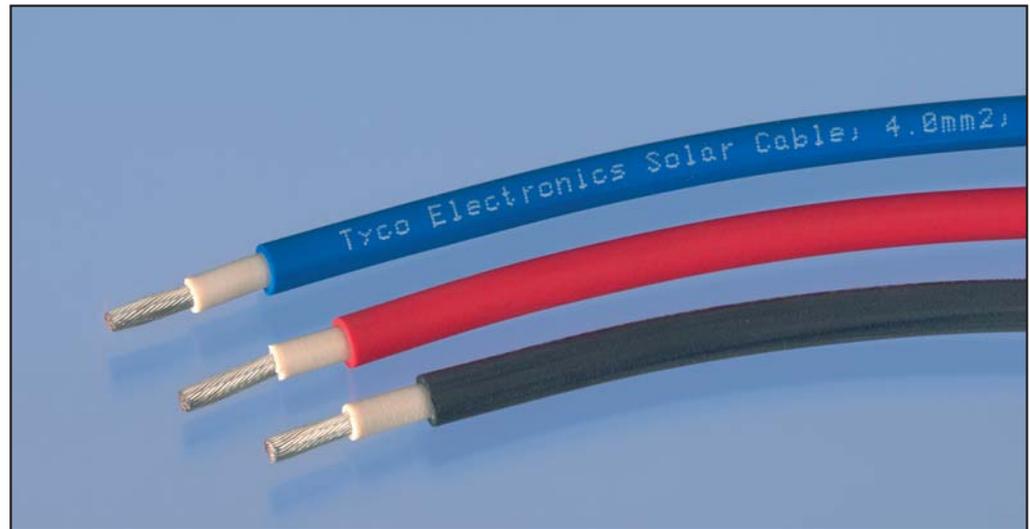
Electrical Features

- Voltage Rating:**
- 600/1,000 V AC / 1,800 V DC
- Test Voltage for 5 Minutes:**
- 6 kV
- Max. Current Carrying Capacity (Free in Air):**
- 2.5 mm² – 41 A
- 4.0 mm² – 55 A
- 6.0 mm² – 70 A

Additional, internal tests have been carried out.

Solar Cable, 1-Pole
Solar Cable, 1-Pole

- TÜV approved
(2Pfg1169/08.2007)
- UL approved
(Subject 4703)


TÜV Approved (ZKLA)

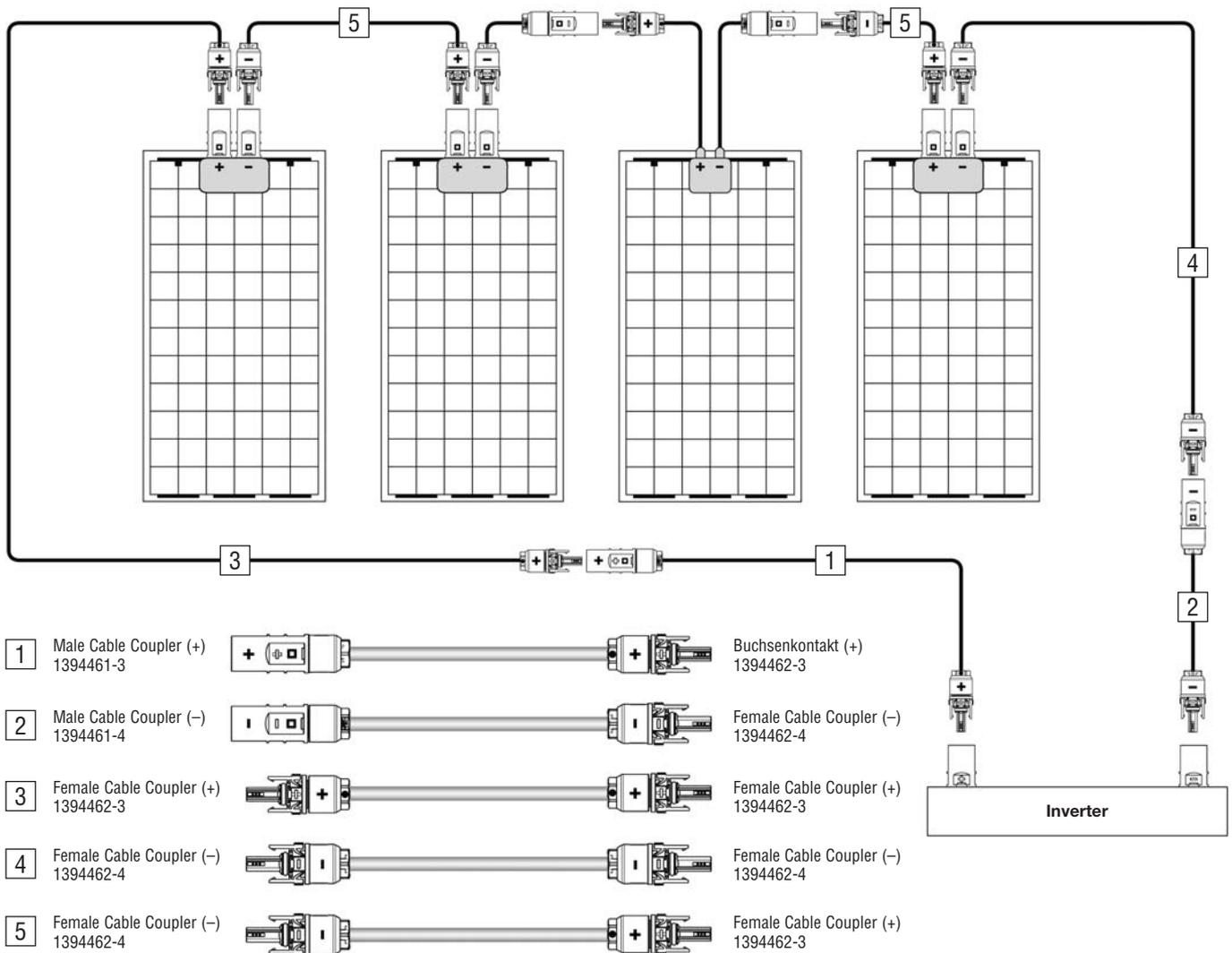
Part Number	Cable Cross Section		Outer Diameter		Color	Package Quantity (m)
	(mm ²)	(AWG)	(mm)	± Toleranz		
956297-4	2.5	14	6.65	+0.15/-0.10	Black	500
1-956297-4	2.5	14	6.65	+0.15/-0.10	Black	100
956297-5	2.5	14	6.65	+0.15/-0.10	Red	500
1-956297-5	2.5	14	6.65	+0.15/-0.10	Red	100
956297-6	2.5	14	6.65	+0.15/-0.10	Blue	500
1-956297-6	2.5	14	6.65	+0.15/-0.10	Blue	100
956298-4	4.0	12	6.90	+0.10/-0.10	Black	500
1-956298-4	4.0	12	6.90	+0.10/-0.10	Black	100
956298-5	4.0	12	6.90	+0.10/-0.10	Red	500
1-956298-5	4.0	12	6.90	+0.10/-0.10	Red	100
956298-6	4.0	12	6.90	+0.10/-0.10	Blue	500
1-956298-6	4.0	12	6.90	+0.10/-0.10	Blue	100
956299-4	6.0	10	7.35	+0.30/-0.25	Black	500
1-956299-4	6.0	10	7.35	+0.30/-0.25	Black	100
956299-5	6.0	10	7.35	+0.30/-0.25	Red	500
1-956299-5	6.0	10	7.35	+0.30/-0.25	Red	100
956299-6	6.0	10	7.35	+0.30/-0.25	Blue	500
1-956299-6	6.0	10	7.35	+0.30/-0.25	Blue	100

UL Approved (only USE-2)

Part Number	Cable Cross Section (AWG)	Outer Diameter (Inch)	Color	Package Quantity (Feet)
1986166-1	14	0.17	Black	7,500
1986166-2	14	0.17	Black	500
1986166-3	14	0.17	Black	2,500
1986165-1	12	0.19	Black	6,000
1986165-2	12	0.19	Black	500
1986165-3	12	0.19	Black	1,600
1986164-1	10	0.21	Black	5,500
1986164-2	10	0.21	Black	500
1986164-3	10	0.21	Black	1,000

For other Cross Sections (1.5 mm² to 400 mm²) as well as technical data please contact us.

Wiring Example with Extension Cables



Configuration Example at 4.0 mm².

Cable Assembly

Wire Size:
4.0 mm²

Color:
Black

Cable Assembly Version	Part Numbers for Cable Length				
	1 m	3 m	5 m	10 m	20 m
1	1987376-1	1987376-2	1987376-3	1987376-4	1987376-5
2	1-1987376-1	1-1987376-2	1-1987376-3	1-1987376-4	1-1987376-5
3	2-1987376-1	2-1987376-2	2-1987376-3	2-1987376-4	2-1987376-5
4	3-1987376-1	3-1987376-2	3-1987376-3	3-1987376-4	3-1987376-5
5	4-1987376-1	4-1987376-2	4-1987376-3	4-1987376-4	4-1987376-5

All used components are TÜV and UL approved.

More variants (cable length, wire diameter, color) upon request.

Grounding Solutions

Product Features

- Self-tapping screw or nut and locking ring
- Quick and easy mounting
- Four-point contact to wire
- Low interface resistance
- Toolless termination
- Re-terminateable up to 5 times
- UV resistant
- Weather-proof
- RoHS compliant
- UL approved
- TÜV in preparation



SolKlip Grounding Clip



AWG 6-8 Grounding Connection

Description

SolKlip ground clips are designed for solar panel grounding applications using solid un-insulated copper 10 AWG and 12 AWG.

Applications

Solar panels and related products that require grounding for safety reasons.

Applications include: wire jumpers between solar panels, solar roof tiles and between panels and the AC/DC inverters.

Electrical

The electrical performance of this product will meet the tough requirements of photovoltaic grounding applications.

Product Offering & Dimensions

SolKlip for Solar Grounding (Part No. **1954381-x**) to handle solid, un-insulated ground wire from 4 mm² (AWG 12) to 6 mm² (AWG 10). For larger wires from 10 mm² (AWG 8) and 16 mm² (AWG 6) please use the AWG 6-8 Grounding Connector.

Application Tooling

No special tooling required.

Approvals

- UL 467 pending
- UL 486A-B pending
- TÜV in preparation

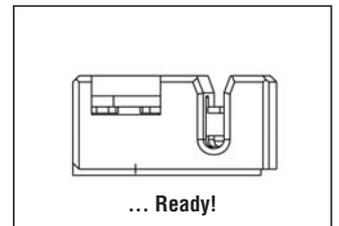
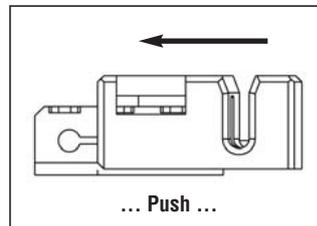
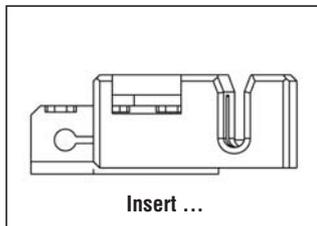
Materials

- Housing:** Durable PPT.
- Contact:** High conductivity copper alloy

Mechanical

The mechanical properties of this product will meet the tough requirements for grounding applications laid down in the UL requirements.

3 Easy Steps to Ground Your PV System

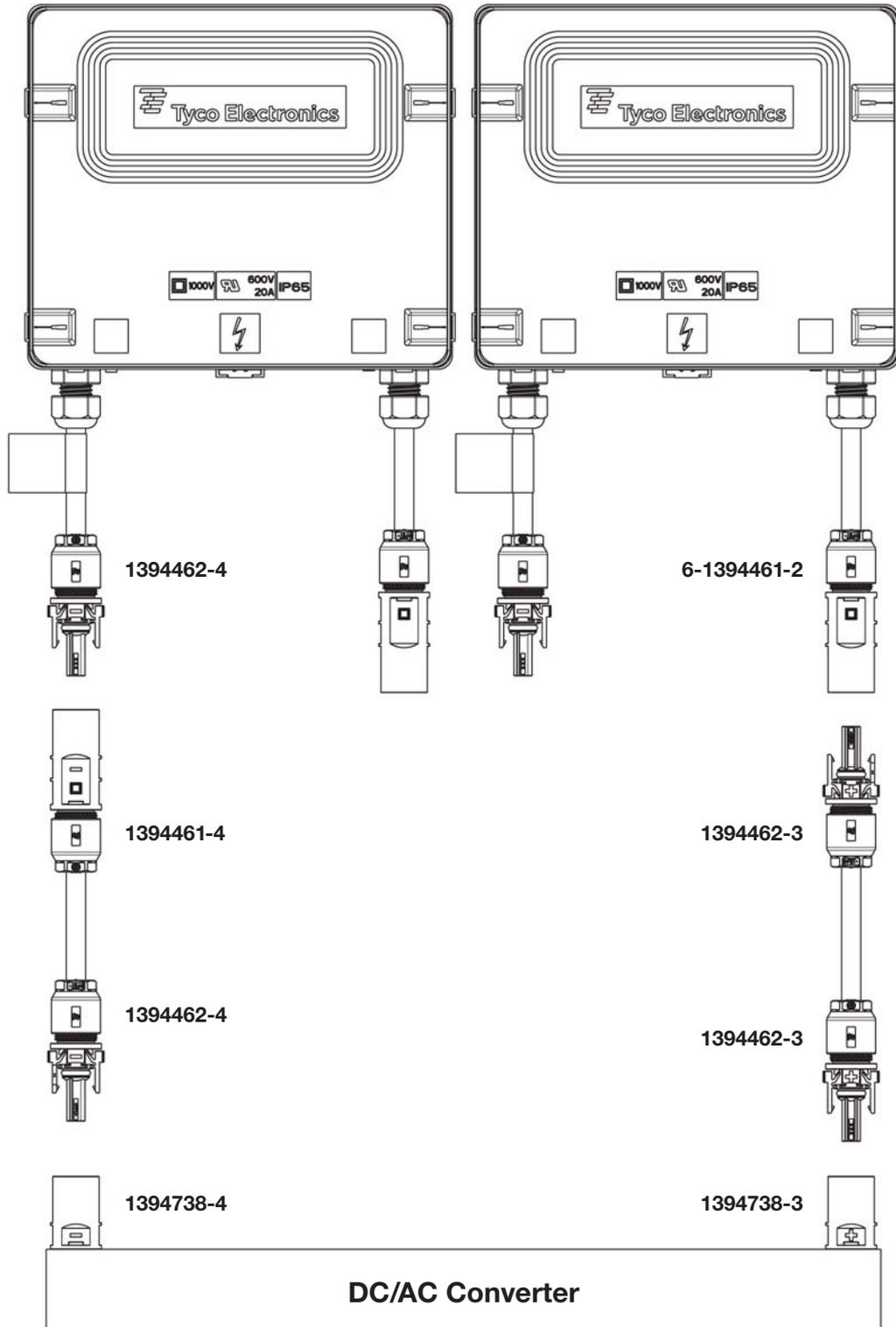


Grounding Solutions

Part Number	Description	Package Quantity
1954381-1	SolKlip with Self-Tapping Screw	100
1954381-2	SolKlip with Screw and Nut	100
1954381-3	SolKlip with Screw, Nut and Locking Ring	100
2058729-1	AWG 6-8 Grounding Clip	100

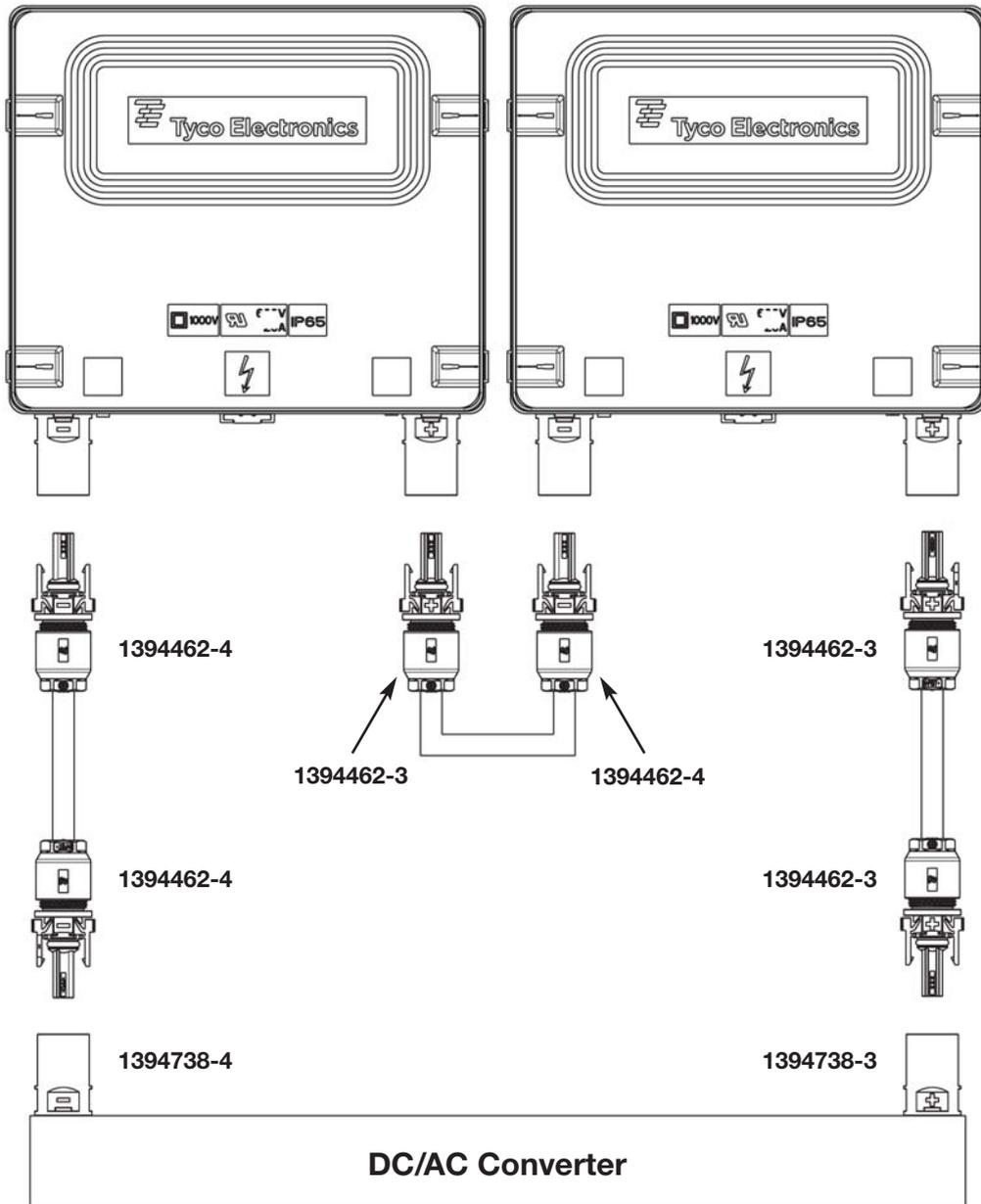
Interconnection Examples

Serial Interconnection for Junction Boxes with Cable Glands (4.0 mm² Wiring)



Interconnection Examples (continued)

**Serial Interconnection for Junction Boxes with Plug Connectors
(4.0 mm² Wiring)**



Application Tooling

Cable Assembly Tooling



Hand Crimping Tool for Screwed Contacts
incl. Vario Crimp Head and Locator
Part Numbers
1-1579004-1 (1.5 + 2.5 mm²)
1-1579004-2 (4.0 + 6.0 mm²)
Vario Crimp Head
7-1579001-8 (1.5 + 2.5 mm²)
7-1579001-9 (4.0 + 6.0 mm²)



Hand Crimping Tool for Stamped & Formed Contacts
incl. Vario Crimp Head and Locator
Part No. **2063900-1**
for 2.5–6.0 mm² (AWG 10–14)

Applicator for Strip Form Contacts
Part No. **1855503-1**



Extraction Tool
suitable for all wire sizes
Part No. **1102855-3**



Insulation Stripper
includes length stop for all wire sizes: 1.5 mm², 2.5 mm², 4.0 mm² and 6.0 mm².
Suitable for Tyco Electronics Solar Cable.
Part No. **4-1579002-2**

**SOLARLOK
Electric Terminator CS 200**

Base Machine:
Part No. **539630-1**



Electric Terminator CS 200 for Screwed Contacts
Adapter for Vario Crimp Head:
Part No. **1579000-4**

Vario Crimp Head (1.5 and 2.5 mm²):
Part No. **7-1579001-8**

Vario Crimp Head (4.0 and 6.0 mm²):
Part No. **7-1579001-9**

Vario Crimp Head (AWG 10):
Part No. **8-1579001-2**

Vario Crimp Head (AWG 12):
Part No. **5-1579001-5**

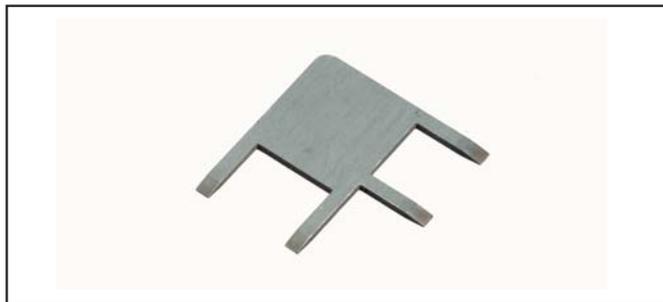
Application Tooling (continued)

**Junction Box
Assembly Tooling**



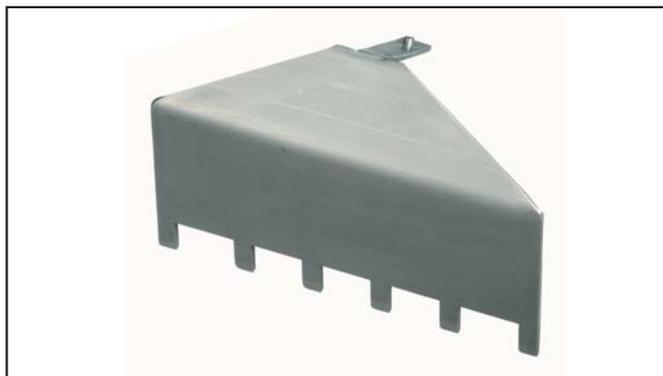
Wire Spring Clamp Tool

Part No. **1579007-2**



**Dioden/Jumper
Spring Clamp Tool**

Part No. **1579007-5**



Foil Spring Clamp Tool

Part No. **1740969-3** 5-Rail Box

Part No. **1740969-1** Medium Box

Part No. **1740969-2** Small Box

Field Service Kit

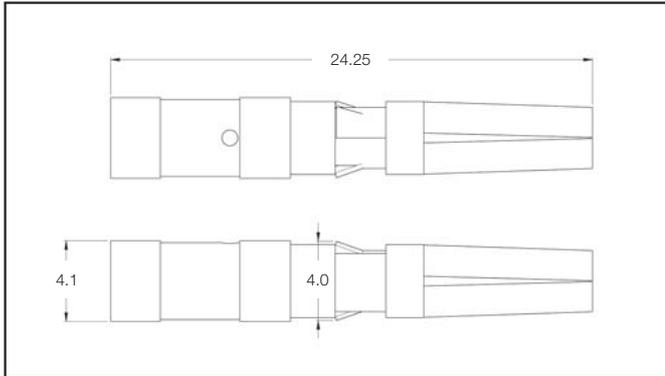
Part No. **1534858-1**
(Metric Wire)



Kit includes the following parts:

- 100 Cable Coupler (Housings, Plus and Minus coded)
- Crimp Contacts (4.0 and 6.0 mm²)
- Strain Relief
- Seals
- **Hand Crimp Tool:**
Part No. **1-1579004-2**
- **Extraction Tool:**
Part No. **1102855-3**
- **Insulation Stripper:**
Part No. **4-1579002-2**

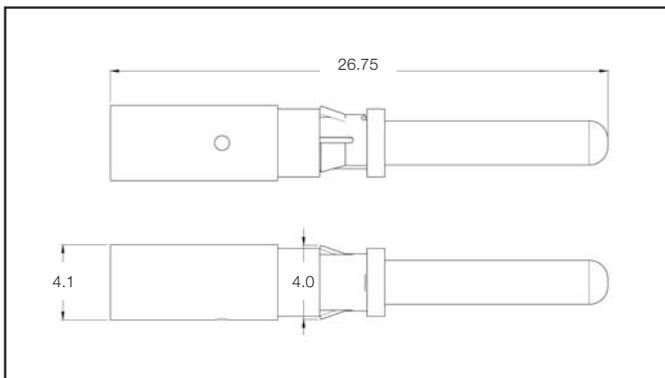
Contacts



Female Contacts (Screw-Machined)

Material: Copper alloy, silver plated

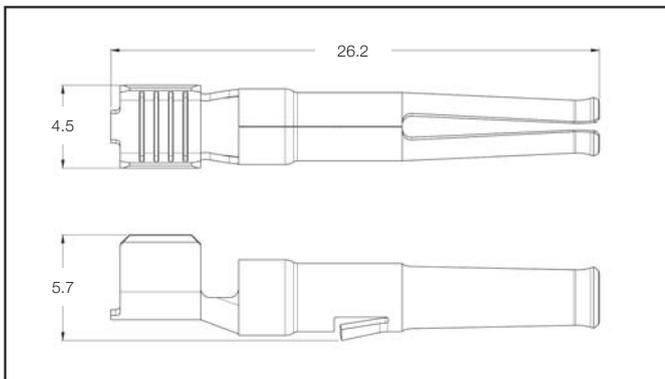
Wire Size		Part Number	Package Quantity
(mm ²)	(AWG)		
2.5	-	1987281-1	100
4.0	-	1987281-2	100
6.0	AWG 10	1987281-3	100
-	AWG 14	1987281-4	100
-	AWG 12	1987281-5	100



Male Contacts (Screw-Machined)

Material: Copper alloy, silver plated

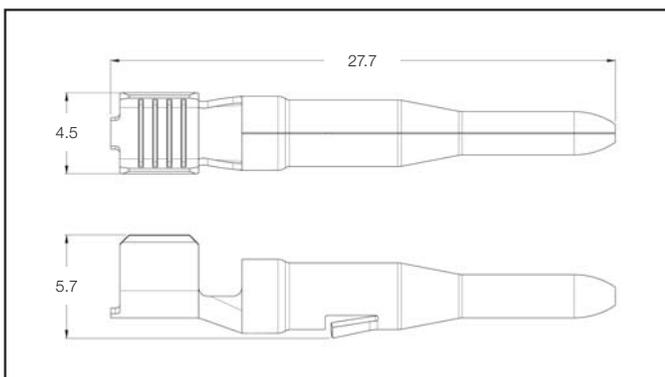
Wire Size		Part Number	Package Quantity
(mm ²)	(AWG)		
2.5	-	1987280-1	100
4.0	-	1987280-2	100
6.0	AWG 10	1987280-3	100
-	AWG 14	1987280-4	100
-	AWG 12	1987280-5	100



Female Contacts (Stamped and Formed)

Material: Copper alloy, silver plated

Wire Size		Part Number	Package Quantity
(mm ²)	(AWG)		
2.5-4.0	12-14	2058454-3	100 (Loose-Piece)
		2058454-2	6,000 (Strip Form)*



Male Contacts (Stamped and Formed)

Material: Copper alloy, silver plated

Wire Size		Part Number	Package Quantity
(mm ²)	(AWG)		
2.5-4.0	12-14	2058453-3	100 (Loose-Piece)
		2058453-2	6,000 (Strip Form)*

***) Note:** Strip Form is only suitable for processing with Applicator, Part No. **1855503-1**.

Assembly and Installation Guidelines

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SOLARLOK Plug Connector

Attention: This connector is to be used only to interconnect firmly fixed cables.

Do not disconnect under load.

Current path should only be disconnected using approved disconnect devices.

Cable assemblies shall be labeled with Part No. **1394470-1**.

To protect against shock, ensure that conductors and their associated connectors are separated from opposite polarity components.

IMPORTANT NOTE

Mounting and installation must be done by qualified and trained staff considering all applying safety regulations. Tyco Electronics disclaims any warranty as a result of non-compliance to these notes.

1. General Comments

Any kind of pollution (dust, oil, humidity, etc.) during the assembly process or to the unmated connector can degrade contact and connector performance. This applies in particular to the seals and the crimping of the contacts.

A clean assembly environment is therefore essential.

2. Termination of the Cable Wires and Crimping of the Contacts

SOLARLOK connectors use different crimp contacts for various wire gauges. Possible wire gauges are 2.5 mm², 4.0 mm², 5.3 mm² und 6.0 mm² resp. AWG 14, AWG 12 and AWG 10.

The tools to be used are selected based upon the wire gauge.

For the application specification, please refer to specification # 114-74013.

3. Handling of the Connectors

3.1 Selection of Sealing Grommet for Cable Connectors

Use only appropriate wire gauges.

Besides the standard seal/pinch ring combination further five different seals are available.

- 4.0 mm grommet inner diameter (for insulation diameter from 3.2 to 4.3 mm), Part No. **1394465-5**
- 5.0 mm grommet inner diameter (for insulation diameter from 4.3 to 5.3 mm), Part No. **1394465-1**
- 6.0 mm grommet inner diameter (for insulation diameter from 5.3 to 6.2 mm), Part No. **1394465-2**
- 7.0 mm grommet inner diameter (for insulation diameter from 6.2 to 7.2 mm), Part No. **1394465-3**
- 8.0 mm grommet inner diameter (for insulation diameter from 7.2 to 8.0 mm), Part No. **1394465-4**

The grommet has to be matched with the outer diameter of the solar cable (see customer drawing, Part No. **1394461** and Part No. **1394462**) and the pinch ring (Part No. **1418677-2**) must be applied.

Assembly and Installation Guidelines (continued)

When assembling the connectors, the following sequence must be followed:

- ① Stripping the Wire (please refer to application specification # 114-74013).



Fig. 1

- ② Insert the stripped wire into the wire crimp barrel until it stops. While holding the wire in place, squeeze tool handles together until ratchet releases.



Fig. 2

- ③ Push contact with cable into the connector housing (incl. seal/pinch ring combination and backshell) until you hear the contact is locked into position.

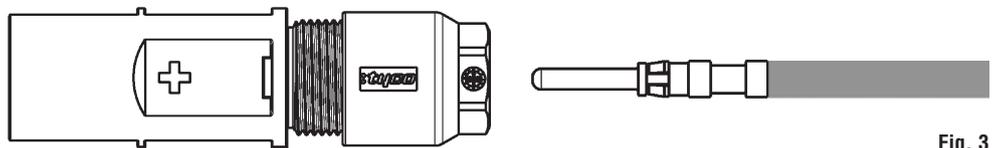
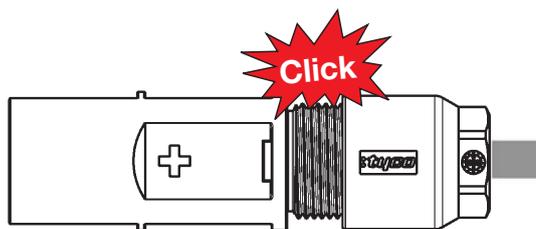


Fig. 3



- ④ Tighten backshell nut to 1.5 Nm.

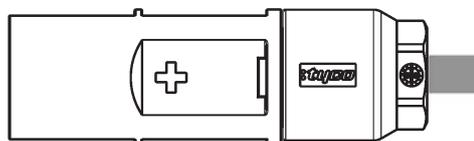


Fig. 4

Assembly and Installation Guidelines (continued)

3.2 Connector Latching

When mating the SOLARLOK connectors, ensure the following:

- Connectors labeled with a plus or minus are keyed and can only be mated to similarly marked and keyed connectors.

CAUTION:

The “neutral” designated pin connectors incorporate no keying features and must only be used for Serial Interconnection of Photovoltaic Modules. The neutral product should not be used where maintaining polarity is critical.

The polarity of the “neutral” connector must be labeled with Part No. **1394725-1** or Part No. **1394725-2** nearby the connector.

- The connector system is fully latched only when the latches are flush with the mating connector.
- After the connector is fully latched, the optional latch locking clip may be snapped into place.

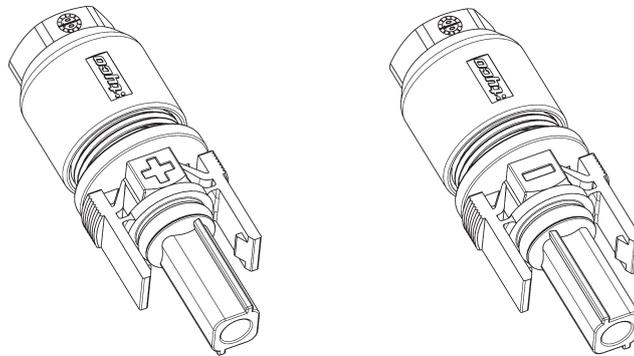


Fig. 5
(Female Connector)

3.3 Disconnecting

CAUTION: This connector must not be disconnected under load.

Disconnect circuit from load before unplugging connectors.

Cable assemblies should be labeled using Tyco Electronics Label, Part No. **1394470-1**.

Unmating of the connector

CAUTION: Do not disconnect the connector under load!

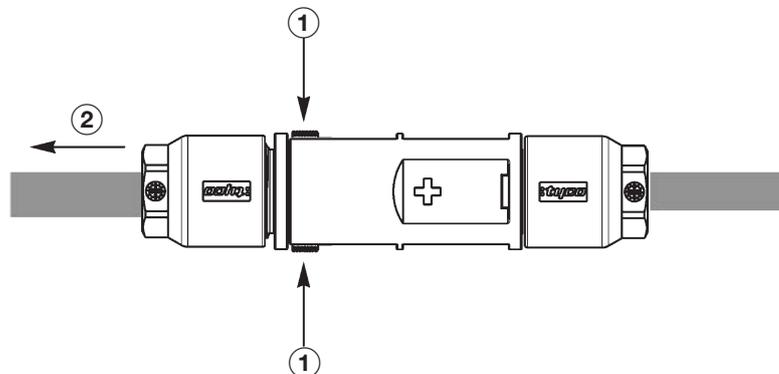


Fig. 6

- ① The locking mechanism is opened by depressing the latches.
- ② Pull out the connectors. While depressing the latches, disconnect the connector by pulling the connector halves apart.

4. Application Examples

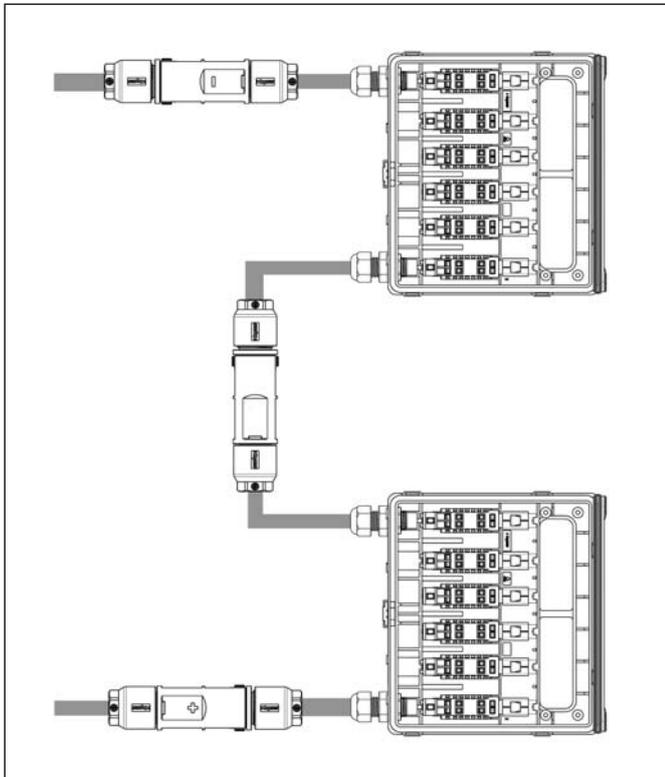


Abb. 7: Serial (Wire Diagram)

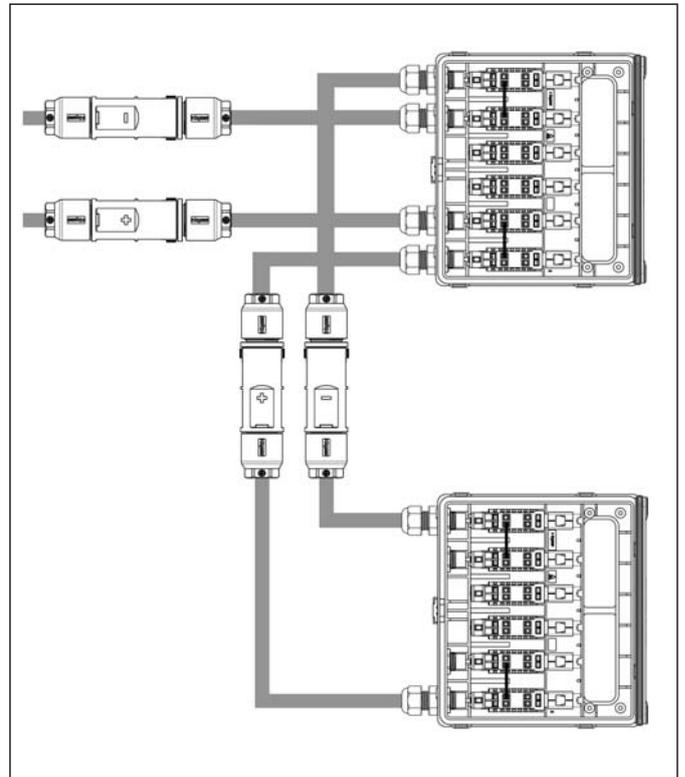


Abb. 8: Parallel (Wire Diagram)

5. Storage

See Product Specification 108-18701

6. Tooling

- Find available tools for the contact crimping on page 26 (please specify required wire gauge).
- An extraction tool (Part No. **1102855-3**) is needed to disassemble the connector components. This tool is used to unlock the contact retention features, after which the contact can be removed and re-used if necessary.

Technical Description

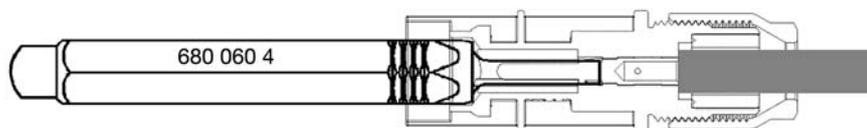


Fig. 9

Technical Data (Junction Box and One Pole Plug Connectors)
Materials

Socket and Pin Contacts:	CuZn
Housing:	PPO, weatherproof against UV radiation and ozone

Color

Connector, Junction Box:	Black
--------------------------	-------

Electrical Features

Withstanding Voltage:	1000 V DC
Current Rating:	up to 25 A
Contact Resistance:	$\leq 5 \text{ m}\Omega$
Contact Resistance (typical):	1 m Ω
Protection Class:	II

Mechanical Features
Junction Boxes

Dimensions:	Depending on junction box type
Temperature Range:	-40 °C to +105 °C
Wire Size Range:	up to AWG 12
Protection Degree:	IP 65, closed

Connector

Dimensions:	Diameter 18 mm, (diameter 0.71 inch)
Temperature Range:	-40 °C to +105 °C
Wire Size Range:	AWG 14, AWG 12, AWG 10 stranded wire
Protection Degree:	IP 67, mated
Contact Finish:	silver plated,
Mating Cycles:	50, silver plated
Unmating Force:	30–40 Newton
Additional Features:	Coded housing ensures mating safety Contact voltage-proof Connector with crimp technology

Standards	IEC 61215 Edition 2, 61646, IEC 61730, Protection Class II, UL 1703
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Subject to Change.

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Fax: +358-95-12-34-250

France – Cergy-Pontoise Cedex
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Fax: +33-1-3420-8600
Product Information Center:
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Fax: +33-1-3420-8623

France Export Divisions –
Cergy-Pontoise Cedex
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Fax: +33-1-3420-8699

Germany – Bensheim
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Fax: +49-6251-133-1600
Product Information Center:
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Fax: +36-1-289-1010
Product Information Center:
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Fax: +353-1-866-5714

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Lithuania and Latvia
Lithuania – Vilnius
Phone: +370-5-213-1402
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Fax: +31-73-6212-365
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Fax: +31-73-6246-998

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Fax: +47-66-77-88-55

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Fax: +48-22-4576-720

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Fax: +40-21-312-0574

Russia – Moscow
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Fax: +7-495-721-1893
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Fax: +7-495-790-7902-401

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Sweden – Upplands Väsby
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889753-3 Revised 9-2009 12M ST



SOLARLOK Interconnection System Installation Manual



Installation Manual

1. Safety Note



- The SOLARLOK connector is to be used only to interconnect firmly fixed cables.
- **Do not disconnect under electrical load!**
- Electrical current path should only be disconnected using approved devices.
- Only cables released from TE Connectivity are permitted to be used with SOLARLOK component cable assemblies.
- SOLARLOK component cable shall be labeled with label PN 1718077-1 “Do not disconnect under load”.
- To protect against shock, ensure that conductors and their associated connectors are separated from opposite polarity components.
- Unconnected connectors **must** always be protected from pollution (e.g. dust, humidity, foreign particles, etc.), prior to installation. Do not leave unconnected (unprotected) connectors exposed to the environment. The usage of TE connector dust caps is strongly recommended.
- Connectors that are unmated in the field should also be protected from pollutants.
- Do **NOT** use any **oil or lubricants** during mounting.



2. Tools

(1) Stripping Tool	1.5 mm ² – 6.0 mm ² , 10 AWG	PN 4-1579002-2
(2) Crimping Tool	4.0 mm ² and 6.0 mm ² , 10-12 AWG	PN 1-1579004-2
(3) Extraction Tool	all terminals	PN 1102855-3
(4) Field Service Kit	all in one	PN 1534858-1



Installation Manual

3. Assembly Steps

- 3.1** Using the appropriate wire stripping tool, strip the wire **9 mm ± 1 mm** without damaging the strands.



- 3.2** Insert the stripped wire into the terminal wire crimp barrel until it stops. While holding the wire in place, squeeze the crimp tool handles together until the ratchet releases.



- 3.3** Press the seal and cable pinch ring assembly into the connector housing until it stops. **If you use the pre-assembled connector kit, please go to 3.5!**



- 3.4** Screw back shell nut onto connector housing.



Installation Manual

Pre-Assembled (Connector Kit)

- 3.5** Push contact with cable into the connector housing until you hear the contact give an audible click and you feel the contact reach the end position. To verify contact engagement, give a slight gentle pull back on the cable, to be sure that the contact is locked.

“CLICK”

- 3.6** Tighten the cable screw lock. The initial assembly tightening torque is **1.3 + 0.2 Nm**. For this, a slotted socket wrench with wrench size 13 mm, is recommended.

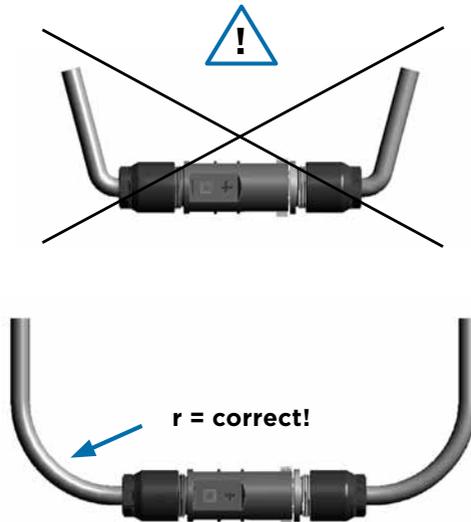
**4. Connector Mating**

- When mating the SOLARLOK connectors, connectors labelled with a “+” or “-” are keyed and can only be mated with equally (same polarity) marked and keyed connectors.
- The connector system is fully latched only when the latches have clicked onto the mating connector.
- The “neutral” designated male connector incorporates no keying features and may be freely mated to either “+” or “-” keyed plug connectors. The neutral product should not be used when maintaining polarity is critical. It is only permitted for serial connections.

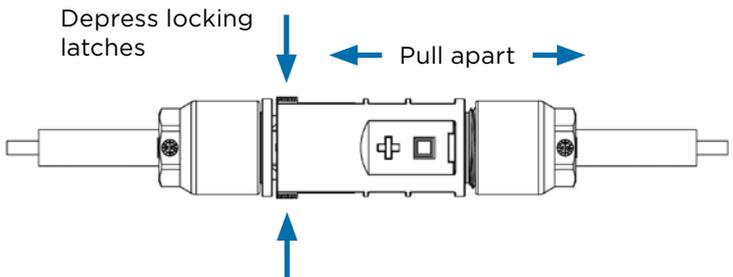
Installation Manual

5. Wiring

Radius (r) min. 5x cable Ø



6. Connector Unmating



Installation Manual

Table 1

Available Connector Kits for SOLARLOK Interconnection System			
Female Cable Connectors			
Part Number	Description	Wire Size	Insulation O.D. Range
4-1394462-6	Plus Female	2.5mm ² / 14AWG	4.5 to 6.0 mm / 0.177-0.236 in
4-1394462-8	Plus Female	4.0mm ² / 12AWG	4.5 to 6.0 mm / 0.177-0.236 in
6-1394462-3	Plus Female	6.0mm ² / 10AWG	4.5 to 6.0 mm / 0.177-0.236 in
4-1394462-7	Minus Female	2.5mm ² / 14AWG	4.5 to 6.0 mm / 0.177-0.236 in
4-1394462-9	Minus Female	4.0mm ² / 12AWG	4.5 to 6.0 mm / 0.177-0.236 in
6-1394462-4	Minus Female	6.0mm ² / 10AWG	4.5 to 6.0 mm / 0.177-0.236 in
Male Cable Connectors			
1394461-7	Plus Male	2.5mm ² / 14AWG	4.5 to 6.0 mm / 0.177-0.236 in
7-1394461-0	Plus Male	4.0mm ² / 12AWG	4.5 to 6.0 mm / 0.177-0.236 in
7-1394461-3	Plus Male	6.0mm ² / 10AWG	4.5 to 6.0 mm / 0.177-0.236 in
1394461-8	Minus Male	2.5mm ² / 14AWG	4.5 to 6.0 mm / 0.177-0.236 in
7-1394461-1	Minus Male	4.0mm ² / 12AWG	4.5 to 6.0 mm / 0.177-0.236 in
7-1394461-4	Minus Male	6.0mm ² / 10AWG	4.5 to 6.0 mm / 0.177-0.236 in
6-1394461-3	Neutral Male	2.5mm ² / 14AWG	4.5 to 6.0 mm / 0.177-0.236 in
7-1394461-2	Neutral Male	4.0mm ² / 12AWG	4.5 to 6.0 mm / 0.177-0.236 in
7-1394461-5	Neutral Male	6.0mm ² / 10AWG	4.5 to 6.0 mm / 0.177-0.236 in



Male housing



Female housing

Table 2

Replacement Contacts (screw-machined) for SOLARLOK System		
Wire Gauge Wire Size	Male Contact PN	Female Contact PN
2.5 mm ² 14 AWG	0-1987280-1	0-1987281-1
4.0 mm ² 12 AWG	0-1987280-2	0-1987281-2
6.0 mm ² 10 AWG	0-1987280-4	0-1987281-3

*HVT contact system

Maximum Operating Conditions

Max. system voltage:

1000V (for UL 600V), max. current 25A@85°C

Ambient temperature:

-40°C up to 85°C, (for UL 75°C) at full load

Please also refer to the following specifications:

Application specification 114-18488-1 as well as instruction sheets 411-18305-1 and 114-94061-1 to ensure correct connector assembly and crimp quality. For additional details, please refer to product specification 108-18701.

For additional info, please visit our website at:

te.com/solar

Installation Manual

Accessories: Dust Covers

Female Housing - Dust Cap	
PN	Package Quantity
1987424-1	100



Male Housing - Dust Plug	
PN	Package Quantity
1987419-1	100



The usage of connector re-usable dust covers until final assembly is strongly recommended. When the dust cover is mounted, the connector fulfils IP44 (dust and splash proof) according to IEC 60529.

Installation Manual

Connector Safety Devices

Locking Collar				
PN	Unlock through	Required	Instruction Sheet	Package Quantity
2106207-1	Flat-blade-screwdriver	NEC* / USA UTE C15-712 / France	408-10296	100

*for detailed informations see NEC 2008: 690.33



Safety Clip Pivoted			
PN	Unlock through	Required	Package Quantity
1534226-1	Tool less	-	100



Installation Manual

Solar Cable

USE-2 Solar AWG Cable			
Wire Size	Color	Part Number	Quantity
14 AWG	Black	1986166-2	500
	Black	1986166-3	2500
12 AWG	Black	1986165-2	500
	Black	1986165-3	1600
10 AWG	Black	1986164-2	500
	Black	1986164-3	1000



This UV resistant cable can be used in the following photovoltaic applications:

- Between solar panels
- Between solar roof tiles
- Between panels and the AC/DC inverters

Approval:

- UL 854 approved 
- Approved for outdoor use

Material:

- Cable conductor is pre-tinned, stranded copper wire.
- Outside wire jacket provides a robust layer of protection and is UV resistant

Voltage:

600V

Temperature Range:

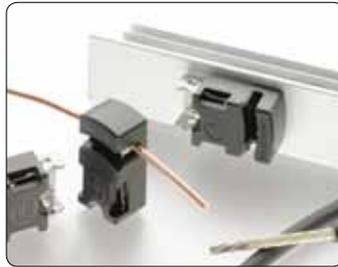
-40 °C - +90 °C

Installation Manual

Grounding Solutions

Grounding Clip and Grounding Bolt Only for solid un-insulated copper wire			
PN	Description	Instruction Sheet	Package Quantity
1954381-1	12-10AWG Grounding Clip with Self-Tapping Screw	408-10160	100
1954381-2	12-10 AWG Grounding Clip with Screw and Nut	408-10160	100
1954381-3	12-10 AWG Grounding Clip with Screw, Nut and Locking Ring	408-10160	100
2106831-1	6-12 AWG Grounding Bolt, # 10-32 UNC Long Tail	408-10262	100
2058729-1	6-12 AWG Grounding Bolt, # 8-32 UNC Std Tail	408-10262	100

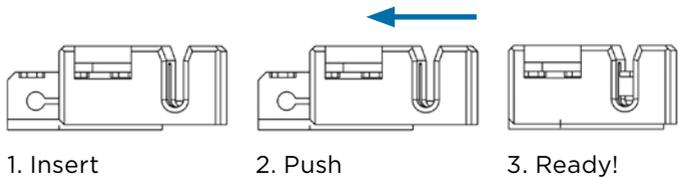
Grounding Clip 



Grounding Bolt 



3 easy steps to ground your PV system:



FOR MORE INFORMATION

te.com/solar

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Mexico	+52 (0) 55-1106-0800
Latin/S. America:	+54 (0) 11-4733-2200
Germany:	+49 (0) 6251-133-1999
UK:	+44 (0) 800-267666
France:	+33 (0) 1-3420-8686
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Part numbers in this brochure are RoHS Compliant*, unless marked otherwise.

*as defined www.te.com/leadfree

te.com/solar

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Telephone, Data and TV
in any room you like
The LexCom Home Network
lets you take control of your home





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This document is not intended to be a comprehensive guide to all aspects of network cabling systems for residential buildings. The information contained in this document is advisory only. It is the responsibility of the installer to be adequately trained and aware of the relevant standards and regulations pertaining to the installation practices and requirements for these types of home network products.

Schneider Electric NZ Ltd (hereafter referred to as “PDL”) reserves the right to change specifications, designs or wording included in this document without notice and without obligation.

A Structured Network for the Home

The LexCom Home Network is a unique and flexible network suitable for houses and apartments. It provides a universal installation for telephone, data and television connections. The LexCom Home Network can, for instance, be connected to broadband internet, making it possible to use all the services offered by that technology throughout the home.

The LexCom Home Network can be adapted for everything from small installations in individual houses to several installations in an apartment building or complex. In apartments, every dwelling can be equipped with its own LexCom Home Network connected to the incoming telephone/TV/data network of the building. Essentially, the LexCom Home Network is the new home network for IT, communication and entertainment.

Built-in Flexibility

LexCom Home Network is a 'structured' installation in which a number of outlets of the same type are connected by cables to a distribution centre. Incoming cables for telephone, data, television, etc. are connected at the distribution centre, and patch leads are used to route the incoming signals to individual outlets around the home.

This gives LexCom Home Network amazing flexibility, as it is extremely quick and easy to reconfigure any outlet in any room to receive whichever incoming signal you require.

A telephone outlet can easily be switched to receive TV, radio or internet signals within seconds.

Easy to Install

The LexCom Home Network is quick to install, thanks to its well thought out assembly methods. It has been developed to achieve high performance and reliability, with the best products on the market chosen and tested to ensure that the system works properly without compatibility problems. The network provides an infrastructure for three forms of media (data, telephone and television) **all on the same cable**, instead of a specific type of cable that would be needed for each medium.

High Capacity

PDL's LexCom Home Network has been designed to accommodate high bandwidth data transmission demands. The system has a very high capacity, with a frequency range of up to 900 MHz. Its data components satisfy and exceed the requirements for Category 6 networking.

Design for the Future

The LexCom Home Network is designed with future home needs in mind. Its modular design makes it easy to use and easy to upgrade, allowing you to replace parts to obtain higher speeds or to add new functionality as technology moves forward.

Just connect and go>



All the outlets in your home are identical, irrespective of the device that you wish to connect. These high quality outlets provide the means for you to make maximum use of your **LexCom** Home Network system. Plug in TVs, computers or phones anywhere in the house.

The connecting cables have been adapted to suit the device, with three types of connecting cables for telephones, computers, and TVs. These connection cables follow the devices when they are moved from the outlet in one room to another. The function of each outlet is easily defined and redefined at the distribution cabinet. With LexCom Home Network, you **just connect and go**>



Think ahead. It is impossible to predict today what requirements a home network will have to meet in five years' time. There are many experts but they don't always agree. One thing is certain – electronic communication is increasing to an extent that we can scarcely imagine.

Using it will call for high capacity and we will probably want to have access to the network almost everywhere in the home. So we are not likely to have too many network outlets. The best approach would be to have a few extras from the outlet. With a LexCom Home Network you can furnish your home so that the computer fits in. In days gone by, it had to be close to a spare phone outlet. And with a home network you can have more than one computer in your home, so that you can share files, your internet connection, printer and all of your digital media files.

Easy to Change the Function of the Room Outlets

1.



The distribution cabinet is similar to a computer patch panel. For every outlet in a room there is a corresponding port at the distribution cabinet with the same numbering.

2.



Using a patch cable, the room outlet is connected with either the TV, telephone or data module, depending on your intended use. The outlet has now been defined.

3.



If you want to alter the function of a TV outlet in a room to enable a computer to be used, simply disconnect the cable from the TV module and insert it into the module marked 'data'. The outlet is now reconfigured for computer use.

The **LexCom** Home Network system comprises a central distribution cabinet, active modules to handle the incoming signals, and outlet ports to transport those signals to the various rooms around the house.

In addition to these, the **LexCom** system also incorporates various AV and FM modulators, Infrared sensors, cable and connecting leads.

The following is a general overview of some of the main components in a **LexCom** Home system. Please refer to the technical section for more details.

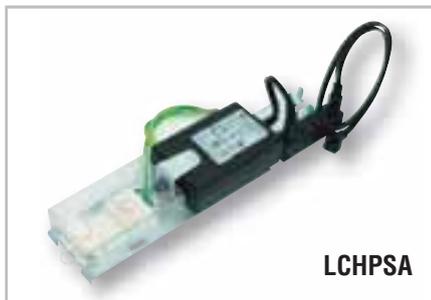


Distribution Cabinet

The distribution cabinet is the “hub” of the LexCom system. It houses the active modules and outlets to rooms, and is where the incoming and outgoing signals are patched.

It is available in both 14" and 22" sizes. The 14" cabinet can house 4 active modules and 16 outlets. The 22" cabinet can house 6 active modules and 26 outlets. Both cabinets can be expanded using high-density patch frames up to a maximum of 40 outlets (or 24 for the 14" cabinet), and both can be surface or flush mounted.

The Distribution Cabinet is also where the incoming telephone and MATV signals are connected.



Power Supply

A 12V DC transformer is provided to supply power to the active modules. (The TV amp module and data switch require 12V supply.)



Data Module

The data module is a switch with four ports to connect computers, printers and other hardware with network interfaces. The module also has an uplink port for connection to an external network such as broadband/ADSL. The module supports data rates of 10/100 Mbit/s.



Telephone Modules

Incoming telephone lines are connected to the telephone modules. The two versions distribute between two and four incoming analogue lines and both have eight ports for connection through to telephone and fax outlets. The LCHT100 has several settings for grouping the two analogue lines to the outlets to accommodate changing priorities. The LCTI04 also provides an RJ31x security jack.



LCHA110

TV Amplifier Module

The TV amplifier module distributes television and radio signals throughout the network. The LCHA110 module has an RF input for the incoming antenna cable and six ports for patching through to the rooms. It also features an AV link port for connection to an AV modulator or PC player.



LCHC110

AV Combiner

The AV combiner allows 2 or 3 AV modulators or PC players to be connected into the AV input port of the LCHA110 amplifier module. It combines the 3 AV signal inputs and forwards the combined result to the single output port, supporting infrared remote control on all devices as standard.

LCHAV110-1



LCHAV111-4

AV Modulators

Two options of AV modulators (either single channel or four channels) are available for the distribution of AV signals (DVD, VCR, security video cameras or Pay TV decoders) to multiple locations in the LexCom Home Network. The AV modulators convert composite video signals from these entertainment devices into TV channels and send them to the LCHA110 TV amplifier module for further distribution. Both AV modulators support remote infrared control of the connected entertainment devices.



LCHPCP110

PC Player

The PC player has a built-in FM stereo modulator and has been designed for the distribution of MP3 music, internet radio, etc. throughout the home. It creates an FM radio channel for the sound signal connected to its input, allowing the stereo sound from any source to be transmitted into the LexCom Home Network via the LCHA110 TV amplifier module. This signal can then be made available at any stereo receiver in the home. (Source can be a PC, portable CD player, MP3 player etc.)

LCHIRRS



LCHIRE

Infrared Link

The infrared link, in conjunction with the LCHA110 TV amplifier module, makes remote control of entertainment devices like a DVD, VCR or Pay TV decoder possible from all TV sets around the home.

The infrared link consists of component IR emitters and receivers. Receivers are located at the TV where the remote control is to be used. Emitters are located over the IR eye of the entertainment device to be controlled and are linked either to an AV modulator or directly to the LCHA110 TV amplifier module.



LCHTERMPLUG

Termination Plug

The termination plug provides a 100 ohm termination of the conducting twisted pair wires for radio/TV/audio-visual applications. It is a requirement that termination plugs are inserted into unused output ports of the TV amplifier module to provide better response stability of the amplifier and minimise RF emissions. Any unused input of the AV combiner and the AV input of the TV amplifier module should also be terminated by this plug to prevent noise being introduced into the system.



LCHITA15

Attenuator

The attenuator is a plug-in unit for outlets to compensate for short link problems with TV signals. Three options are offered, providing different levels of attenuation to the TV signals and thus simulating different lengths of the cable link.



LCHLTVP

Patch Leads

Patch leads are used only at the distribution cabinet to connect the incoming signals to the required outlet. These leads are available in either fully shielded (STP) used for TV/video or unshielded (UTP) used for telephone and data.



LCHLTVWH

Connecting Cords

Three types of connecting cords are used to connect TV/radio, data and telecommunication devices to the wall mounted outlets.

TV/radio cord: Shielded, RJ45 to coax.

Data cord: Shielded, RJ45 to RJ45, Category 6.

Telephone cord: Unshielded, RJ11 to RJ45.



LCHC300

Network Cable

Used for the fixed installation in the distribution network. The cable connects the room outlets to the ports of the patch frame in the distribution cabinet. With its exceptional bandwidth and high signal capacity, the cable can handle all types of traffic (telephone, data, radio/TV). The copper cable is made up of individually screened 'twisted pair' wires with a common copper braid shield. Its outside diameter is 7.5mm. Supplied on 300 metre drums.

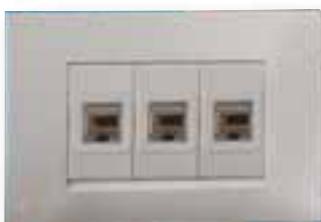


LCHRJ45

Modular Connection Jack

The modular connection jack (LCHRJ45) is used at both the wall outlet and the patch frame in the distribution cabinet. It can allow very fast and easy termination of the installation cable without using any punch down tool. Category 6 data performance and high quality TV transmission can be achieved with this connector.

To fit the LCHRJ45 connector to PDL wall plates, you need to order the 500/600/800 series module adaptor (611M). Available in black and white.



Outlets

Outlets are located where needed. Normally, two or more outlets are installed in every room. The same type of outlet is used throughout the installation. The function of each outlet is controlled from the distribution cabinet. Different cords are used to connect different devices, depending on the function chosen for the outlet in question. Outlets are available in different colours to match PDL 800, 600 series switches, socket outlets, dimmers, etc. The outlets are always fitted with RJ45 modular connection jacks.

(Note: the RJ45 jacks shown are purchased separately as is the 611M module adaptor)

A Structured Cabling System for the home

The LexCom Home system is designed in a star network configuration. This sees all wall outlets wired back to a centrally located distribution cabinet housing the active modules. The active modules handle the incoming phone and TV/AV signals, as well as catering for networking of data devices (computers, printers, game consoles etc).

Expand as your needs change

With the LexCom Home Network it is easy to expand the system as your needs dictate.

- AV modulators can be added to allow DVD/PAY TV or VCR signals to be sent to all TV's around the house.
- Infrared remote control can be added to allow for control of AV devices from any room in the house.
- Network modules can be added to cater for computer or network printer/storage devices.
- The modular nature of the distribution cabinet allows you to add or upgrade technologies as they become available.

Outlets and Planning

Typically the structured cabling will be run at the same time as the electrical cabling. It is therefore wise to plan all electrical outlets and LexCom home network outlets at the same time.

It is recommended to install at least 2 outlets per grid plate to allow for multiple services at each grid. Areas like the lounge/entertainment room will probably require several more outlets depending on the needs of the particular house. (A 5-outlet area with a TV, phone, computer, gaming console and AV modulator would not be unusual)

Cable Lengths

In order to maintain optimal RF signal quality (for TV/AV purposes) the maximum cable length for any circuit is set at 40m. Also, due to a possibility of overdriving a circuit, there is a minimum distance of 8m per cable run. The LexCom Cat7 cable is meter marked to aid in this aspect of installation.

Positioning the Distribution Cabinet

In order to maximize all cable runs, the distribution cabinet should be set in a centrally located position. Often the inside wall of an internally joined garage is a good choice. The distribution cabinet may also require power, so provision should be made to have an electrical feed into the cabinet. Often cabinets are located in the same room/cupboard as the main power distribution board.

Typical Layout and Requirements

Kitchen

Commonly the hub of the home, there is often a telephone, TV or computer.

Two outlets

Living Room

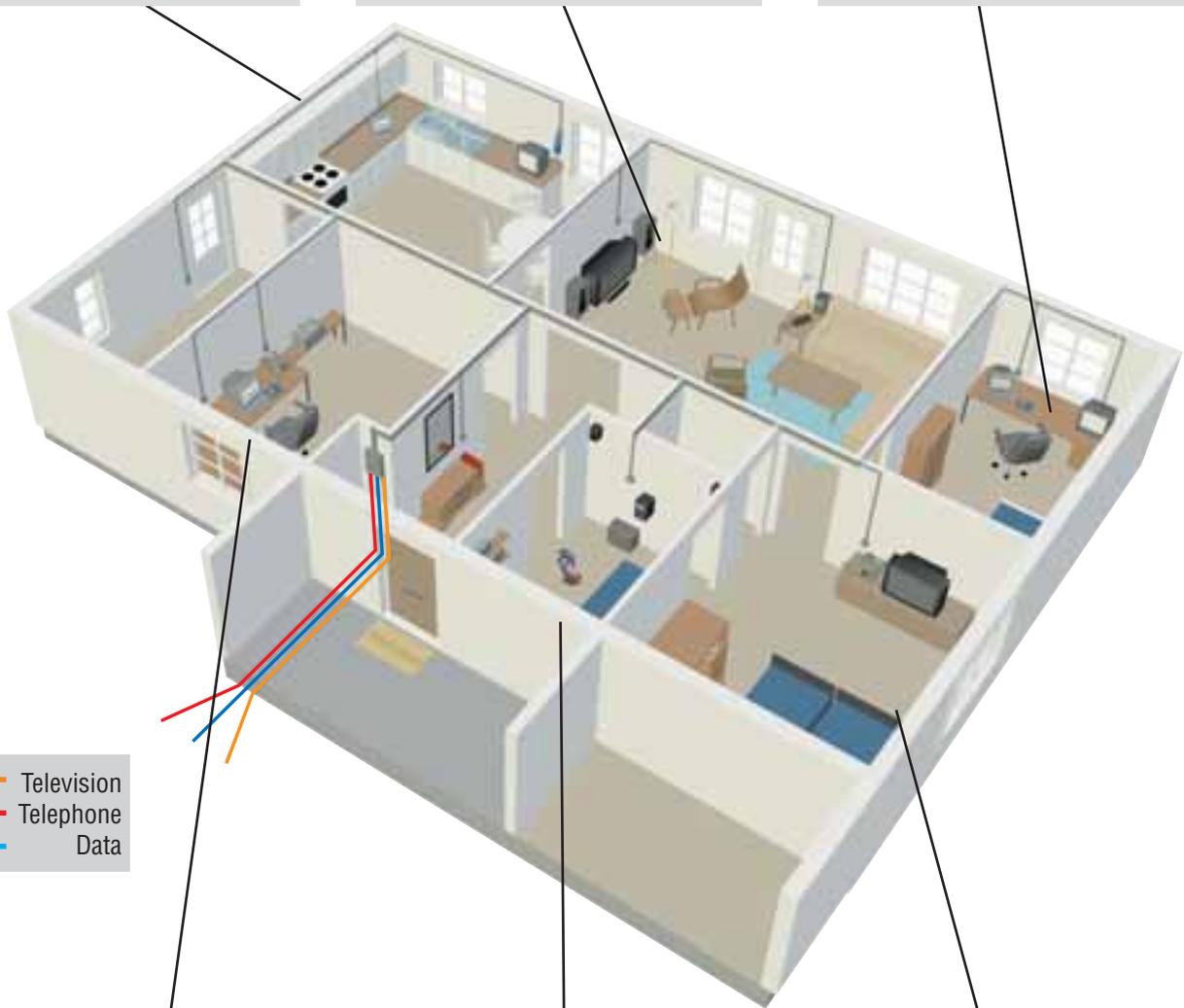
Typically an entertainment centre for watching TV, DVD and VCR, it can also be a place to play computer games or to plug in a laptop PC.

Six outlets

Spare Room

Convert a spare room into a study, with phone line and internet, or a bedroom with access to Pay TV or the DVD.

Two outlets



— Television
— Telephone
— Data

Study or Home Office

Telephone, fax, computer, printer.

Four outlets

Children's Room

Requirements change as children grow, TVs and computers are often needed for games as well as homework and projects.

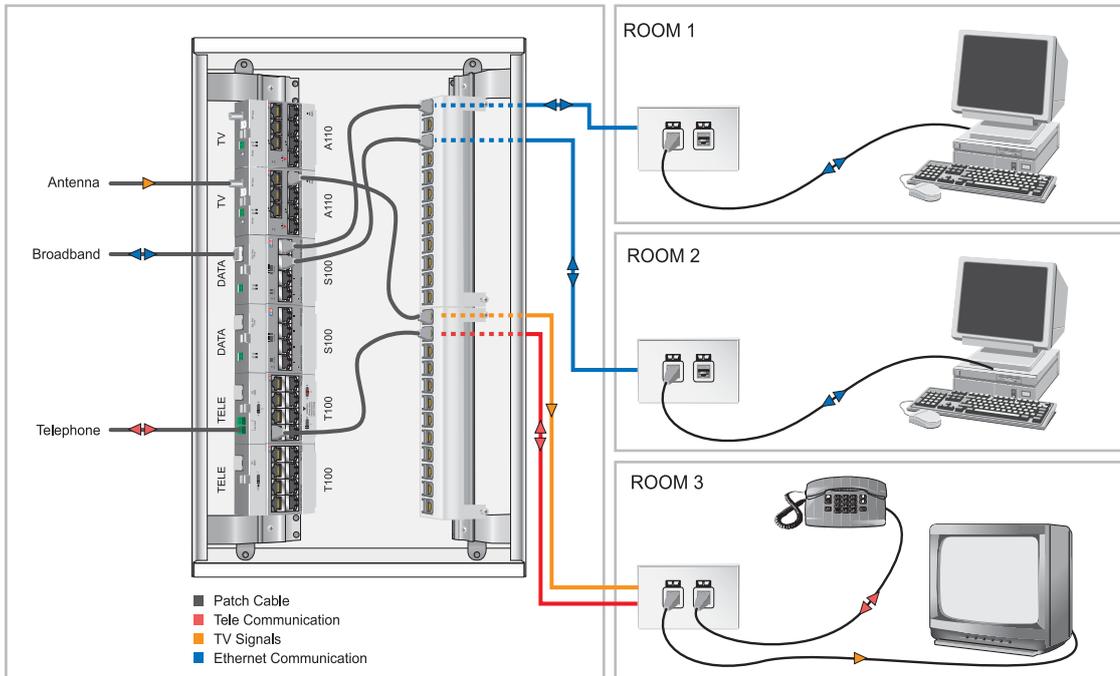
Two outlets

Master Bedroom

A telephone and TV connection are usually a requirement in any master bedroom, with the possible requirement for adding a computer.

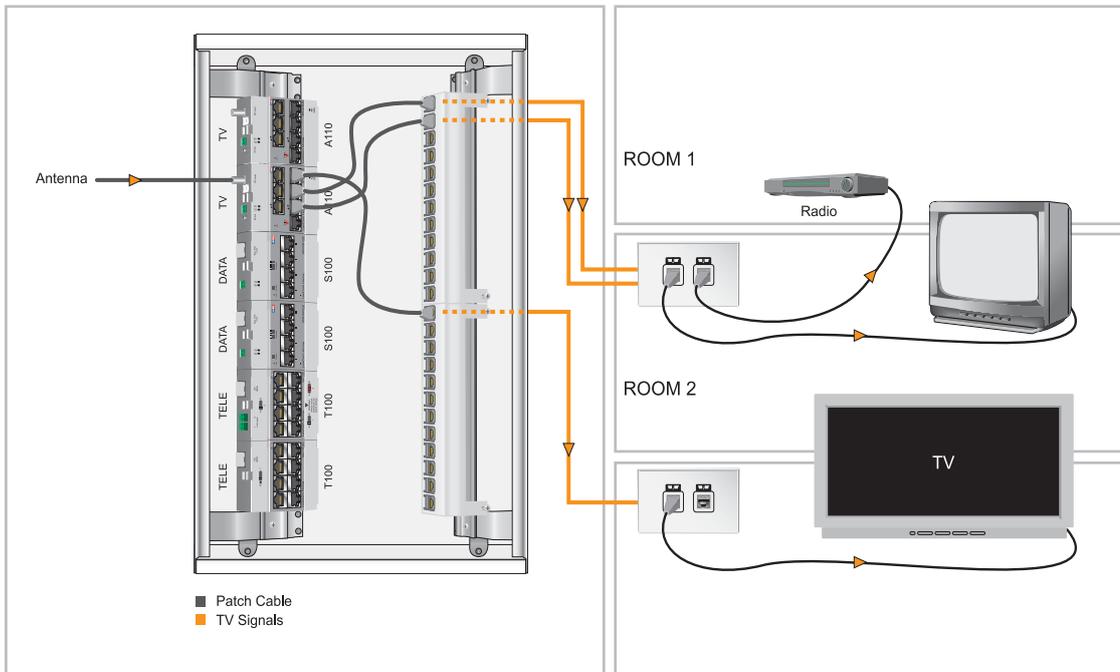
Four outlets

Note: In the following connection examples, all systems and devices that are not part of the **LexCom** Home Network installation are to be procured by the home owner or installer from other suppliers and/or service providers.



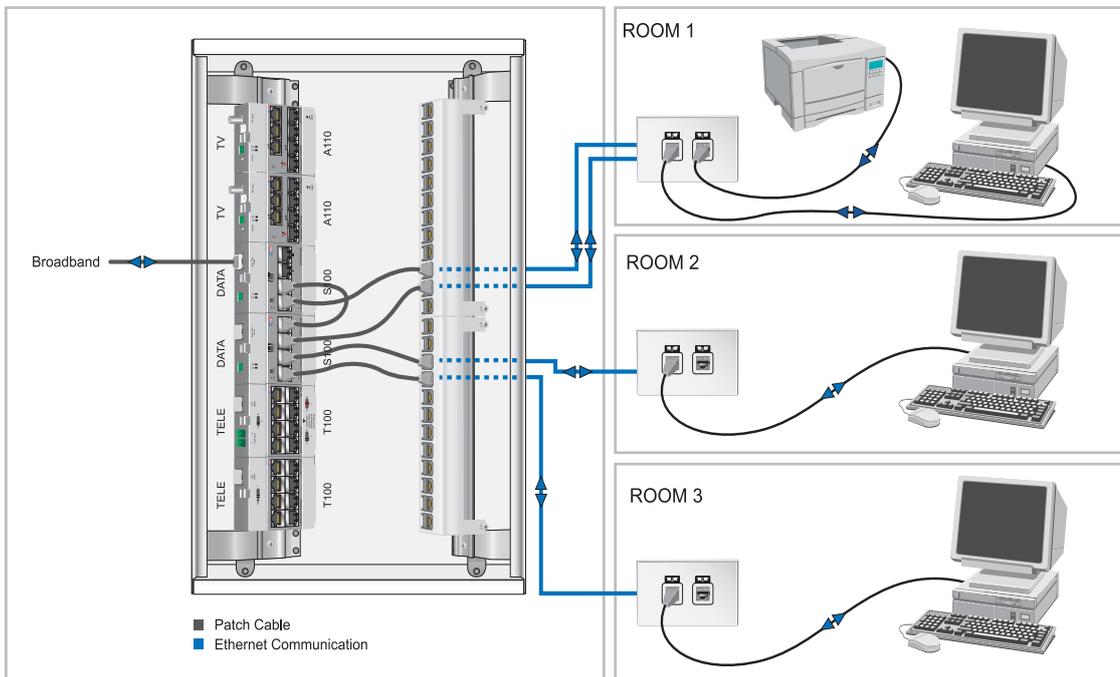
Distribution of Telecoms, TV and Data

LexCom Home Network gives an infrastructure for several types of media on a network. In this example, incoming signals for data, telephone and television are connected to the active modules of the distribution centre and patched to the required outlets.



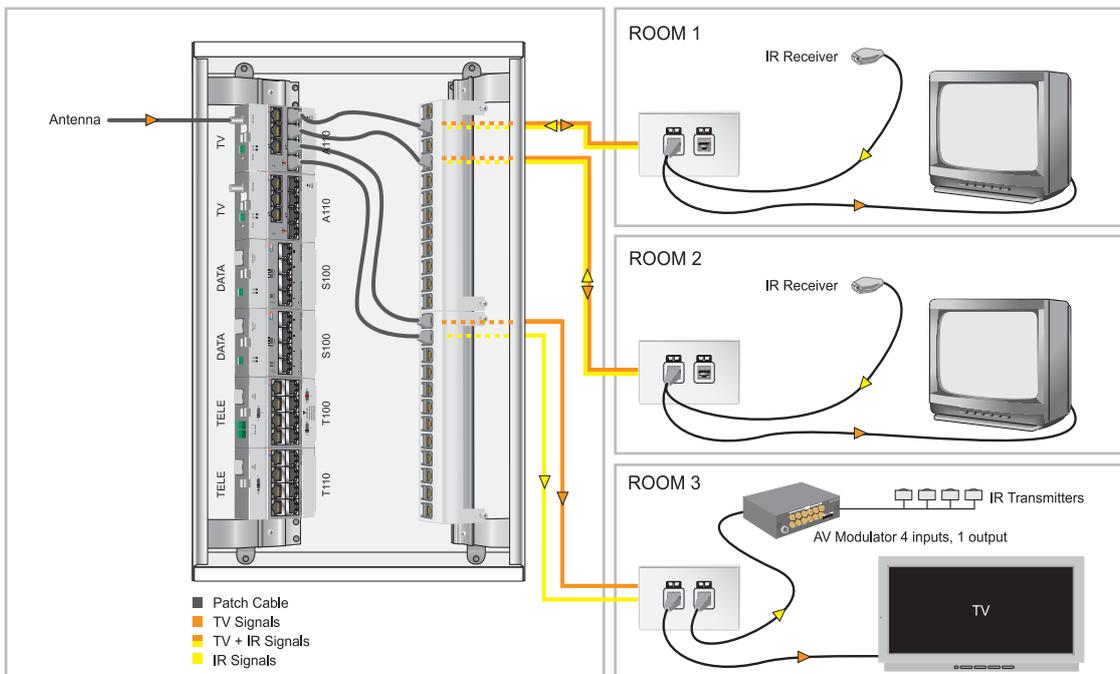
Simple TV Antenna Distribution

Here, LexCom Home Network connects all TV sets to the TV antenna. In addition, a radio is connected to the antenna system using the female adaptor supplied.



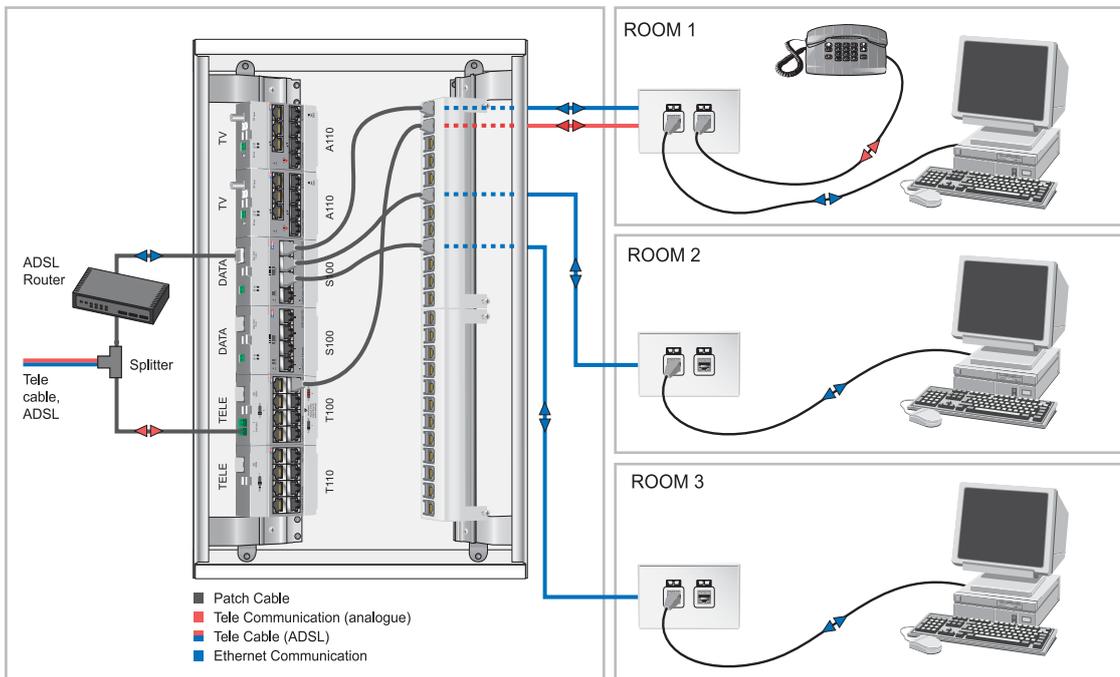
Network with Computers and Printers and a Connection to an External Network (e.g. Broadband)

In this example, LexCom Home Network is used to set up an internal data network of computers and a shared printer. The outlets are patched to the data module of the distribution centre to allow communication between these outlets. Connection is also made to an external network, e.g. broadband or a permanent internet connection. This internet service is then also available at all outlets connected to the data module.



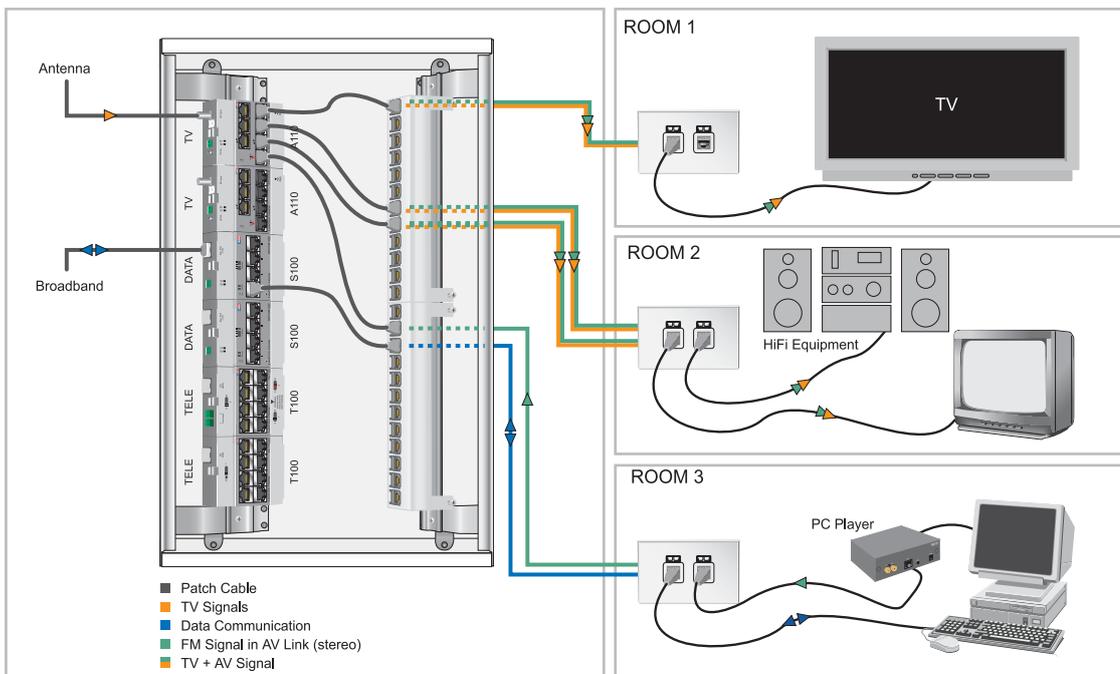
Infrared (IR) Link

This example shows a TV antenna connected to the LCHA110 TV amplifier module. In this installation, there is an AV modulator which can accept signals from four video sources (video, DVD, etc.). These video sources can be controlled from all rooms via IR receivers. The AV modulator must be connected to the AV link port on the LCHA110 TV amplifier module via an outlet and a patch module. All six outlets on the TV amplifier module can receive IR control signals. IR control signals are always sent on the AV port and IR output of the TV amplifier module.



ADSL

Incoming ADSL lines are terminated by the system operator at the splitter. The analogue port of the splitter must be connected to the telephone module, e.g. the T100. The ADSL port of the splitter must be connected via the ADSL router to the data module (S100 data switch). The computers can now surf the internet simultaneously using shared internet access via the ADSL router. At the same time, the analogue port can be used for conventional telephones. The splitter and ADSL router are both obtained from the telecommunication service provider.



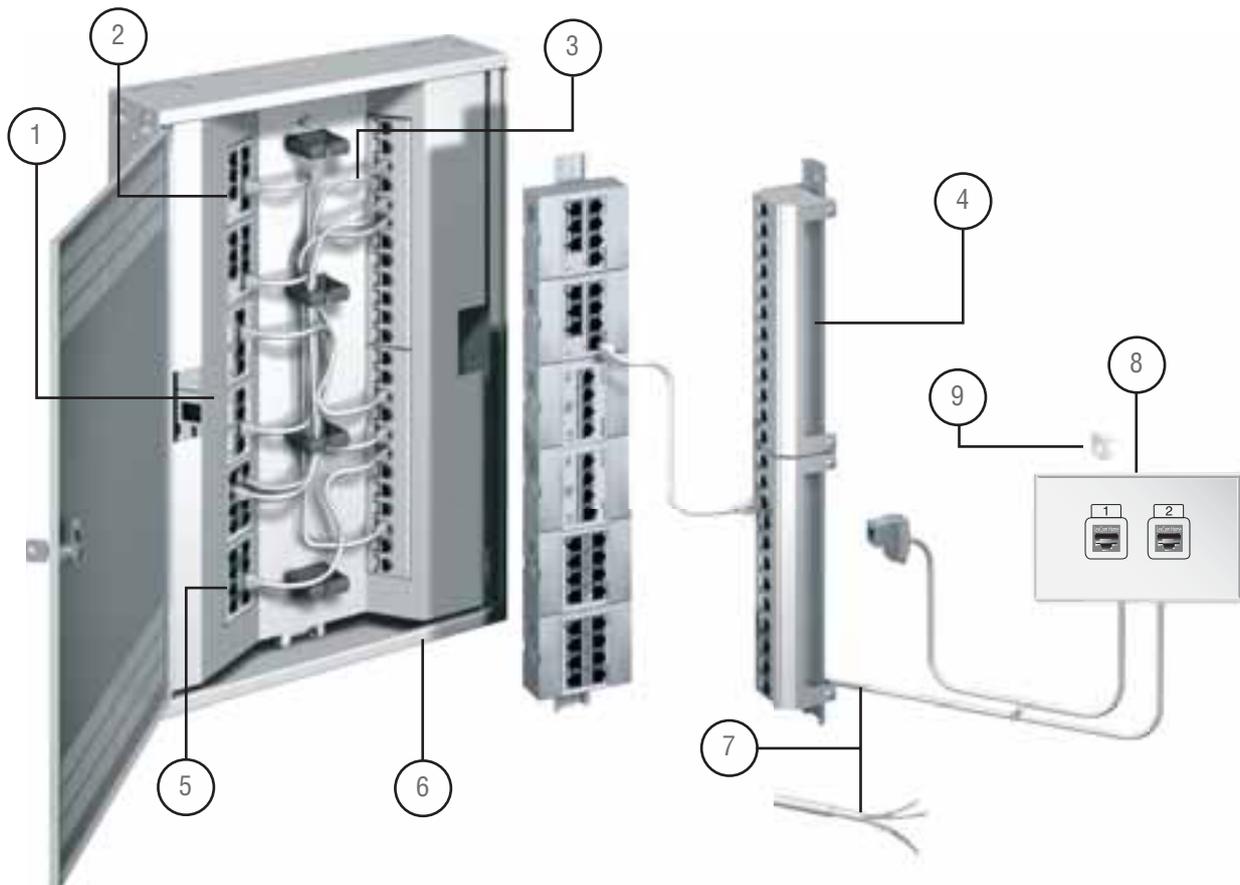
PC Player

The PC player is the FM stereo modulator for LexCom Home Network. It is used when there is an audio source that is not centrally located and where the signal from this source is required to be distributed via LexCom Home Network to the stereo and hi-fi installations in the home. In this example, the computer receives broadband internet radio, which goes from the computer's sound card to the PC player. The PC player modulates the frequency to a pre-set selectable FM channel, and then send the modulated signal to the AV input of the LCHA110 TV amplifier module. Any of the hi-fi stereo amplifiers can then receive the signal and play it over the loudspeakers. Similarly, MP3 audio stored in the computer can be played back on any of the sound systems in the home.

This section describes how **LexCom** Home Network should be installed. Detailed information about the components and how to install them is given in the documentation supplied with the products.

Before installation, it is important to prepare and plan so that you know where the outlets and the distribution cabinets are to be installed and which components the network will include.

Basic Components of the Home Network



Basic components of the Home Network:

1. Data module, with 4 ports for computer networks.
2. TV amplifier module, with 4 or 6 ports for TV connections.
3. Patch leads.
4. Patch frame, with 26 ports for connection to room outlets.
5. Telephone module, with 8 ports for telephone/fax/modem connections.
6. Distribution cabinet, where incoming cables from UHF/VHF antenna, telephone and the building network are connected to the home network.
7. Network cable, 8 wires (4 twisted pairs).
8. Universal outlet with 2 or more jacks to be mounted in PDL's Wiring Accessory product.
9. 611M module adaptor clip.

Cable Installation

Cables must be run from all outlets to the distribution cabinet in accordance with the relevant data wiring standards. The number of cables must be equal to the number of outlets required in the particular room. The bending radius of installed cable must not be less than 25mm.



This example involves a flush-mounted 22" distribution centre.



1. Position the distribution cabinet in the wall cut-out such that its front surface is flush with the wall, and then fasten it to a supporting frame installed around the cabinet inside the wall cavity.



2. Terminate all the installation cables with RJ45 modular connection jacks in accordance with the procedure as described on page 16.



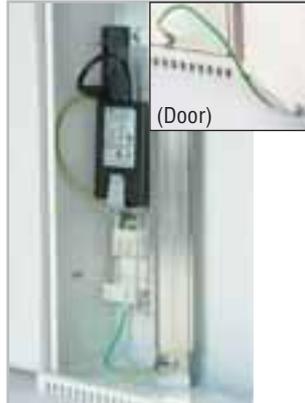
3. Insert the terminated RJ45 connection jacks into the ports of the patch frame, and keep track of the numbers (1-26) as marked on the patch frame.



4. Install and connect all the wall outlets in the rooms using the same RJ45 modular jacks. Mark each room outlet with the same number as that on the distribution cabinet.



5. Install the power supply unit on the left side of the distribution cabinet. A power supply should be run to the distribution cabinet from the circuit board.



6. Terminate the earth wire from the internal power supply to the DIN rail spade connection point at either end of the DIN rail. The door has to be earthed with the supplied jumper wire in addition to the DIN rail.



7. Install the active modules (telephone, data and TV amplifier) on the DIN rail provided in the distribution cabinet.



8. Connect the incoming cables/wires to the active modules. Connect the 12V DC power supply to the data and TV amplifier modules.



9. Position the internal cover over the active modules and patch frames, and then fasten with screws.



10. Connect patch leads between the patch frame and the TV amplifier, telephone and data modules.



11. Place the patch leads neatly in the middle of the distribution cabinet with the help of guides provided.



12. Close and lock the door of the distribution cabinet.

The RJ45 modular connection jack allows very fast and easy termination of the installation cable.



1. Cut and strip the cable as shown.



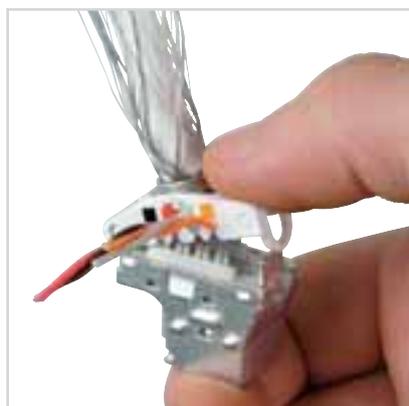
2. Pull back the shield over the insulated cable to at least 30mm.



3. Insert the cable through the cover and upper part of the modular jack.



4. Insert the wire pairs into the correct slots in accordance with the colour coding as marked. Do not strip them. The slots penetrate the insulation to give a perfect contact.



5. Firmly press on the upper part of the modular jack until it locks with a "click" sound.



6. Cut off the protruding wires flush with the modular jack.



7. Move the cover of the modular jack into place.



8. Firmly press the cover until it locks with a "click" sound, securing the cable and shield.



9. Cut off the excess shield.

When a **LexCom** Home Network installation is completed, it is highly recommended the network be tested. This will ensure all connections have been correctly made and that the installation complies with all regulatory requirements.

The LexCom Home Network installation must comply with AS/NZS 3086, AS/NZS 3080:2003 (11801 Ed2) and PTC 225:2003. The network should be tested with a **level 3** hand-held field tester that is capable of recording and storing the test data. The results may be required for system certificates or extended warranty claims.

Minimum network testing that should be performed will include wire mapping, return loss, cable lengths, and NEXT/FEXT with the Category 6 permanent link standard. This will ensure the network will operate at its optimum capacity without compromising any of the design features.

Testing of TV/Video Network

The LexCom Home Network installation must also be tested to ensure adequate TV/video quality at every outlet. This testing should be performed with a RF field strength meter.

As a minimum requirement, a video test signal (from the LexCom Home Network AV Modulator or equivalent) should be injected into the system, and level measurements should be taken at the shortest and longest cable runs. The strength of these test signals needs to be measured and documented (should be within the range of 60 - 80 dB microvolt).

It is recommended that an external TV antenna is already properly installed (for optimal reception of terrestrial TV signal) and connected to the LexCom Home Network system at the time of testing. The signal strength of all the TV channels should be within the range of 60 - 80 dB microvolt throughout the home. The difference in signal strength between the strongest and weakest TV channels at any outlet should not exceed 12 dB microvolt.

The LexCom Home Network installation amplifies and distributes the TV signal inside the home, but does not improve the quality of the incoming TV antenna signal. If the incoming TV antenna signal results in poor TV reception (e.g. due to weak signal strength or too much interference), this problem should be checked and rectified by a TV antenna installation specialist.

There is a big difference between installing high-speed data networks and conventional electrical and telecommunication installations. Capacity will be reduced if the installation work is not done properly, e.g. cables must run in smooth curves at corners, they must not be strapped too tight, and so on. Therefore it is important for installers to have sufficient theoretical and practical knowledge about networks.



Antenna Amplifier

LCHA110 (standard)

Description

Shielded DIN “multimedia” antenna amplifier with 6 x RJ45 output parts, one main input (F-conn) and one AV input (RJ45). The TV/FM amplifier forwards the incoming signal to all outputs adding the necessary gain to compensate for the signal loss in the LexCom Home cabling. The level/profile on the incoming TV signal should be flat, ie no tilt.

If tilted, it must be levelled by an external equaliser unit.

Infrared is supported on all output ports and distributed to a dedicated IR link output on the top of the module. The AV link port is connected to AV modulators/PC players, making these AV signals available on all outputs.

Once installed, unused output ports should be terminated by 100 Ohm termination plugs (LCHTERMPLUG).

Power is supplied from the 12V DC power supply. Gain is adjustable on the front.

Tilt is fixed (pre-set slope) LED indication: Green when power is on.

Technical information

Electrical and Technical Data

Carrier to Noise Ratio	>46 dB at 60 dB μ V input, min. gain Typ. 57 dB at 76 dB μ V input – output
Balancing of Outputs	Within +/- 1 dB
Power Supply	12V DC
Power Consumption	4 W
Current	325 mA
Bandwidth	44-862MHz
AV Link Bandwidth	88-862 MHz
Output Level	6 x 112 dB μ V (DIN45004B)
CSO	88 dB μ V (measured @ 42 Channels)
CTB (>60dB)	94 dB μ V (measured @ 42 Channels)
Gain Forward	34 dB \pm 2dB @ 860 MHz on all outputs 23 dB \pm 2 dB @ 110 MHz on all outputs
Gain Return	Nom +3.5 dB in pass band
Attenuation	0 – 20 dB (adjustable)
Tilt (Equaliser)	+ 11 dB Pre-set Slope
Slope Tolerance	\pm 3 dB (110 – 862 MHz)
Input level	60 – 80 dB μ V
AV Input Level	80 – 90 dB μ V
Impedance Output	100 Ohm, balanced
Impedance Input	75 Ohm, unbalanced
Noise Figure	<5.5 dB @ 860 MHz < 4.0 dB @ 85 MHz
Return Loss	-14 dB@ 40 MHz/-9.5 dB@860 MHz
Isolation	>25 dB standard outputs,
Stopband Attenuation	>55dB
Emission	<12 dBpW/30-1000 MHz (acc.to EN50083-2)

Construction and Material Data

Output Connector	RJ45 STP
IR Out Connector	2.5 mm jack
Shielding	Plated 3 μ m Sn over 20 μ m Cu, double sided
Module Dimension	72 x 37 x 86 mm
Weight	160 grams
RF Input Connector	F-connector (connector \varnothing : max 1.2 mm)

Data Switch

LCHS100



Description

Shielded DIN Switch for 10/100 Mbps data transmission with 4 RJ45 ports plus one RJ45 port for uplink connections. The switch module supports 10 Base-T Ethernet and 100 Base-T Fast Ethernet on all 5 ports and is an easy- installation, plug and play unit.

The data switch comprises the following features:

- N Way 10/100 Mbps ports
- Auto MDI/MDI-X ports (Auto cross over detect)
- Store and forward switching
- Back-Pressure-Base flow control on half-duplex ports
- Pause-Frame-Base flow control on full-duplex ports
- Non-blocking and full wire speed forwarding rate
- 1 MB memory buffer sharing

Green LED indication for Link/Data and 100 Mb mode for each port and a general Power on indication.

Power is supplied from the 12V DC power supply

The data switch has a reset function on power up.

Technical information

Electrical and Technical Data

Power Supply	12V DC
Current	140 mA max
Shielding Attenuation	>55 dB
Data Rate	10/100 Mbps
Protocol	CSMA-CD
Data Buffer	1MB
Latency	83.36 μ Sec

Construction and Material Data

Shielding	Plated 3 μ m Sn over 20 μ m Cu double sided
Dimension	WDH = 72 x 37 x 86 mm
Weight	125 grams
No. of Ports	5 (4+1)

Standards and Approvals

Performance	IEEE 802.3 10 Base-T IEEE 802.3u 100 Base-Tx IEEE 802.3x N-Way
EMI	FCC Class B, CE mark

Telephone Modules

LCHT100 and LCHT104



LCHT100

Shielded DIN telephone module for 2 analogue lines, or 1 analogue and 1 ISDN line. This module is a passive splitter with 8 RJ45 output ports. The outputs can be switched in various groupings to allow different combinations of inputs to outputs (e.g. Line 1 active on ports 1-4, Line 2 active on ports 5-8. See manual for more options).

All outputs in each group are linked in parallel. Using the 3 switches on the front of the module sets all configurations.

LCHT104

The LCHT104 is an analogue only 4-line module (no ISDN). All 8 outputs are “fully loaded” and connected in parallel, with separation of the lines being made at the wall outlet with the corresponding telephone cable.

This module can also be used as part of a PABX configuration, offering 4 lines of intercom.

An RJ31X security jack is also located in the bottom of the LCHT104 module, and connected directly to Line 1. When mated, the security jack allows interruption of the routing of Line 1 to the module outputs. When the security device returns to idle mode, Line 1 will be returned to the output ports again.

Technical Information

Electrical and Technical Data	LCHT100	LCHT104
Shielding Attenuation	>55dB	
ISDN Format	S0	n/a
ISDN Tx	Pair 4/5	n/a
ISDN Rx	Pair 3/6	n/a
Analogue	Pair 4/5	Line 1 to pin 4 & 5 Line 2 to pin 3 & 6 Line 3 to pin 1 & 2 Line 4 to pin 7 & 8
Return ISDN A	Pair 1/2	n/a
Return ISDN B	Pair 7/8	n/a
Return Fax	Pair 1/2	n/a
Security port	n/a	Forward line 1 to pin 4 & 5 Return line 1 to pin 1 & 8

Construction and Material Data	LCHT100	LCHT104
Input connector	2 x 2 pole + ISDN connector	4 x 2 pole connector
Output connector	8 x STP J45	8 x STP RJ45 1 x RJ31X (Security)
Shielding	Plated 3 um Sn over 20 um Cu, double sided	
Dimension	72 x 37 x 86mm	
Weight	130grams	

AV-Combiner

LCHC110



Description

A fully shielded DIN module enabling the user to connect 2 or 3 AV-Modulators/PC Players to the AV link input of the multimedia amplifier LCHA110. The AV-Combiner LCHC110 mixes the AV signal on the 3 input ports and forwards the result to the single output port. The LCHC110 works in the full frequency band up to 860 MHz and supports infrared.

The module should be installed in the distribution cabinet of the LCHA110 amplifier. All interfaces are RJ45 jacks and all connections up to and from the AV-Combiner must be made by LexCom Home shielded patch cords only.

The AV-Combiner is supplied with a termination plug (RJ45) that must be connected to the potential unused input of the LCHC110.

Technical information

Electrical and Technical Data

Return Loss	min 10dB
Isolation	> 18 dB (between all inputs)
Shielding Attenuation	> 65 dB
Insertion Loss	6.5 dB @ 470 MHz 8 dB @ 862 MHz
No. of Matings	min 500
Impedance Output	100 Ohm Balanced
Impedance Input	100 Ohm Balanced
AV Link Bandwidth	80 – 862 MHz
IR Link	Transparent

Construction and Material Data

Input Connector	3x RJ45 STP Jack
Output Connector	1x RJ45 STP Jack
Shielding	Plated 3 µm Sn over 20µm Cu, double sided
Module Dimension	72 x 37 x 86 mm
Weight	110 grams

Power Supply

LCHPSA



Description

This LexCom Home power supply kit is a compact all-in-one solution installed in the cabinet that provides power to all the active LexCom Home modules. The Power Supply Unit (PSU) provides a 12V DC output for the active modules via the 4-way junction unit and its 12V plug-in cords, up to 4 active modules can be powered inside the cabinet. The power input of the PSU accepts 100 – 250V AC voltage (50-60Hz), making the power supply kit a universal and global solution. The mains receptacles offer good strain relief and screwless terminals for easy installation (only solid conductors). An additional cover provides a physical segregation of the receptacles to the rest of the installation environment. Safety earth must always be connected to the installation. Once installed, the power supply kit is a class 1 construction that ensures good grounding and earthing continuity to the steel cabinet. Within the kit comes the necessary fixing bracket, segregation cover, 5-way magazine and 4 pcs 12V jumper cords.

Technical information

Electrical and Technical Data

Power Consumption	max. 20 W (depending on modules connected)
Output Voltage	12V DC
Type	ELV, Switch mode, fully regulated output
Permissible Load	max. 18 W
Input Voltage	90 – 264 Vac/47-63 Hz
Safety Classification	Class 1
Protection	Overvoltage: 15V max. Overcurrent: built-in. Short circuit: Auto recovery

Construction and Material Data

Conductor Ø	Mains: 0.5 mm ² to 2.5 mm ² Solid
Size	PSU: 85 x 56 x 25.5mm Kit: 278 x 56 x 28 mm
No. of Outputs	4
Cable Ø	Mains: 6.5 mm – 12.5 mm

AV Modulators



A key element in the LexCom Home system, the modulators allow you to connect up to 4 DVD/VCR/PC/Digital Pay TV devices to the LCAH110 TV module. In fact, any device with a composite output can be connected to a modulator. The modulator takes the composite inputs and converts them into a (selectable) TV frequency. The combined output from the modulator is again combined at the LexCom cabinet with the incoming MATV signals and distributed to the connected TV's in the home, allowing you to watch free to air TV, or any of the modulated devices at any TV in the house.

IR (Infrared) links on the modulator and TV leads allow you to have full remote control of your connected AV devices, even if you are at the other end of the house.

The modulators are available as a mono VHF version, or a stereo (A2/Nicam) UHF version.

External power supply and basic connecting cords are included in the package.

Technical information

Electrical and Technical Data	LCHAV110-4	LCHAV111-4
Power Supply	12V AC (External)	
Power Consumption	Approx 8.5W	Approx 14W
Input Level	1Vpp Comp Video/75 Ohm 0.5 Vrms Audio/10K Ohm	
Output Level	85-92dBuV@130MHz 85-100dBuV@470MHz	Max 114dBuV@860MHz
TV Channels	05-12/S5-S41 selectable	21-68 selectable
Noise Figure	<5dB	
Output Impedance	100 Ohm balanced	
Inputs	4 stereo inputs*	4 stereo inputs
Modulation	Double sideband	
TV Standard	PAL B/G	
Sound Format	Analogue mono	A2 stereo / Nicam
Screening Attenuation	>55dB	
Frequency Band	VHF:130-470MHz	UHF:470-862MHz
Gain Attenuation	0-15dB@470MHz 0-7dB@130MHz	0-20dB
Carrier to noise ration	>50dB	
Harmonic suppression	>50dB (2nd and 3rd order)	

* Stereo input is converted to mono after modulation

Construction and Material Data	LCHAV110-4	LCHAV111-4
Input Connector	RCA-Phono (2 audio + 1 Video per input)	
Output Connector	1 x STP RJ45	
Dimensions	169 x 164 x 49mm	
Weight	0.80Kg	0.90Kg

PC Player

LCHPCP110



Description

A key element in the LexCom Home Multimedia Package. An audio unit that creates Radio FM channels from the sound signal connected to its input. This enables the stereo sound from any source to be transmitted into the LexCom Home system via the LCHA110 amplifier and makes it available at any stereo receiver or HI-FI installation in the building.

The PC Player has a built-in FM stereo modulator where the user selects the radio channel. The PC Player is intended for the distribution of MP3 music, Internet radio etc from the sound card of a PC.

The PC player also supports the use of infrared remote control of connected devices. Connection cord for PC sound cards and external power adaptor included in the package.

The PC Player will also work with iPod docking stations via the RCA output plate.

Technical information

Electrical and Technical Data

Power Supply	12V DC (external)
Output level	85 dB μ V
Input level	775 mVRms/(0dBm)
Consumption	70 mA max.
Channels	84 preset selectable
Modulation	FM
Sound Format	Stereo
Shielding	>55 dB
Frequency Band	89 – 106 MHz
Pre-Emphasis	50 μ /Sek
Distortion	0.4%
Signal-To-Noise	66 dB
Channel Separation	28 dB
Impedance Output	100 Ohm (balanced)
Impedance Input	47 kOhm
Audio Bandwidth	30 Hz – 18 kHz

Construction and Material Data

Input Connector	2 x RCA phono
Output Connector	RJ45 STP
Dimension	169 x 84 x 49 mm
Weight	0.65 kg
Colour	Black

Standards and Approvals

CE marked according to	EN 55020
EMC	89/336/EEC

Patch Cords, Leads & Connecting Cords



Patch Lead S/STP - Video/TV

LCHLTVP (Video Coms)

Description

The patch leads are exclusively dedicated for use in the LexCom Home distribution cabinet to connect between the active modules and patch units.

The patch cords are universal by means of the applications they support (TV, telephony, data etc.).

Further, they are characterised by very high bandwidth and shielding attenuation.

Technical information

Electrical and Technical Data

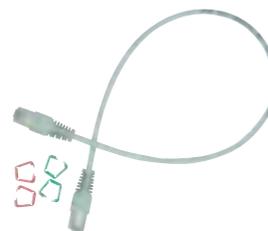
Bandwidth	0 – 862 MHz
Shielding Attenuation	>80 dB
Crosstalk Attenuation	>45 dB @100 MHz

Construction and Material Data

Material	LSOH
Colour	Light Grey
Cord Length	50cm

Telephone/Data Patch Lead

LCHLUTP



Description

The UTP patch leads are used in the distribution cabinet for telephone and data applications only. Colour coding clips are included in the package to ensure correct patching.

Technical information

Electrical and Technical Data

Contact Resistance	<20 mOhm
Insulation	>500 MOhm/100 Vdc
Insertion Loss	<0.5 dB @ 100MHz (1m) 1.5 dB @ 100 MHz (5m)
NEXT	<-40 dB @ 250 MHz typ.
Impedance	100 Ohm nom.
No. of Matings	Min. 2500
Bending Radius	Min. 5 x overall diam.
Operating Voltage	Max. 125 V
DC Resistance	Max. 89 Ohm/km
Transfer Impedance	< 50 mOhm @ 1 MHz
Coupling Attenuation	> 75 dB typ

Construction and Material Data

Material	LSOH
Dimension	Ø: 5.5 mm
Contacts	1.3 µm Gold (AU) plated phosphor bronze
Colour coding	Red and Green
Construction	UTP with tensile strength centre element
Conductors	4 x 2 x AWG24 Stranded

AV Connecting Cords

LCHLAV02, LCHLAV03



Description

A double shielded patch cord to connect AV modulators and PC players to the LexCom Home wall outlet. RJ45 to RJ45 interface. Offers very good shielding performance and low signal loss. Available in 2 lengths; 2 metres and 3 metres. Cable jacket in Light Grey.

Technical information

Electrical and Technical Data

Contact Resistance	<20 mOhm
Insulation	>500 Mohm/100V DC
Insertion Loss	<0.5 dB @100MHz (1m) <1.5 dB @100MHz (5m)
Impedance	100 Ohm nom.
No. of Matings	Min. 2500
Bending Radius	min. 5 x overall diam.
Operating Voltage Ueff	Max. 125V
DC Resistance	Max. 150 Ohm/km
Transfer Impedance	<50 mOhm @ 1 MHz
Coupling Attenuation	>75 dB typ.

Construction and Material Data

Material	LSFROH
Dimension	Ø : 6.2 mm
Contacts	1.3µm Gold (AU) plated phosphor bronze
Colour coding	Blue
Construction	S/STP (pairs in aluminium foil with overall tinned copper braid)
Conductors	4 x 2 x AWG26 Stranded
Caloriefic Value	0.50 MJ/m
Length	2 Metre/3 Metre

TV Connecting Cords

LCHLTV, LCHLTVIR



Description

Connecting cords between wall outlets and TV sets/radios converting the 100 Ohms balanced cabling to the 75 OhmsTV/R input connector. Built-in balun in the cable plug. 2 types available; simple interconnection cable between outlet and TV or interconnecting cable with infrared connector. LCHLTVIR TV cables are available in white and black and are 3 metres long. LCHLTV connecting cords are available in black only. Adaptors are included in each package. Note: IR receivers sold separately.

Technical information

Electrical and Technical Data

Bandwidth	1 - 862 MHz
Shielding Attenuation	> 80 dB
Impedance Output	75 Ohm, IEC
Impedance Input	100 Ohm, RJ45

Construction and Material Data

Material	PVC
Weight	0.13 Kg
Connector	IEC 9.5 mm male
Cable Type	Coaxial, double shielded
Length	3 m

Standards and Approvals

EMC	EN 50041
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Telephone Connecting Cords

LCHLTELE02, LCHLTELE05



Description

Connecting cords for standard telephones for LexCom Home outlets. Converts phone RJ11 interface to RJ45 interface. Offered in 2 lengths; 2 metres and 5 metres. Unshielded 4 conductor flat cable.

Technical information

Electrical and Technical Data

Insulation	>1500 Vrms, Breakdown voltage
Insulation Resistance	>500 MOhm/ 100V DC

Construction and Material Data

Wire Configuration	Line 1: Pair 4/5 Line 2: Pair 3/6 Line 3: Pair 1/2 Line 4: Pair 7/8
Connector	RJ11 – RJ45 UTP plugs
Cord Length	2 and 5 metres
Cable Colour	Silver (Line 1) Purple (Line 2)* White (Line 3) Red (Line 4) Black (Line 1 + 2)
Conductor Ø	AWG 28, stranded
Insulation Material	PVC

*Note: Only available in 2 metre version.

Distribution Cabinets

LCHC14 and LCHC22



The LexCom Distribution Cabinet is made of folded sheet steel with a textured epoxy polyester powder coated finish. The enclosure comprises the cabinet itself along with a reversible hinged steel front door that opens 180°, a vertically mounted DIN rail for active components and a removable connector panel for the room outlets. Knockouts in the cabinet provide plenty of cable access and the front cover provides a handy cable management system.

The cabinets are fully prepared for Class 1 power installation, having all units and components safely linked to ground.

Also included is a built in MATV test point with 20dB tap, and an additional 11dB tap point for apartment backbone breakout. A flush trim plate is available to provide step-less depth adjustment. Keyholes in the rear of the cabinet allow for surface mounting. The LCHC14 cabinet will house up to 4 active modules and 16 outlets as standard. 24 outlets are possible with the LCHC2414 high-density patch frame.

The LCHC22 cabinet will house up to 6 active modules and 26 outlets as standard. 40 outlets are possible using the LCHC4022 high-density patch frame.

Technical information

Electrical and Technical Data	LCHC14	LCHC22
Return Loss	TAP unit > 18dB	
Isolation	TAP to OUT = norm 37dB	
Insertion loss	TAP unit < 2dB / 11dB / 20dB	
Impedance	Coax units 75 Ohm	
Frequency Band	Coax units 5-1000MHz	

Construction and Material Data	LCHC14	LCHC22
No of ports	16 (expandable to 24 with high density patch frame)	26 (expandable to 40 with high density patch frame)
Material	1.25mm painted aluzink	
Dimensions	H14" x W14" x D4" 355.6 x 355.6 x 100mm	H22" x W14" x D4" 556.3 x 355.6 x 100mm
Weight	3Kg	6 Kg
Colour	White RAL 9010 textured epoxy polyester	
Key lock	Euro lock	
Construction	Folded, spot welded	
Cable Entry	2 x 2" knockouts - top/bottom 3 x 2" and 2 x 1.5" knockouts - rear 2 x 2" knockouts - side	2 x 2" and 2 x 3" knockouts - top/bottom 4 x 2" and 4 x 1.5" knockouts - rear

Trim Frames for Flush Mounting

LCHF14, LCHF22

Description

Trim frames for flush mounting of 14" and 22" steel enclosures. The frame will cover the edge from the cutout for the enclosure in the wall.

Stepless (floating) adjustment and latch with screw from top/bottom (inside) of the cabinet.



Technical information

Construction and Material Data

Material	1.25mm, painted aluzink
Weight	14" 500g 22" 1000g
Colour	White RAL 9010 textured epoxy polyester
Construction	Folded, spot welded
Size 14"	420 x 420 x 45mm
Weight 14"	0.75 kg
Size 22"	620 x 420 x 45mm
Weight 22"	1.25 kg

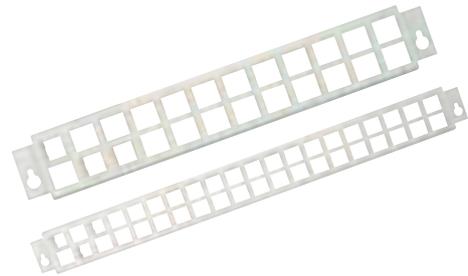
Patch Frames (High Density)

LCHC2414, LCHC4022

Description

High Density (HD) patch frames for upgrading of the 14" and 22" distribution cabinets to accommodate more patch out jacks. The HD patch frame offer a high number of ports by providing space for 2 rows of WB RJ45 connectors.

The HD patch frame is made of sheet steel and is mounted vertically in the distribution cabinet by simply replacing the original patch frame. Mounting clips to support installation of the WB connectors are supplied with each patch frame. The HD patch frame is painted white and ports are numbered.



Technical info

Construction and Material Data

Material, Panel	1.5 mm AluZinc
Colour, Panel	White RAL 9010
No. of Ports	24 for 14" distribution cabinet 40 for 22" distribution cabinet

LCHRJ45



Description

A tool-less wide band STP connector to be used in the LexCom Home Network installation. The RJ45 WB Connector provides a Cat 6 link and is also capable of providing MATV signals up to 900 MHz. The superior shielding characteristics are obtained by means of the copper and tin-plated die-cast zinc housing.

Technical information

Electrical and Technical Data

Bandwidth	0- 900 MHz (cat 6)
Isolation	>500 MOhm/100V DC >1500 Vrms; Breakdown Voltage
Shielding Attenuation	>70 dB typ
Contact Resistance	<20 mOhm
IDC Resistance	<2.5 mOhm
Insulation	max. 1.3mm (cable conductors)
Insertion Loss	<0.025 dB @ 100 MHz
NEXT	-58 dB typ. @ 100 MHz -49 dB typ. @ 250 MHz
Impedance	100 Ohm nom.
Transfer Impedance	<0.25 m Ohm @ 1 MHz

Construction and Material Data

Material	Tin-plated die-cast zinc and PC/ABS
Dimension	16.8 x 31.4 x 36.1 mm
Weight	25.5 grams
Colour	Metal/White
Contacts	1.3 µm Gold (AU) over 1.0 µm Nickel (Ni)
No. of Matings	Min 2500
Conductor Ø	AWG 22-23 solid

Attenuators

LCHITA05, LCHITA10, LCHITA15



Description

A plug-in unit for outlets to compensate for short link problems on TV signals. 3 versions offered providing different levels of attenuation to the TV signals and thus simulating different length of the total cable link.

The Attenuator plugs only support distribution of R/TV signals and the AV/IR link. MATV return path is also supported in the opposite direction.

The attenuators are fully shielded units with a full covering mould in light grey. Each unit is labelled with its specific type and version.

Technical information

Electrical and Technical Data

Attenuation	1.5 dB @ 100 MHz: ITA 05 10dB @ 800 MHz: ITA 10	5 dB @ 800 MHz: ITA 05 2 dB @ 100 MHz: ITA 15	1.5 dB @ 100 MHz: ITA 10 15 dB @ 800 MHz: ITA 15
Impedance	100 Ohm		
Return Loss	-14 dB from 5 to 400 MHz	-8 dB from 400 to 860 MHz	
Shielding Attenuation	Min. 55 dB		
No. of Matings	500		
Frequency Band	5 – 860 MHz		
Insulation Resistance	500V DC/100 MOhm acc. To IEC 512-2 : 1985 Test 3a Method C		

Construction and Material Data

Input Connector	RJ45 Plug STP
Output Connector	RJ45 Jack STP
Material	Hotmelt PA
Dimension	18.5 x 45 x 18.5mm
Weight	14 grams
Colour	Light Grey
Contacts	AU over NI

Termination Plug 100 Ohm

LCHTERMPLUG



Description

A termination accessory for RF products. The plug provides a 100 ohm termination of the conducting pair for R/TV/AV applications. The plug is recommended to be installed into unused output ports in the antenna amplifier, leading to better response stability of the amplifier and minimising RF emissions. Unused inputs of the AV combiners and the AV input on the antenna amplifier should also be terminated by this plug.

Technical information

Electrical and Technical Data

Impedance	100 Ohm termination (pair 7/8)
No. of Matings	500
Insulation Resistance	500V DC/100 MOhm

Construction and Material Data

Colour	Black
Connector	RJ45 plug STP
Material, Housing	Hotmelt PA

Network Cable (WB)



LCHC300

Description

A double shielded (S/STP) 4 pair cable that offers very high bandwidth, superior shielding and good installation performance. The WB (Wide Band) cable connects the patch frame in the distribution cabinet to the wall outlet. The unique colours of the conductors match the wire map of the WB connectors.

Each pair is individually shielded in a metal foil and all pairs together are covered by a tinned copper wire braid. The WB cable can be used in both surface and flush mounted installations and shows excellent resistance to damage and reduction of performance due to stress from the installation work.

Available in 300m drums.

Technical information

Electrical and Technical Data

Bandwidth	0 - 900 MHz (CATV)
Attenuation	53 dB @ 800MHz / 100 metres
Insulation	> 5 GOhm/100V DC
NEXT	86 dB @ 100 MHz 78 dB @ 300 MHz 71 dB @ 800 MHz
Impedance	100 Ohm nom.
Bending Radius	Min 3 x overall diam.
DC Resistance	max. 82 Ohm/km
Transfer Impedance	< 5 mOhm/m @ 10MHz
Voltage	Max. 125V
Screening Attenuation	> 70 dB up to 1 GHz.
Interference Suppression	> 90 dB
Signal Velocity	0.8 c

Construction and Material Data

Material	LSFROH
Dimension	Ø: 7.5 mm
Weight	70 kg/km
Colour	White RAL 9010
Colourcoding	grey/orange, red/black, yellow/green, blue/brown
Construction	S/STP (pairs in aluminium foil with overall tinned copper braid)
Conductors	4 x 2 x AWG23 Solid

Standards and Approvals

Absence of halogens	IEC 60754-2
Smoke Density	IEC 61034
Flame Retardance	IEC 60332-3 Cat.C
Cabling Standards	EN 50173-1 2. edition ISO/IEC 11801 2. edition EIA/TIA 568



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