

# Using Energystar paint to improve comfort and show compliance with Section J of the BCA.

We have looked at the plans provided by office near Port Hedland (see attached) and have some preliminary results on the comparative performance with varying absorptance coatings.

#### **Section J Compliance – Verification Method**

BCA Volume 1, Section J, Part JV3 allows building compliance with a reference building for classes 3, 5, 6, 8 & 9. Simulation software used must comply with the Australian Building Codes Board Protocols for Energy Rating Analysis Software. The software is used to model the building as designed and and again using the DTS requirements. If the building simulated as designed uses less energy than the model simulated as DTS, then the building as designed can be said to comply with Section J.

The EnergyPlus simulation software was developed by the United States Department of Energy and complies with the Australian Building Codes Board Protocols for Energy Rating or Analysis Software. EnergyPlus assesses the total energy use of a building with respect to the buildings, climate, orientation, materials, occupancy, lighting, heating and cooling, and appliances.

#### **Results**

A model was created in Energyplus using the schedules, material specification and others details set out in Section J of the BCA. The variables changed were roof and external wall insulation, as well as external wall and roof absorptance. Floor insulation of R1.5 has been kept constant except for models 2 and 4.

The simulations are based on the glazing of the building facing West, with the location set to Port Hedland (BCA Climate Zone 1).

The DTS model (1) shows the building with 0.7 abs on roof and walls, R1.3 to the external wall and R3.0 to the ceiling – the energy use figures for this model constitute the target for BCA compliance. Simulation results for the building as it is proposed via the plans provided (model 3) show that the building achieves compliance, however this is only by a small amount and therefore slight changes to things such as glazing area, location and orientation may lead to non-compliance. Lowering the absorptance of both roof and walls to 0.248 in model 8 brings the total cooling loads down by approximately a further 10%.

Table 1 shows the results of the preliminary Energyplus simulation runs. Lighting, hot water and other

energy uses were kept constant and have been excluded from the results.

	Heating (kWh)	Cooling (kWh)	Total (kWh)
1 BCA Allowance	23	2979	3002
Abs = 0.7 (standard)			
2 Steel only	8	8245	8253
3 Proposed	22	2699	2721
Abs = 0.248			
4 Steel only	24	4212	4236
5 Steel + Airgap + Plasterboard	37	3166	3203
6 Steel + Airgap + Polyair + Plasterboard	38	2468	2506
7 Steel + Airgap + Bondor	27	2447	2474
8 Proposed	25	2401	2426

These preliminary results show that, whilst the currently proposed design is compliant under the verification method, reducing the absorptance of the external walls and roof has a positive effect on the building's cooling requirements. This indicates a significant impact on internal conditions.

By comparing instances 3 and 8 above, the results show a reduction in cooling load of approximately 10% through reducing the absorptance of the walls and roof. Furthermore, the results for variations 5, 6 and 7 show that the building can achieve compliance without needing both the proposed insulation products (Bondor panel and Polyair).

Please be aware that these results apply only to the building under consideration as the design of an individual building and the buildings location and orientation has a large influence on the simulation results.

Please contact me if you would like to discuss these results, or if you wish us to do any further research into the performance of the buildings under consideration in other climate zones (please see Appendix 1 for preliminary results of this building in Climate Zone 2).

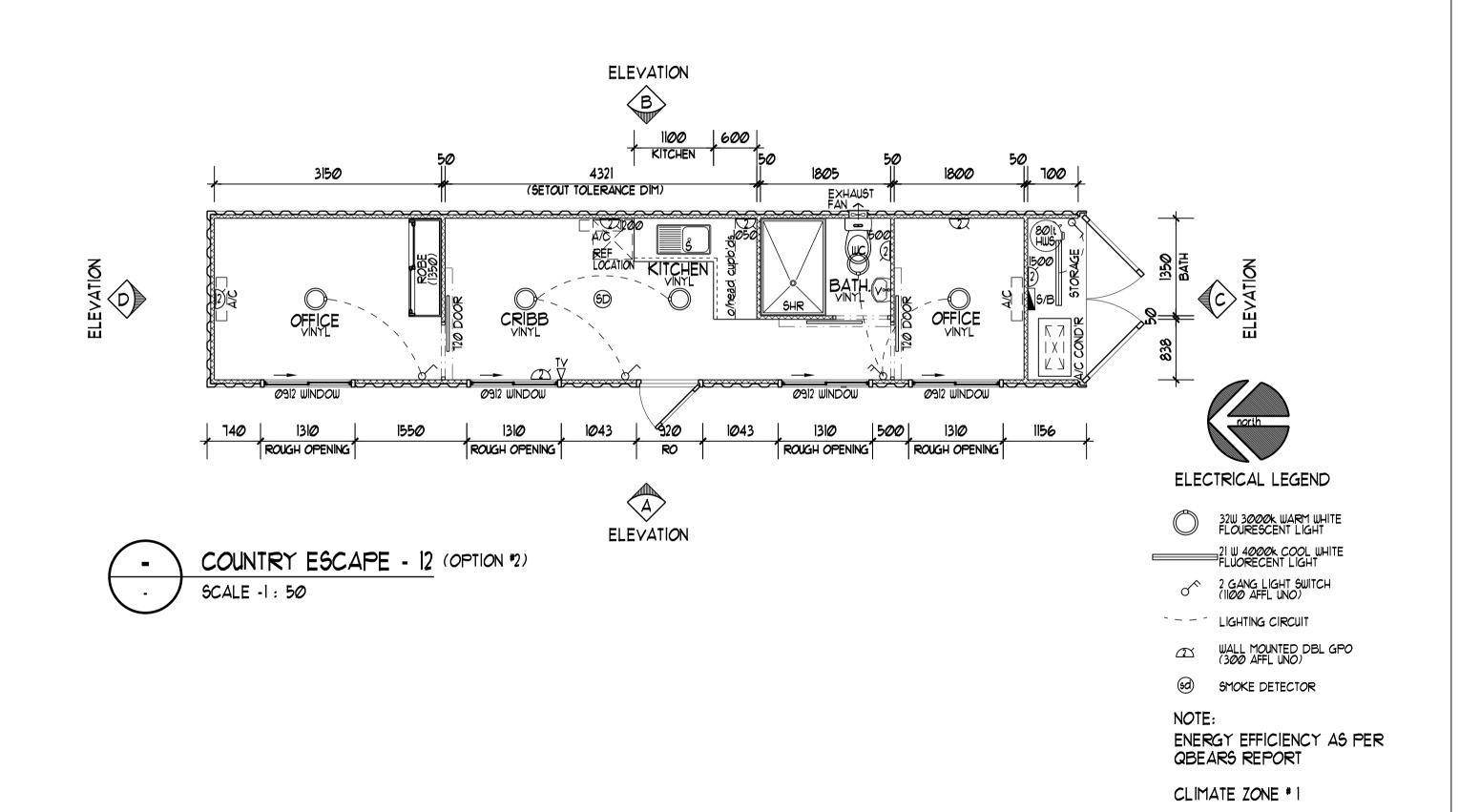
Regards,

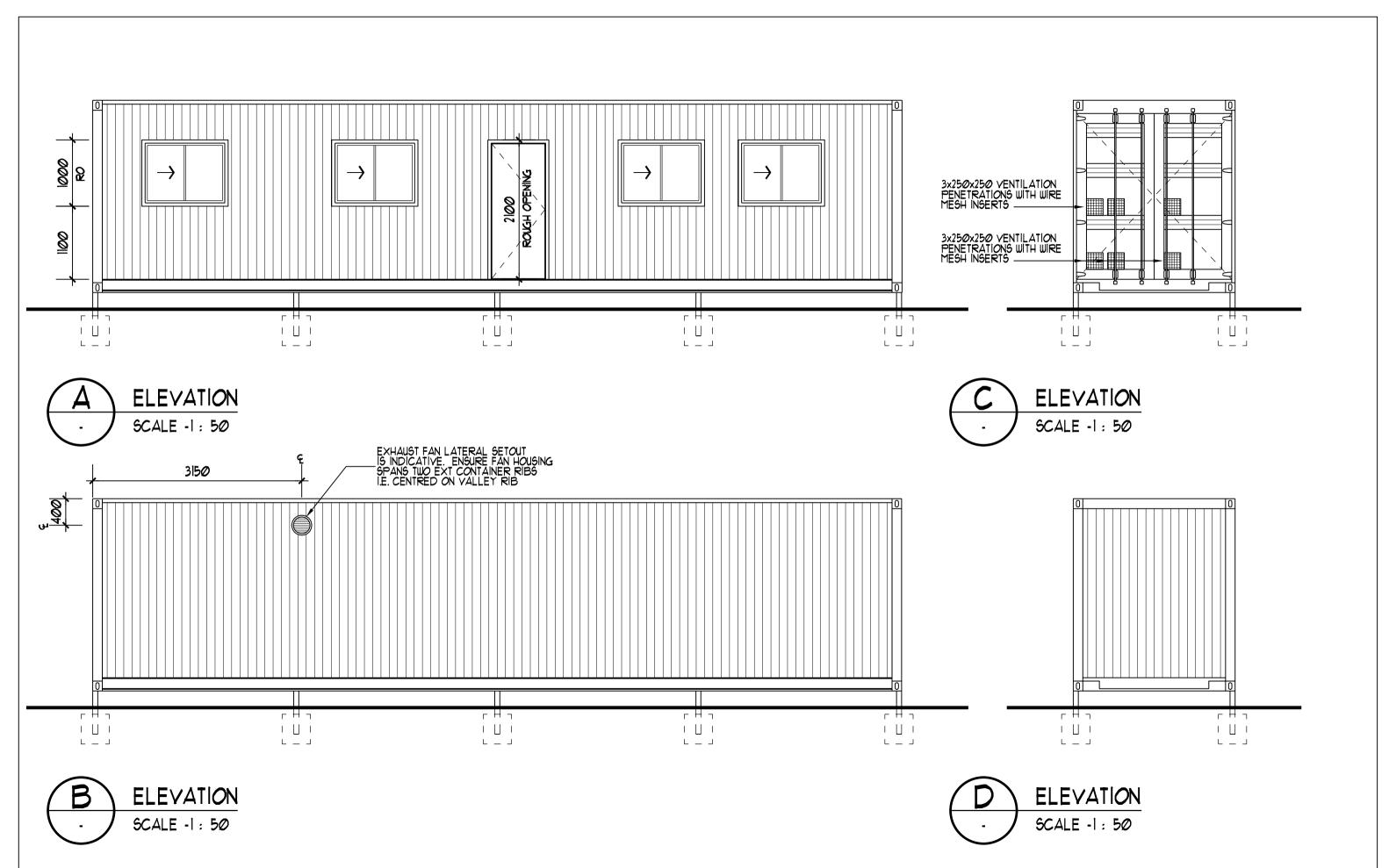
Sebastian Carr 1300 308 525

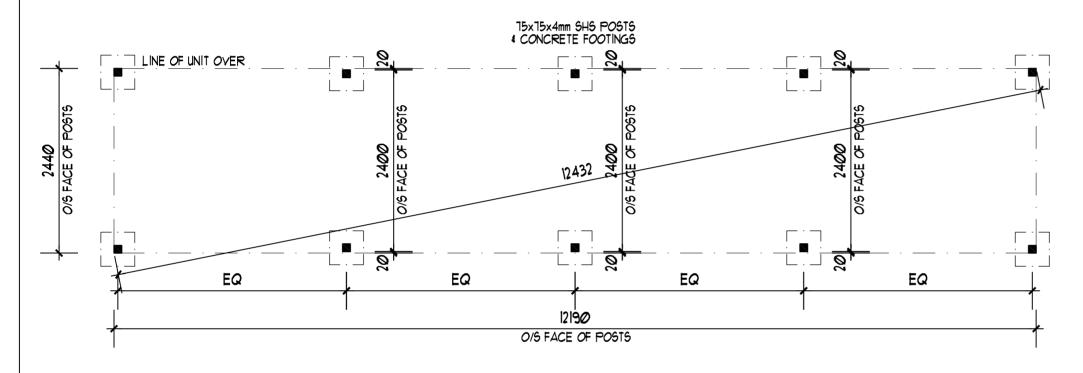
### **Appendix 1** – *Altenative Climate Zone*

In order to show the application of the process across various locations, we have run a trial of the same building in Mackay, QLD (BCA Climate Zone 2). All elements were kept constant except for the use of underfloor insulation (as this is not a requirement for climate zone 2). The results below indicate that compliance should be achieved without the need for any bulk insulation.

Mackay QLD	BCA Climate 2		
	Heating	Cooling	TOTAL (kWh)
1 BCA Allowance	15	2546	2561
Abs = 0.7 (standard)			
2 Steel	4	5843	5847
3 Proposed	15	2269	2284
Abs = 0.248			
4 Steel + Astec	17	2639	2656
5 Steel + Airgap + Plasterboard	27	2176	2203
6 Steel + Airgap + Polyair + Plasterboard	30	1852	1882
7 Steel + Airgap + Bondor	19	2053	2072
8 Proposed	19	2020	2039







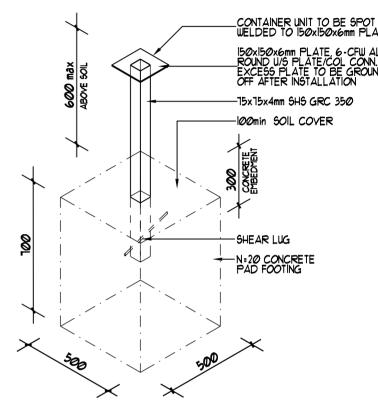
## 12M UNIT SHS STUMP & FOOTING PLAN (REGION "D")

SCALE -1: 50

NOTE:

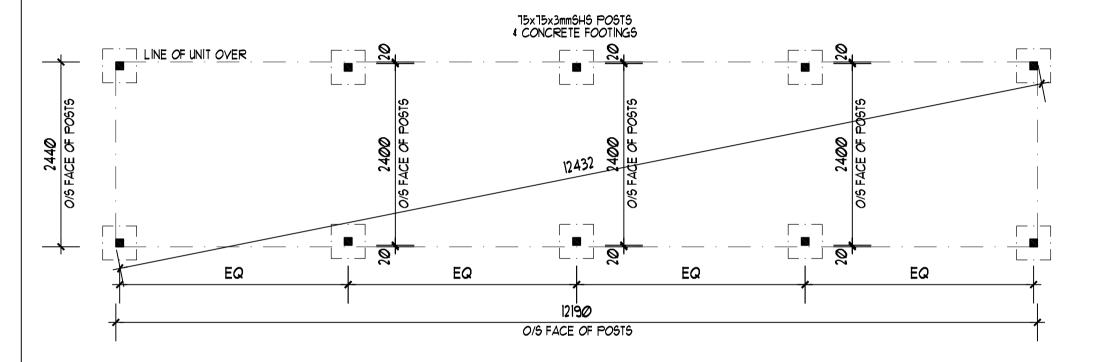
4 x CORNER STUMP HEIGHTS ARE 15mm LOWER THAN 6 x INTERMEDIATE STUMPS





REGION "D" TERRAIN CATEGORY 2 SOIL CLASS A, S, M, FOR CLASS H INCREASE SOIL COVER TO 200mm SOIL BEARING CAPACITY = 100kPa

3 SHS FOOTING DETAIL
5CALE -1: NTS



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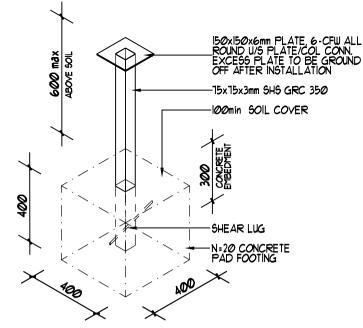
### 12M UNIT SHS STUMP & FOOTING PLAN

SCALE -1: 50

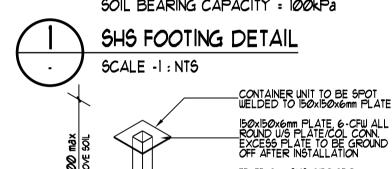
NOTE:

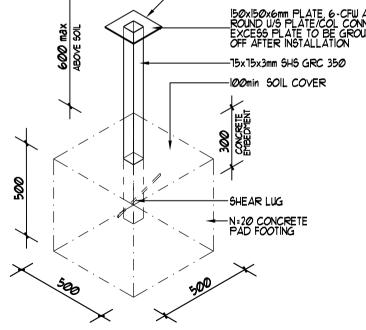
4 x CORNER STUMP HEIGHTS ARE 15mm LOWER THAN 6 x INTERMEDIATE STUMPS





REGIONS "A & B" TERRAIN CATEGORY 2 SOIL CLASS A, S, M, FOR CLASS H INCREASE SOIL COVER TO 200mm SOIL BEARING CAPACITY = 100kPa





REGION "C" TERRAIN CATEGORY 2 SOIL CLASS A, S, M, FOR CLASS H INCREASE SOIL COVER TO 200mm SOIL BEARING CAPACITY = 100kPa

2 SHS

SHS FOOTING DETAIL

SCALE -1: NTS