



ASTEC PAINTS AUSTRALASIA PTY LTD

**TAMINMIN COLLEGE
TEST RESULTS**

SEPT/OCT 2010



MANUFACTURERS OF



Name of Client **TAMINMIN COLLEGE**
Challoner Crs
Humpty Doo 0836
Northern Territory

Project 4 School Demountable Rooms referred as:
19.01 – Demountable School Room
19.02 – Demountable School Room
19.03 – Demountable School Room
19.04 – Demountable School Room

Applicator Turtlehead Enterprises Pty Ltd

Executive Summary
of Findings

Overall the temperature reductions of rooms 19.01 and 19.04 after having their roof coated with the Energy Star coatings remained between **1°C – 4.8°C cooler** than the external ambient temperatures without air-conditioners being used. In fact and without the use of air-conditioning, the temperature of the roof cavity in room 19.01 was up to **13.4°C cooler**, after its roof had been coated with the Energy Star coatings, whilst the roof cavity temperature of room 19.02 remained consistently higher than external ambient temperature by up to 8°C. By comparing the roof cavity temperatures of the Energy Star treated roof of room 19.01 to that of the untreated room 19.02, we noted that the temperatures were as much as **8.67°C lower** in room 19.01 rather than room 19.02. The reasoning behind using the roof cavity temperature data for comparison purposes above was that it minimized any impact the “hot box syndrome” may have created to the rooms, as all rooms were insulated using “bulk insulation”. We note that air-conditioning will still be required for these rooms when the internal ambient temperatures exceed 25°C, as the comfort temperature for occupancy (referred as the “dead zone”) outlined by the Macquarie University for a building is between 20°C to 25°C (refer Appendix 10). It is also notable that the air-conditioner condenser motors will not have to work as hard to reduce internal temperatures when the roofs of buildings have been coated with the Energy Star Infra-Red Heat Reflective roof coatings, as the temperatures remained below that of an uncoated roof. In fact a 1°C drop in temperature can provide a 10% power saving, and as such a considerable overall power saving for a property (refer Appendix 10), let alone the Co2 emissions reduction that is saved for our environment. We also note that the Energy Star coatings that were used on the site provide rust inhibiting properties for the metal roof substrate and have waterproofing properties to help eliminate water leaks in buildings thus protecting the asset value over the long term.

TEST METHOD

Location	<p>In accordance with the BCA climate map all school demountable buildings were located in Zone 1 (refer Attachment 1).</p> <p>These rooms formed 2 separate demountable buildings and in pairs (i.e. Rooms 19.01 and 19.02 formed one demountable building and were joined, Rooms 19.03 and 19.04 formed the other demountable building and were joined).</p> <p>The demountable buildings were located in a direct linear fashion and separated from each other by approximately 4 meters in length.</p> <p>Room 19.01's end wall was also positioned in a westerly direction obtained direct sunlight, whereas the other end walls did not receive this direct sunlight.</p>
Properties	<p>Upon inspection:</p> <p>Each room that was co-joined in the same demountable building seemed adequately separated as between each other; and</p> <p>Bulk insulation was installed upon inspection in all rooms.</p>
Temperature Data Loggers/Sensors	<p>Temperature Data Loggers/Sensors were placed in each room as follows:</p> <p>Room 19.01</p> <ul style="list-style-type: none">(i) Roof Cavity (inside manhole) – DET1;(ii) Server Box (higher level inside of room) – LP3;(iii) Blackboard (lower level inside of room) – DET3. <p>Room 19.02</p> <ul style="list-style-type: none">(i) Roof Cavity (inside manhole) – DET2;(ii) Server Box (higher level inside room) – LP1;(iii) Behind Cabinet (lower level inside room) – LP4. <p>Room 19.03</p> <ul style="list-style-type: none">(i) none in roof cavity(ii) Behind Cabinet (lower level inside room) – LP5;(iii) Blackboard (lower level inside room) - #1. <p>Room 19.04</p> <ul style="list-style-type: none">(i) none in roof cavity(ii) Northern Cabinet (lower level inside room) – LP2;(iii) Western Cabinet (lower level inside room) – LP6.

External Ambient temperature

Temperature Data Logger/Sensor was placed on the underside of Room 19.04 to provide a measurement of external ambient temperature.

External Ambient
Temperatures

As the temperature data logger/server was placed on a steel plate on the underside of Room 19.04, this would provide a cooler external ambient data reading than the actual external ambient temperatures during the test period. As a result, accurate external ambient temperature data was extracted from the Bureau of Meteorology website – “Middle Point (Humpty Doo), Northern Territory, September and October 2010 Daily Weather Observations” that were listed at 9.00am and 3.00pm for each and every day of the test period.

Application

The following works during application by Turtlehead Enterprises Pty Ltd, were performed on the roof of rooms 19.01 and 19.04:

List of activities completed on 25 September 2010 at approximately 12.00pm.

Pressure cleaning of the roof for rooms 19.01 and 19.04;

Priming of the Roof for rooms 19.01 and 19.04;

First coat of Energy Star for rooms 19.01 and 19.04.

List of activities completed on 26 September 2010 at approximately 9.00am.

Final coat - Energy Star for room 19.01.

List of activities completed on 27 September 2010 at approximately 12.00 pm.

Final Coat - Energy Star for room 19.04.

TEST DISCUSSION

External Ambient
Temperature
Readings

The placement of the external ambient temperature data logger (being placed underneath room 19.04) recorded lower temperatures by as much as 3.9°C as compared to the external ambient temperatures recorded by the Bureau of Meteorology (Humpty Doo area). This is a logical variation in temperature by virtue that the external temperature data logger was placed underneath the building of room 19.04 and mounted on a steel plate that had a direct connection with the earth. Heat flow to the cooler ground temperatures would have caused inaccuracies in the external temperatures recordings of this sensor. Accordingly and in order to provide an accurate external ambient temperature comparative standard for all comparisons, the Bureau of Meteorology external ambient temperature (Humpty Doo area) recordings were used.

Bulk and Foil
Insulation
Considerations

BULK INSLATON

The buildings had bulk insulation installed as indicated by the applicator.

As a result, we are aware that the so called “hot box syndrome” applies in this instant. This means that this form of insulation has a greater resistance to heat flow up, causing buildings to stay hotter longer by trapping in the often difficult to ventilate (stagnant heat zone) between the top of the door heads and ceilings. This phenomenon was examined in detail in a report considering the “Thermal Performance of Housing Units in Queensland Phase 1; A study by the Department of Architecture and Building, University of Melbourne. AHRC Report 58, 1981. Research project funded by The Australian Housing Research Council. It considered the impact of “bulk insulation” as compared to “foil insulation” for hot climates, noting that our Energy Star IR heat reflective coatings were not developed at the time of the report. In warm to hot climates where winter heating is very low or non-existent, - quoting Prof. Aynsley: **“Horizontal reflective foil airspaces in roofs have the unique characteristic of having a greater resistance to heat flow down than up. They act as one-way valves for summer heat flow, restricting daytime heat gain while facilitating night time heat loss.** This is important because indoor discomfort in the evening which inhibits sleep can be very debilitating.”

Please refer to attachment 2 that has displayed this effect in graphical format, using temperature data recorded on the 2 October 2010 for the external ambient temperature recorded

underneath room 19.04 and both the server loggers (higher levels) for rooms 19.01 and 19.02. What is evident is that not only was the temperature recordings of room 19.01 coated with our Energy Star coatings lower than that of room 19.02, but room 19.02 took a significant period of time to cool down as compared to both the external ambient temperature and Room 19.01, coated with Energy Star coatings.

FOIL INSULATION

Although foil insulation was the preferred method of insulation for warm and hot climates (refer above comments), there exist some very significant electrical issues with this form of insulation, if not applied correctly. In fact, the NTWorkSafe website Bulletin 05.02.04, outlines a WARNING NOTICE to all installers of this form of insulation noting “Insulation installers are warned of the dangers associated with installing conductive foil type insulation near electrical equipment including cable, light fittings and ceiling fans etc. **Installed incorrectly this could cause the insulation to become energized, posing an electrical risk, not only to the installer, but also to others.**”

Energy Star
Products

CodeMark™ certified products.

Comply with AS/NZS 4859.1 – Materials for the Thermal Insulation of Buildings.

As our Energy Star coatings are placed on the outside of buildings and thereby coating the external envelope of the building, they do not have any of the concerns raised above with “foil insulation” yet they provide the same and if not a better result than either the “bulk or foil” insulation materials. In a report dated 1 Sept 2010 by Quasar Management Services Pty Ltd, Mr Rod Johnston B Tech, M Eng Sc, CP Eng, NPER, MIE Aust, RPEQ, Director he stated that

“2. Energy Star – safe, cost effective and thermally effective

- **Infra-red reflective paint systems can be applied to existing roofs, in order to augment ineffective bulk insulation or to replace unsafe foil insulation. The relevant properties are set out in Appendix 2.**
- **ASTEC Energy Star is approved for guaranteed compliance with the BCA under the CodeMark system.**
- **Infra-red reflective paint systems can be applied to existing roofs, in order to augment ineffective bulk insulation.**
- **Infra-red reflective paints systems can be applied to new or existing concrete walls to negate the need for conventional bulk insulation.”**

Air-Conditioner
Use

During the trial and due to the nature of use of the school rooms, air-conditioning was implemented on various days. From the information provided from the applicator and the temperature data collected these were on the following days; 10 Sept 2010 and 13-17 Sept 2010 and 20-23 Sept 2010 and 4-5 Oct 2010. Room data contaminated by this influence has been eliminated from the assessments.

TEST FINDINGS

Aligning the temperature data recorded by the temperature data loggers/sensors to that provided by the Bureau of Meteorology for each given date at the times of 9.00am and 3.00pm, the following can be summarized (ignoring the days of air-conditioner use):

Attachment 3
Graph 1

Compares the Roof Cavity temperatures as recorded to the external ambient temperature for each given day from 10 Sept 2010 to 5 October 2010.

The roof cavity temperature of Room 19.01 was as much as 8.6°C hotter than the external ambient temperature before the roof was coated with the Energy Star coating.

The roof cavity temperature of Room 19.01 was as much as **4.8°C cooler** than the external ambient temperature after its roof was coated with the Energy Star coating. In fact, the room 19.01 roof cavity temperature never exceeded the outside ambient temperature after the roof was coated with Energy Star coatings and remained **cooler by as much as 4.8°C**.

Accordingly, this represents a drop by as much as **13.4°C** in the roof cavity temperature when comparing the Energy Star coated roof of room 19.01 to the uncoated roof of room 19.01.

The roof cavity temperature of room 19.02 remained consistently higher than the external ambient temperature by as much as 8°C.

Attachment 4
Graph 2

This compares the roof cavity temperature of rooms 19.01 and 19.02, for the period after room 19.01's roof had been coated with the Energy Star coatings. Temperatures in the roof cavities were as much as **8.6°C lower than** that of the roof cavity temperature for room 19.02.

Attachment 5
Graph 3

The sever boxes in both rooms were located at the highest point in the rooms and as such replicated the temperature data in the (stagnant heat zone) between the top of the door heads and ceilings. Noting the comments made above about bulk and/or foil insulation and the impediments associated with this, the following can be inferred:

Prior to the coating the roof with Energy Star coatings, the temperature recorded in Room 19.01 was up to 4.53°C hotter than external ambient temperature, and this occurred 50% of the time.

Upon the roof of room 19.01 being coated with Energy Star coatings, the temperature of the server box only exceeded the external ambient temperature by 1.2°C, equating to 13.3% of the time. In fact, when comparing the server box temperature recordings of Room 19.01 after its roof was coated with Energy Star coatings, it remained up to **3.9°C cooler** than the external ambient temperature.

Attachment 6
Graph 4

When comparing the server box temperatures in Room 19.01 to that of Room 19.02 after the roof of Room 19.01 being coated with Energy Star coatings, we notice that the temperatures remain up to **4.2°C cooler** in Room 19.01 rather than Room 19.02.

Attachment 7
Graph 5

Even though the comparison of temperatures noting the impact of the rooms having “bulk insulation” installed is somewhat skewed due to the “Hot Box Syndrome” influences mentioned previously, Room 19.01 temperatures after having its roof coated with Energy Star coatings remained cooler than that of Room 19.02 by as much as **2.4°C** during the hot part of the days @ 3.00pm.

Attachment 8
Graph 6

Rooms 19.03 and 19.04 seemed to have air-conditioned used on the 29 & 30 September 2010 and 1 October 2010, in addition to the above air-conditioning use dates. When comparing the temperatures recorded and ignoring these air-conditioning use days, one can see that room 19.04 once coated with the Energy Star coatings provided close to a **1°C temperature drop** compared to the untreated room 19.03.

Attachment 9
Graph 7

Displays the temperatures levels for the whole period from the 10 September 2010 to 5 October 2010 for all rooms 19.01, 19.02, 19.03 and 19.04. It clearly shows the impact for the non air-conditioned days using Energy Star coatings for roofs in rooms 19.01 and 19.04 **remained cooler**.

Attachment 10

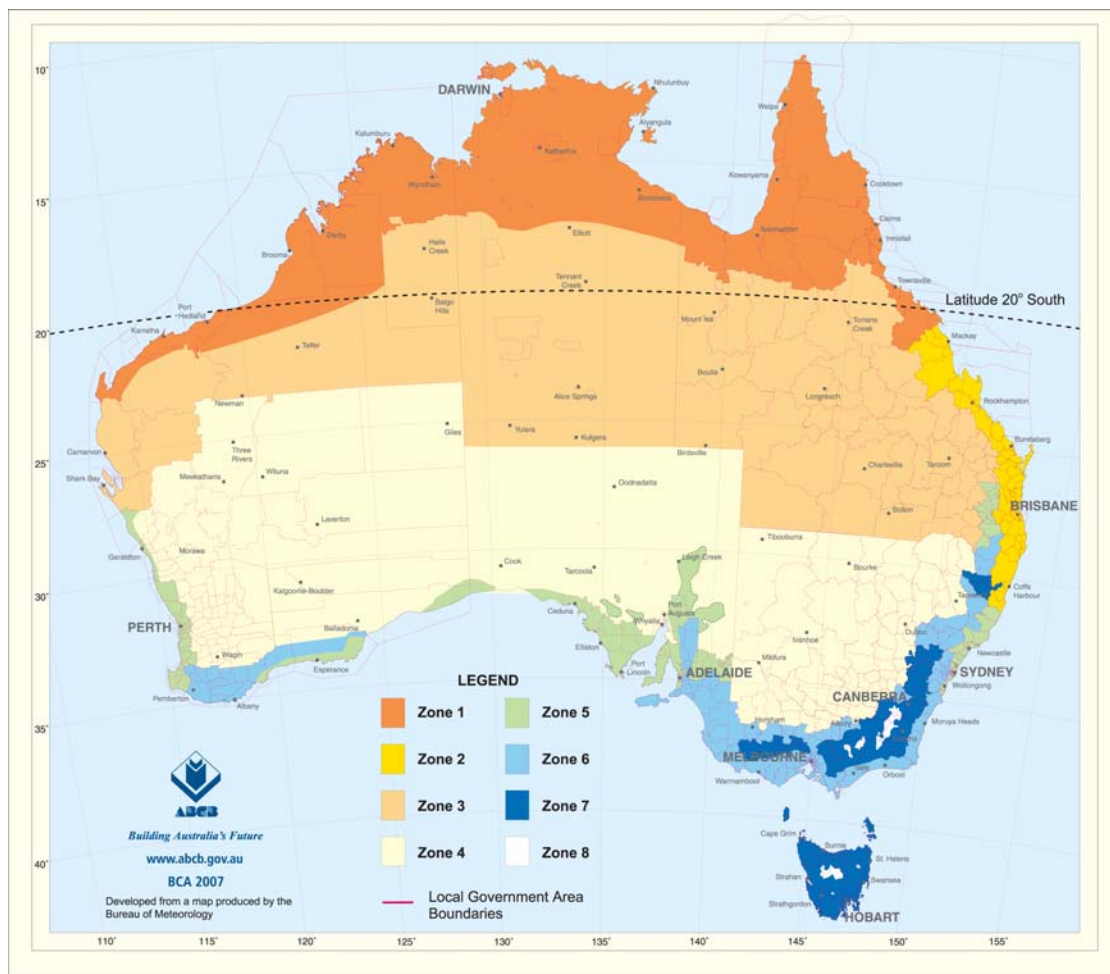
Extract Macquarie University webpage
Energy and Emissions – Sustainability

Attachment 11

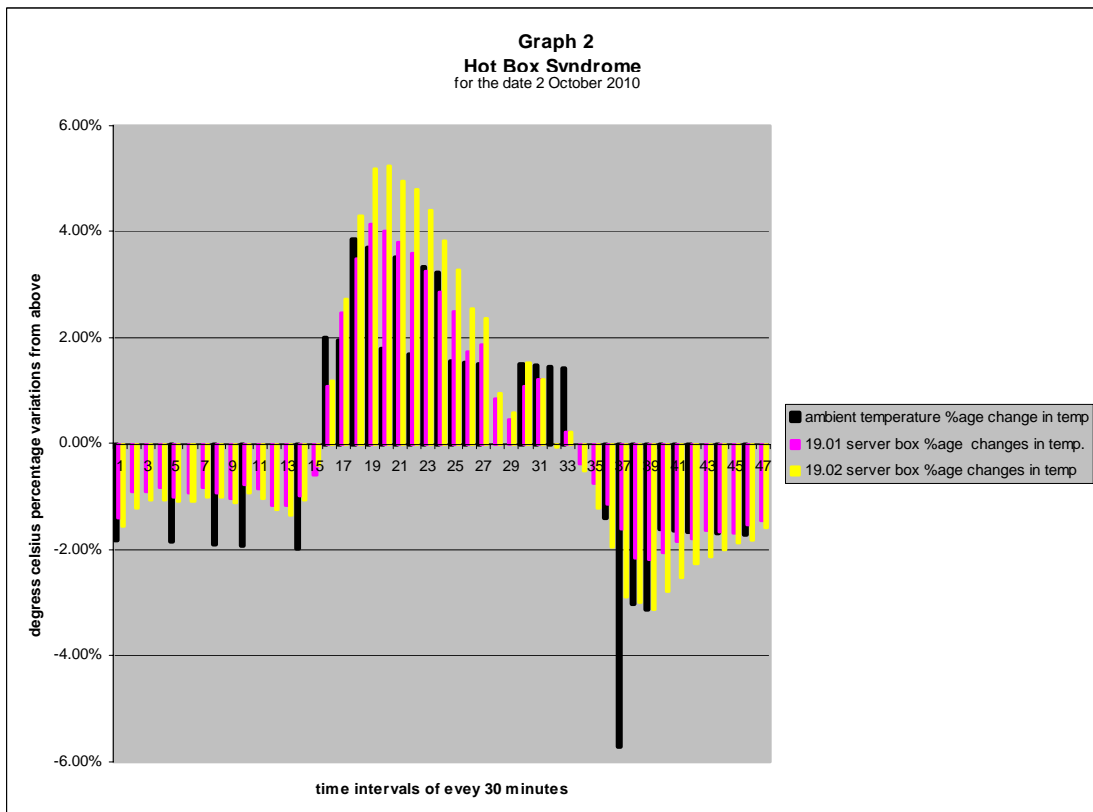
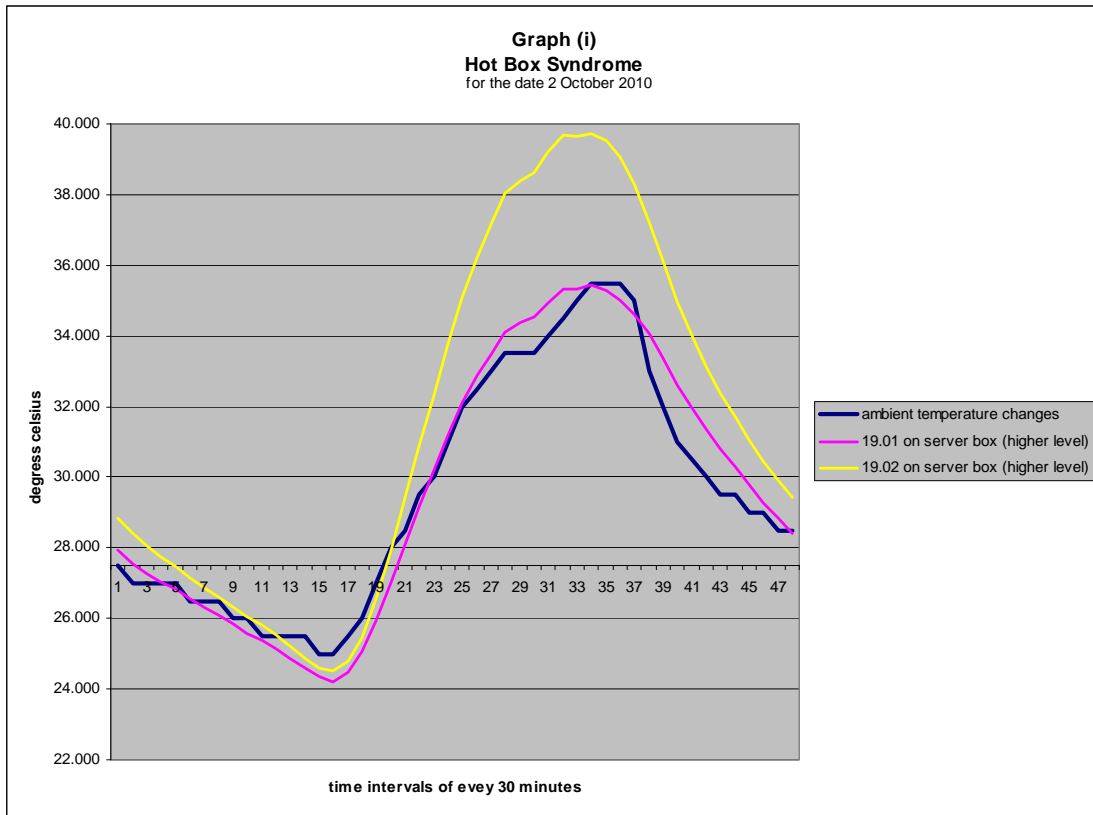
Temperature Data

ATTACHMENT 1

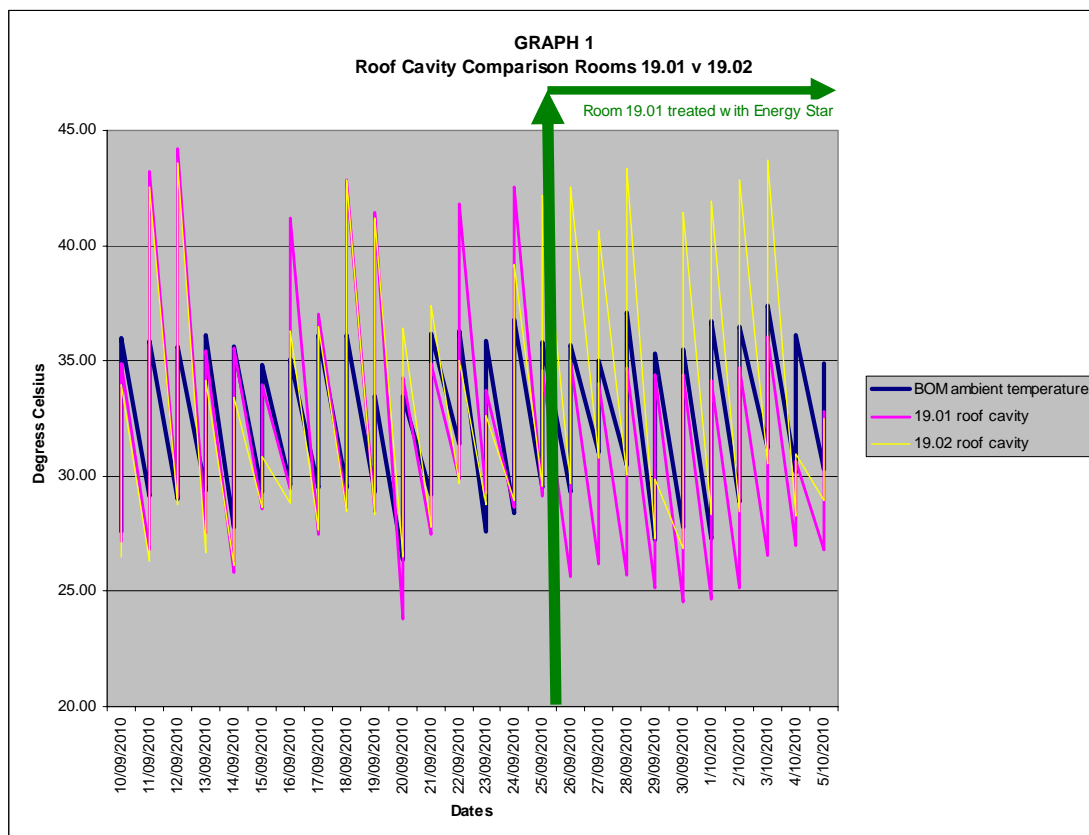
CLIMATE ZONE MAP OF AUSTRALIA



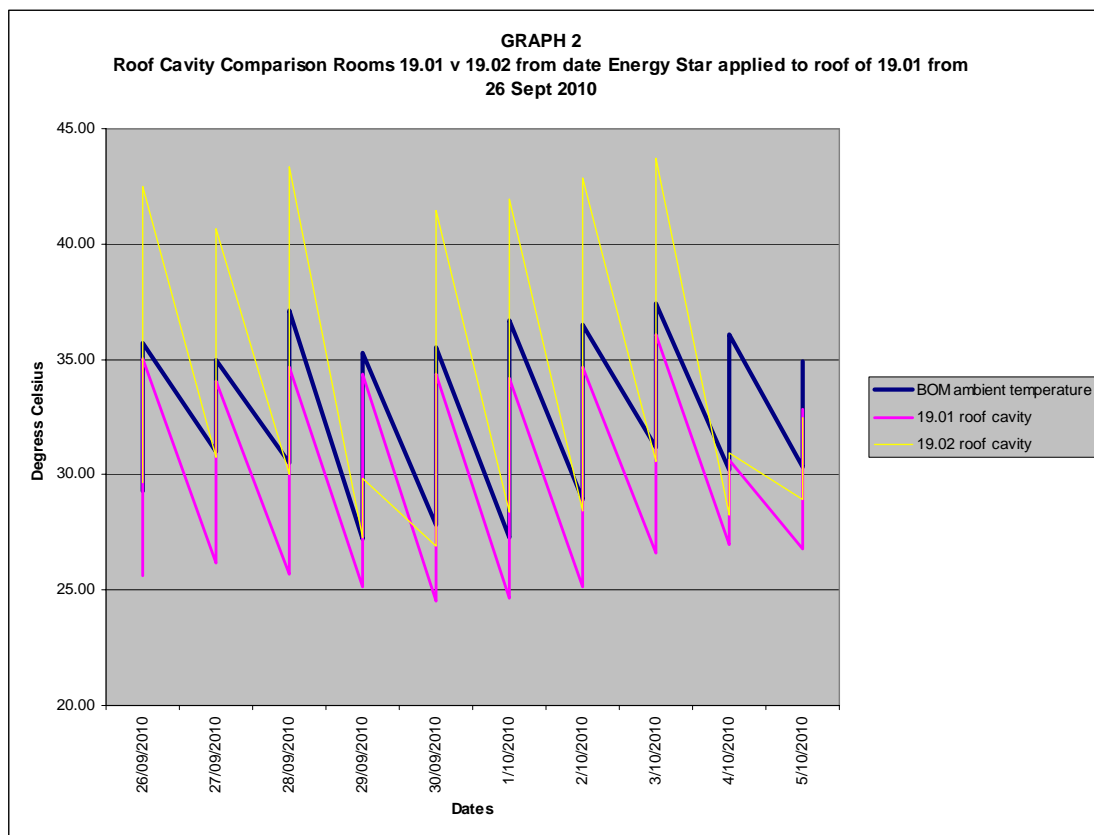
ATTACHMENT 2



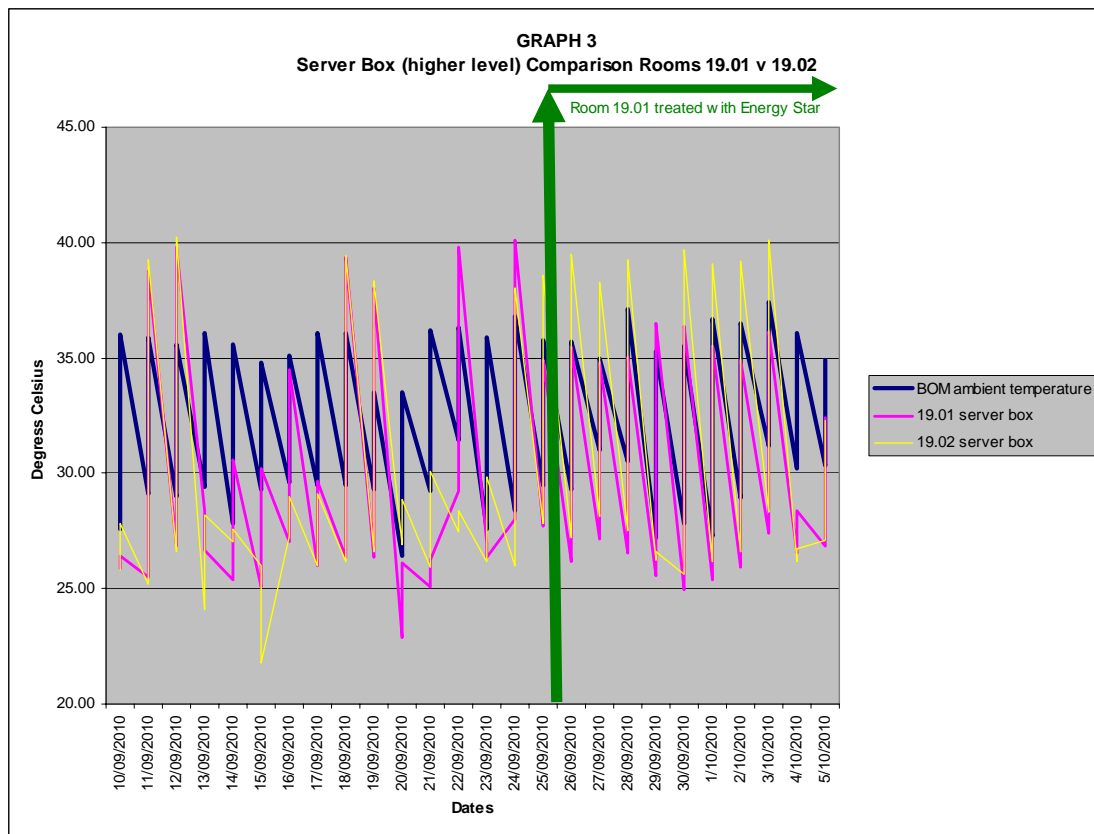
ATTACHMENT 3



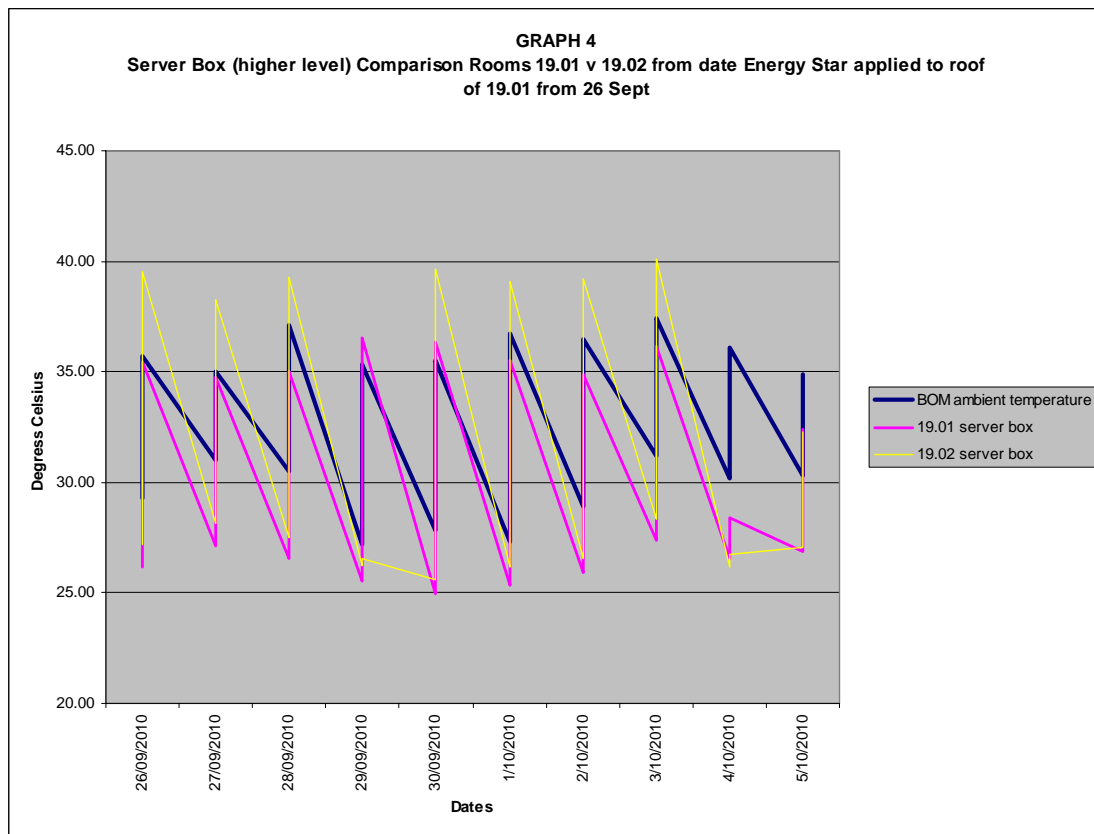
ATTACHMENT 4



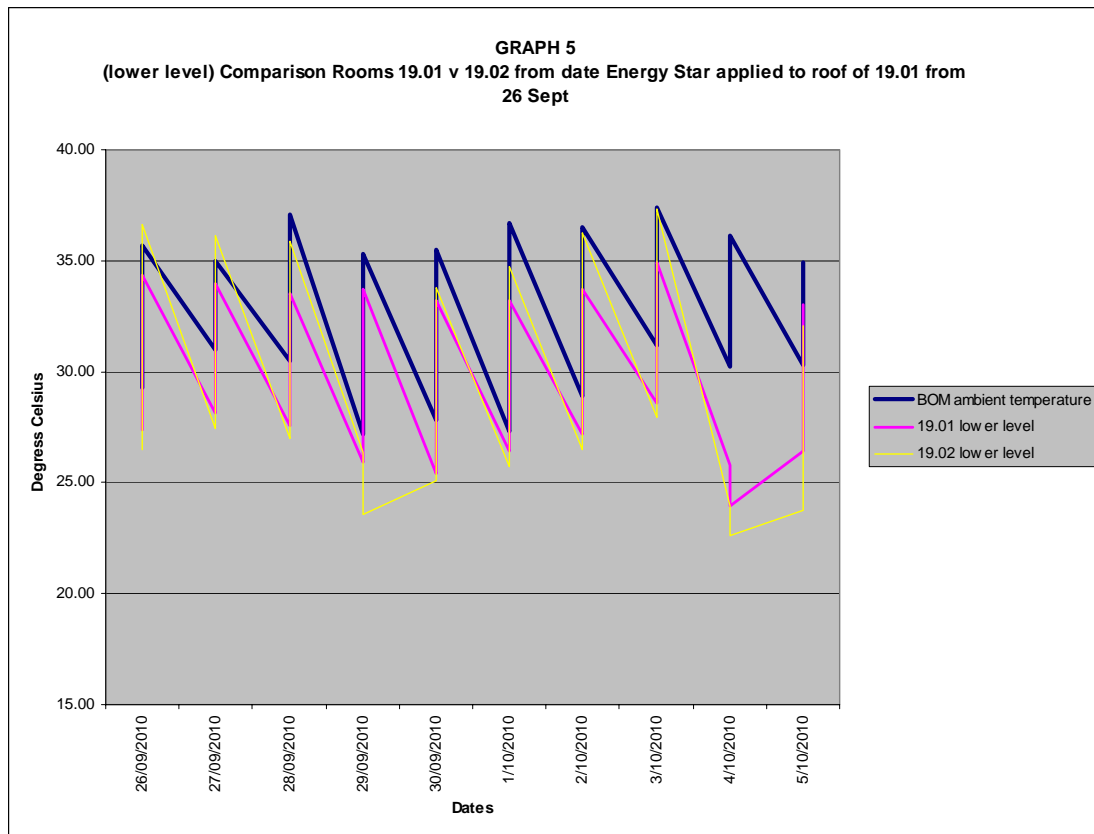
ATTACHMENT 5



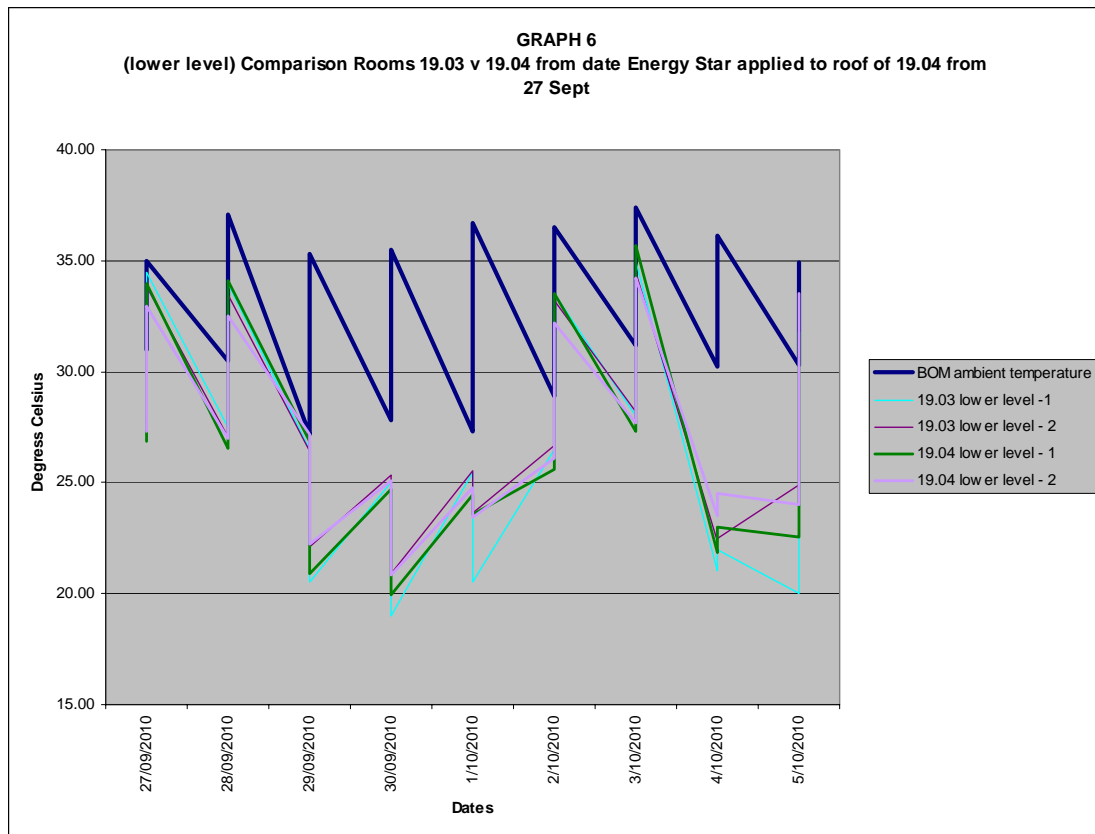
ATTACHMENT 6



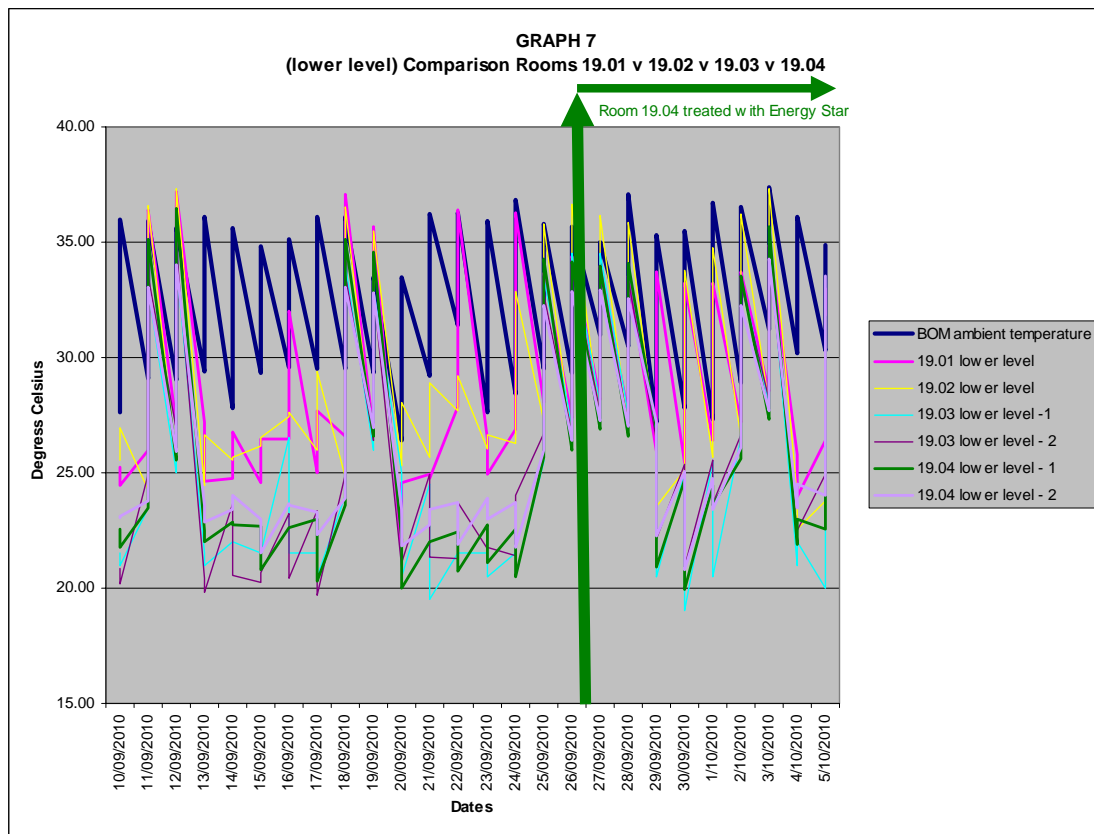
ATTACHMENT 7



ATTACHMENT 8



ATTACHMENT 9



ATTACHMENT 10

**Extract from Macquarie University web page
Energy and Emissions - Sustainability**



Air-conditioning set points

One of the major energy users and greenhouse gas emitters on campus is air-conditioning. By increasing or decreasing the temperature to better suit the outside environment enormous savings can be made. Campus building energy trials (PDF 0.82MB) were undertaken to assess the impact of changing temperature set points to a sustainable level and measure the potential resulting energy advantage and consequent CO2 emission reduction.

Initial trial findings indicate the following energy savings:

- Results in E11A over 5 day test week: 1,183 kilowatt hour (kWh) reduction, or a 20% decrease in energy consumption. This equates to a CO2 reduction of 1,278kg over a 5 day period.
- Results in E3B over 5 day test week: 408.725 kWh reduction, or a 7.3% decrease in energy consumption. This equates to a CO2 reduction of 441.5kg over a 5 day period.

We have started changing the set points for air conditioning to have a "dead zone" between 20 and 25 degrees. That is no heating will occur till the temperature goes below 20 and no cooling until it goes above 25.

This has been implemented in E4A, E4B, X5B, E3B and soon in E6A and E6B.

Changes to the set temperature point will also occur in E11A in the near future.

Adjusting the temperature ranges to more appropriate outside conditions will enable us to make substantial energy and carbon emission savings. You can find out more about why these changes have been made in a paper by Richard de Dear (PDF 1.80MB).

did you know?

Did you know that increasing the air conditioning temperature setting in summer by just 1 degree saves 10% energy and emissions?

Developing an Adaptive Model of Thermal Comfort and Preference

FINAL REPORT
ASHRAE RP- 884
March 1997

Richard de Dear, Gail Brager, Donna Cooper

Macquarie Research Ltd., Macquarie University,
Sydney, NSW 2109 AUSTRALIA

Center for Environmental Design Research, University of California,
Berkeley, CA 94720 USA

“Results of Cooperative Research between the American Society of Heating,
Refrigerating
and Air Conditioning Engineers, Inc., and Macquarie Research, Ltd.”

EXTRACT FROM REPORT

“EXECUTIVE SUMMARY

One of the more contentious theoretical issues in the applied research area of thermal Acceptable ranges of operative temperature were applied symmetrically above and below predicted optimum operative temperatures.

The average winter prescription for 90% general thermal acceptability (excluding local discomforts) was given as $22.5^{\circ}\text{C} \pm 1.2 \text{ K}$ while the summer prescription was given as $23.5^{\circ}\text{C} \pm 1.2 \text{ K}$.

The variable temperature standard for use in naturally ventilated buildings was given as an adaptive linear regression model based on outdoor weather and climate: optimum indoor temperature = $18.9 + 0.255 * (\text{outdoor mean } ET^*)$ Acceptable temperature ranges around the optimum in naturally ventilated buildings were specified as ± 3.5 for 80% general acceptability and ± 2.5 for 90% general acceptability.”

ATTACHMENT 11

Astec Paints Australasia Pty Ltd

Taminmin College
Temperature Data Logger/ Sensor Results
Sept/Oct 2010

#	Approx Time	Ambient		Outside Ambient	#	Approx Time	19.01	19.01	19.01	
		BOM Temp Celsius(°C)	R/H %	Temperature Celsius(°C)			Roof Cavity	On server box Inside Room	Under Blackboard Inside Room	
		day					Temperature Celsius(°C)	Temperature Celsius(°C)	Temperature Celsius(°C)	
91	10/09/2010 9:01	fri	27.60	71	26.000	85	9/10/2010 9:00	27.173	25.841	25.222
103	10/09/2010 15:01	fri	36.00	33	34.000	109	9/10/2010 15:00	34.903	26.426	24.448
139	11/09/2010 9:01	sat	29.10	70	26.000	181	9/11/2010 9:00	26.781	25.501	26.000
151	11/09/2010 15:01	sat	35.90	40	35.000	205	9/11/2010 15:00	43.238	38.756	36.403
187	12/09/2010 9:01	sun	29.00	63	26.500	277	9/12/2010 9:00	29.053	26.818	27.075
199	12/09/2010 15:01	sun	35.60	33	35.000	301	9/12/2010 15:00	44.211	39.829	37.165
235	13/09/2010 9:01	mon	29.40	65	26.500	373	09/13/10 09:00:58 AM	27.567	28.369	27.173
247	13/09/2010 15:01	mon	36.10	36	34.000	397	09/13/10 03:00:58 PM	35.435	26.671	24.641
283	14/09/2010 9:01	tue	27.80	76	26.000	469	09/14/10 09:00:58 AM	25.805	25.380	24.738
295	14/09/2010 15:01	tue	35.60	38	35.000	493	09/14/10 03:00:58 PM	35.542	30.545	26.781
331	15/09/2010 9:01	wed	29.30	63	27.000	565	09/15/10 09:00:58 AM	28.555	25.065	24.545
343	15/09/2010 15:01	wed	34.80	36	32.500	589	09/15/10 03:00:58 PM	33.953	30.217	26.488
379	16/09/2010 9:01	thu	29.60	63	27.500	661	09/16/10 09:00:58 AM	29.452	27.014	26.488
391	16/09/2010 15:01	thu	35.10	45	34.500	685	09/16/10 03:00:58 PM	41.225	34.466	31.983
427	17/09/2010 9:01	fri	29.50	60	26.500	757	09/17/10 09:00:58 AM	27.468	25.963	25.028
439	17/09/2010 15:01	fri	36.10	21	33.500	781	09/17/10 03:00:58 PM	37.055	29.665	27.665
475	18/09/2010 9:01	sat	29.50	61	26.500	853	09/18/10 09:00:58 AM	28.655	26.378	26.585
487	18/09/2010 15:01	sat	36.10	31	34.000	877	09/18/10 03:00:58 PM	42.878	39.346	37.055
523	19/09/2010 9:01	sun	29.30	69	26.500	949	09/19/10 09:00:58 AM	28.456	26.353	26.781
535	19/09/2010 15:01	sun	33.50	46	33.000	973	09/19/10 03:00:58 PM	41.458	38.032	35.649
571	20/09/2010 9:01	mon	26.40	36	24.500	1045	09/20/10 09:00:58 AM	23.773	22.848	21.473
583	20/09/2010 15:01	mon	33.50	31	32.000	1069	09/20/10 03:00:58 PM	34.268	26.109	24.545
619	21/09/2010 9:01	tue	29.20	37	26.000	1141	09/21/10 09:00:58 AM	27.468	25.089	24.931
631	21/09/2010 15:01	tue	36.20	28	34.000	1165	09/21/10 03:00:58 PM	34.903	26.231	24.738
667	22/09/2010 9:01	wed	31.40	47	27.500	1237	09/22/10 09:00:58 AM	29.853	29.215	27.862
679	22/09/2010 15:01	wed	36.30	40	34.000	1261	09/22/10 03:00:58 PM	41.810	39.800	36.403
715	23/09/2010 9:01	thu	27.60	81	26.000	1333	09/23/10 09:00:58 AM	29.252	26.965	26.488
727	23/09/2010 15:01	thu	35.90	42	32.500	1357	09/23/10 03:00:58 PM	33.743	26.329	24.931
763	24/09/2010 9:01	fri	28.40	77	26.500	1429	09/24/10 09:00:58 AM	28.655	28.023	26.879
775	24/09/2010 15:01	fri	36.80	31	34.000	1453	09/24/10 03:00:58 PM	42.520	40.114	36.295
811	25/09/2010 9:01	sat	29.50	67	27.500	1525	09/25/10 09:00:58 AM	29.152	27.677	28.060
823	25/09/2010 15:01	sat	35.80	33	33.000	1549	09/25/10 03:00:58 PM	34.585	34.889	33.639
859	26/09/2010 9:01	sun	29.30	65	27.000	1621	09/26/10 09:00:58 AM	25.610	26.158	27.370
871	26/09/2010 15:01	sun	35.70	37	34.500	1645	09/26/10 03:00:58 PM	35.009	35.448	34.374
907	27/09/2010 9:01	mon	31.00	59	28.000	1717	09/27/10 09:00:58 AM	26.195	27.136	28.159
919	27/09/2010 15:01	mon	35.00	40	33.500	1741	09/27/10 03:00:58 PM	34.058	34.783	33.953
955	28/09/2010 9:01	tue	30.50	58	27.000	1813	09/28/10 09:00:58 AM	25.708	26.524	27.567
967	28/09/2010 15:01	tue	37.10	32	34.500	1837	09/28/10 03:00:58 PM	34.691	35.022	33.535
1003	29/09/2010 9:01	wed	27.20	68	25.500	1909	09/29/10 09:00:58 AM	25.125	25.550	25.902
1015	29/09/2010 15:01	wed	35.30	45	33.000	1933	09/29/10 03:00:58 PM	34.374	36.525	33.743
1051	30/09/2010 9:01	thu	27.80	79	26.000	2005	09/30/10 09:00:58 AM	24.545	24.968	25.416
1063	30/09/2010 15:01	thu	35.50	43	33.500	2029	09/30/10 03:00:58 PM	34.374	36.362	33.222
1099	1/10/2010 9:01	fri	27.30	77	26.000	2101	10/01/2010 9:00	24.641	25.355	26.390
1111	1/10/2010 15:01	fri	36.70	33	33.500	2125	10/01/2010 15:00	34.163	35.502	33.222
1147	2/10/2010 9:01	sat	28.90	71	27.000	2197	10/02/2010 9:00	25.125	25.939	27.173
1159	2/10/2010 15:01	sat	36.50	33	34.000	2221	10/02/2010 15:00	34.691	34.916	33.743
1195	3/10/2010 9:01	sun	31.20	62	28.000	2293	10/03/2010 9:00	26.585	27.407	28.555
1207	3/10/2010 15:01	sun	37.40	36	35.500	2317	10/03/2010 15:00	36.079	36.146	34.903
1243	4/10/2010 9:01	mon	30.20	72	28.500	2389	10/04/2010 9:00	26.977	26.549	25.805
1255	4/10/2010 15:01	mon	36.10	46	34.500	2413	10/04/2010 15:00	30.659	28.394	23.966
1291	5/10/2010 9:01	tue	30.30	67	28.500	2485	10/05/2010 9:00	26.781	26.867	26.390
1301	5/10/2010 14:01	tue	34.90	41	36.000	2505	10/05/2010 14:00	32.807	32.381	33.014

Astec Paints Australasia Pty Ltd

Taminmin College
Temperature Data Logger/ Sensor Results
Sept/Oct 2010

Ambient				19.02 Roof Cavity				19.02 Behind Cabinet Inside				
Approx Time	day	BOM Temp Celsius(°C)	R/H %	#	Approx Time	Temperature Celsius(°C)	#	Approx Time	Temperature Celsius(°C)	#	Approx Time	Temperature Celsius(°C)
10/09/2010 9:01	fri	27.60	71	195	9/10/2010 8:58	26.488	188	9/10/2010 9:07	25.574			
10/09/2010 15:01	fri	36.00	33	219	9/10/2010 14:58	33.953	212	9/10/2010 15:07	26.940			
11/09/2010 9:01	sat	29.10	70	291	9/11/2010 8:58	26.292	284	9/11/2010 9:07	24.291			
11/09/2010 15:01	sat	35.90	40	315	9/11/2010 14:58	42.520	308	9/11/2010 15:07	36.606			
12/09/2010 9:01	sun	29.00	63	387	9/12/2010 8:58	28.754	380	9/12/2010 9:07	25.453			
12/09/2010 15:01	sun	35.60	33	411	9/12/2010 14:58	43.601	404	9/12/2010 15:07	37.315			
13/09/2010 9:01	mon	29.40	65	483	09/13/10 08:58:31 AM	26.683	476	09/13/10 09:07:51 AM	24.436			
13/09/2010 15:01	mon	36.10	36	507	09/13/10 02:58:31 PM	34.163	500	09/13/10 03:07:51 PM	26.671			
14/09/2010 9:01	tue	27.80	76	579	09/14/10 08:58:31 AM	26.097	572	09/14/10 09:07:51 AM	25.550			
14/09/2010 15:01	tue	35.60	38	603	09/14/10 02:58:31 PM	33.430	596	09/14/10 03:07:51 PM	25.695			
15/09/2010 9:01	wed	29.30	63	675	09/15/10 08:58:31 AM	28.655	668	09/15/10 09:07:51 AM	26.182			
15/09/2010 15:01	wed	34.80	36	699	09/15/10 02:58:31 PM	30.862	692	09/15/10 03:07:51 PM	26.524			
16/09/2010 9:01	thu	29.60	63	771	09/16/10 08:58:31 AM	28.853	764	09/16/10 09:07:51 AM	27.431			
16/09/2010 15:01	thu	35.10	45	795	09/16/10 02:58:31 PM	36.295	788	09/16/10 03:07:51 PM	27.604			
17/09/2010 9:01	fri	29.50	60	867	09/17/10 08:58:31 AM	27.665	860	09/17/10 09:07:51 AM	25.987			
17/09/2010 15:01	fri	36.10	21	891	09/17/10 02:58:31 PM	36.511	884	09/17/10 03:07:51 PM	29.389			
18/09/2010 9:01	sat	29.50	61	963	09/18/10 08:58:31 AM	28.456	956	09/18/10 09:07:51 AM	24.847			
18/09/2010 15:01	sat	36.10	31	987	09/18/10 02:58:31 PM	42.878	980	09/18/10 03:07:51 PM	36.525			
19/09/2010 9:01	sun	29.30	69	1059	09/19/10 08:58:31 AM	28.357	1052	09/19/10 09:07:51 AM	26.304			
19/09/2010 15:01	sun	33.50	46	1083	09/19/10 02:58:31 PM	41.225	1076	09/19/10 03:07:51 PM	35.475			
20/09/2010 9:01	mon	26.40	36	1155	09/20/10 08:58:31 AM	26.488	1148	09/20/10 09:07:51 AM	25.331			
20/09/2010 15:01	mon	33.50	31	1179	09/20/10 02:58:31 PM	36.403	1172	09/20/10 03:07:51 PM	28.023			
21/09/2010 9:01	tue	29.20	37	1251	09/21/10 08:58:31 AM	27.764	1244	09/21/10 09:07:51 AM	25.671			
21/09/2010 15:01	tue	36.20	28	1275	09/21/10 02:58:31 PM	37.384	1268	09/21/10 03:07:51 PM	28.891			
22/09/2010 9:01	wed	31.40	47	1347	09/22/10 08:58:31 AM	29.652	1340	09/22/10 09:07:51 AM	27.702			
22/09/2010 15:01	wed	36.30	40	1371	09/22/10 02:58:31 PM	35.009	1364	09/22/10 03:07:51 PM	29.190			
23/09/2010 9:01	thu	27.60	81	1443	09/23/10 08:58:31 AM	28.754	1436	09/23/10 09:07:51 AM	26.036			
23/09/2010 15:01	thu	35.90	42	1467	09/23/10 02:58:31 PM	32.600	1460	09/23/10 03:07:51 PM	26.646			
24/09/2010 9:01	fri	28.40	77	1539	09/24/10 08:58:31 AM	28.953	1532	09/24/10 09:07:51 AM	26.256			
24/09/2010 15:01	fri	36.80	31	1563	09/24/10 02:58:31 PM	39.163	1556	09/24/10 03:07:51 PM	32.846			
25/09/2010 9:01	sat	29.50	67	1635	09/25/10 08:58:31 AM	29.552	1628	09/25/10 09:07:51 AM	27.284			
25/09/2010 15:01	sat	35.80	33	1659	09/25/10 02:58:31 PM	42.164	1652	09/25/10 03:07:51 PM	35.797			
26/09/2010 9:01	sun	29.30	65	1731	09/26/10 08:58:31 AM	29.652	1724	09/26/10 09:07:51 AM	26.475			
26/09/2010 15:01	sun	35.70	37	1755	09/26/10 02:58:31 PM	42.520	1748	09/26/10 03:07:51 PM	36.661			
27/09/2010 9:01	mon	31.00	59	1827	09/27/10 08:58:31 AM	30.760	1820	09/27/10 09:07:51 AM	27.431			
27/09/2010 15:01	mon	35.00	40	1851	09/27/10 02:58:31 PM	40.645	1844	09/27/10 03:07:51 PM	36.146			
28/09/2010 9:01	tue	30.50	58	1923	09/28/10 08:58:31 AM	30.054	1916	09/28/10 09:07:51 AM	26.989			
28/09/2010 15:01	tue	37.10	32	1947	09/28/10 02:58:31 PM	43.359	1940	09/28/10 03:07:51 PM	35.850			
29/09/2010 9:01	wed	27.20	68	2019	09/29/10 08:58:31 AM	27.272	2012	09/29/10 09:07:51 AM	26.353			
29/09/2010 15:01	wed	35.30	45	2043	09/29/10 02:58:31 PM	29.853	2036	09/29/10 03:07:51 PM	23.545			
30/09/2010 9:01	thu	27.80	79	2115	09/30/10 08:58:31 AM	26.879	2108	09/30/10 09:07:51 AM	25.113			
30/09/2010 15:01	thu	35.50	43	2139	09/30/10 02:58:31 PM	41.456	2132	09/30/10 03:07:51 PM	33.783			
1/10/2010 9:01	fri	27.30	77	2211	10/01/2010 8:58	28.357	2204	10/01/2010 9:07	25.695			
1/10/2010 15:01	fri	36.70	33	2235	10/01/2010 14:58	41.928	2228	10/01/2010 15:07	34.730			
2/10/2010 9:01	sat	28.90	71	2307	10/02/2010 8:58	28.456	2300	10/02/2010 9:07	26.500			
2/10/2010 15:01	sat	36.50	33	2331	10/02/2010 14:58	42.878	2324	10/02/2010 15:07	36.227			
3/10/2010 9:01	sun	31.20	62	2403	10/03/2010 8:58	30.556	2396	10/03/2010 9:07	27.924			
3/10/2010 15:01	sun	37.40	36	2427	10/03/2010 14:58	43.723	2420	10/03/2010 15:07	37.315			
4/10/2010 9:01	mon	30.20	72	2499	10/04/2010 8:58	28.258	2492	10/04/2010 9:07	23.954			
4/10/2010 15:01	mon	36.10	46	2523	10/04/2010 14:58	30.963	2516	10/04/2010 15:07	22.585			
5/10/2010 9:01	tue	30.30	67	2595	10/05/2010 8:58	28.953	2588	10/05/2010 9:07	23.761			
5/10/2010 14:01	tue	34.90	41	2615	10/05/2010 13:58	32.497	2608	10/05/2010 14:07	32.073			

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Approx Time	Ambient			19.02	#	Approx Time	19.03	#	Approx Time	19.03
	day	BOM Temp Celsius(°C)	R/H %	Temperature Celsius(°C)			Behind Blackboard Inside Temperature Celsius(°C)			Whiteboard Inside Temperature Celsius(°C)
10/09/2010 9:01	fri	27.60	71	25.817	91	10/09/2010 9:01	21.500	188	9/10/2010 9:08	20.841
10/09/2010 15:01	fri	36.00	33	27.801	103	10/09/2010 15:01	21.000	212	9/10/2010 15:08	20.174
11/09/2010 9:01	sat	29.10	70	25.210	139	11/09/2010 9:01	23.500	284	9/11/2010 9:08	24.944
11/09/2010 15:01	sat	35.90	40	39.234	151	11/09/2010 15:01	33.000	308	9/11/2010 15:08	33.548
12/09/2010 9:01	sun	29.00	63	26.598	187	12/09/2010 9:01	25.000	380	9/12/2010 9:08	26.867
12/09/2010 15:01	sun	35.60	33	40.257	199	12/09/2010 15:01	34.000	404	9/12/2010 15:08	34.783
13/09/2010 9:01	mon	29.40	65	24.074	235	13/09/2010 9:01	21.500	476	09/13/10 09:08:06 AM	20.436
13/09/2010 15:01	mon	36.10	36	28.196	247	13/09/2010 15:01	21.000	500	09/13/10 03:08:06 PM	19.793
14/09/2010 9:01	tue	27.80	76	27.014	263	14/09/2010 9:01	22.000	572	09/14/10 09:08:06 AM	23.641
14/09/2010 15:01	tue	35.60	38	27.604	295	14/09/2010 15:01	22.000	596	09/14/10 03:08:06 PM	20.579
15/09/2010 9:01	wed	29.30	63	26.012	331	15/09/2010 9:01	21.500	668	09/15/10 09:08:06 AM	20.269
15/09/2010 15:01	wed	34.80	36	21.795	343	15/09/2010 15:01	21.500	692	09/15/10 03:08:06 PM	20.698
16/09/2010 9:01	thu	29.60	63	27.259	379	16/09/2010 9:01	26.500	764	09/16/10 09:08:06 AM	23.208
16/09/2010 15:01	thu	35.10	45	29.015	391	16/09/2010 15:01	21.500	788	09/16/10 03:08:06 PM	20.412
17/09/2010 9:01	fri	29.50	60	25.987	427	17/09/2010 9:01	21.500	860	09/17/10 09:08:06 AM	23.328
17/09/2010 15:01	fri	36.10	21	29.090	439	17/09/2010 15:01	20.500	884	09/17/10 03:08:06 PM	19.698
18/09/2010 9:01	sat	29.50	61	26.158	475	18/09/2010 9:01	24.000	956	09/18/10 09:08:06 AM	24.944
18/09/2010 15:01	sat	36.10	31	39.460	487	18/09/2010 15:01	34.000	980	09/18/10 03:08:06 PM	33.574
19/09/2010 9:01	sun	29.30	69	26.573	523	19/09/2010 9:01	26.000	1052	09/19/10 09:08:06 AM	26.426
19/09/2010 15:01	sun	33.50	46	38.309	535	19/09/2010 15:01	33.000	1076	09/19/10 03:08:06 PM	32.846
20/09/2010 9:01	mon	26.40	36	26.916	571	20/09/2010 9:01	25.000	1148	09/20/10 09:08:06 AM	20.936
20/09/2010 15:01	mon	33.50	31	28.891	583	20/09/2010 15:01	20.500	1172	09/20/10 03:08:06 PM	21.127
21/09/2010 9:01	tue	29.20	37	25.939	619	21/09/2010 9:01	24.500	1244	09/21/10 09:08:06 AM	24.919
21/09/2010 15:01	tue	36.20	28	30.091	631	21/09/2010 15:01	19.500	1268	09/21/10 03:08:06 PM	21.366
22/09/2010 9:01	wed	31.40	47	27.431	667	22/09/2010 9:01	21.500	1340	09/22/10 09:08:06 AM	21.27
22/09/2010 15:01	wed	36.30	40	28.394	679	22/09/2010 15:01	21.500	1364	09/22/10 03:08:06 PM	23.737
23/09/2010 9:01	thu	27.60	81	26.158	715	23/09/2010 9:01	21.500	1436	09/23/10 09:08:06 AM	21.7
23/09/2010 15:01	thu	35.90	42	29.840	727	23/09/2010 15:01	20.500	1460	09/23/10 03:08:06 PM	21.772
24/09/2010 9:01	fri	28.40	77	25.987	763	24/09/2010 9:01	21.500	1532	09/24/10 09:08:06 AM	21.413
24/09/2010 15:01	fri	36.80	31	38.004	775	24/09/2010 15:01	20.500	1556	09/24/10 03:08:06 PM	24.002
25/09/2010 9:01	sat	29.50	67	27.850	811	25/09/2010 9:01	25.500	1628	09/25/10 09:08:06 AM	26.72
25/09/2010 15:01	sat	35.80	33	38.560	823	25/09/2010 15:01	33.500	1652	09/25/10 03:08:06 PM	32.768
26/09/2010 9:01	sun	29.30	65	27.210	859	26/09/2010 9:01	27.000	1724	09/26/10 09:08:06 AM	26.72
26/09/2010 15:01	sun	35.70	37	39.516	871	26/09/2010 15:01	34.500	1748	09/26/10 03:08:06 PM	33.861
27/09/2010 9:01	mon	31.00	59	28.147	907	27/09/2010 9:01	28.000	1820	09/27/10 09:08:06 AM	27.628
27/09/2010 15:01	mon	35.00	40	38.282	919	27/09/2010 15:01	34.500	1844	09/27/10 03:08:06 PM	33.835
28/09/2010 9:01	tue	30.50	58	27.530	955	28/09/2010 9:01	27.500	1916	09/28/10 09:08:06 AM	27.063
28/09/2010 15:01	tue	37.10	32	39.262	967	28/09/2010 15:01	34.000	1940	09/28/10 03:08:06 PM	33.443
29/09/2010 9:01	wed	27.20	68	26.256	1003	29/09/2010 9:01	26.500	2012	09/29/10 09:08:06 AM	26.402
29/09/2010 15:01	wed	35.30	45	26.573	1015	29/09/2010 15:01	20.500	2036	09/29/10 03:08:06 PM	22.106
30/09/2010 9:01	thu	27.80	79	25.623	1051	30/09/2010 9:01	25.000	2108	09/30/10 09:08:06 AM	25.355
30/09/2010 15:01	thu	35.50	43	39.658	1063	30/09/2010 15:01	19.000	2132	09/30/10 03:08:06 PM	20.889
1/10/2010 9:01	fri	27.30	77	26.158	1099	1/10/2010 9:01	25.500	2204	10/01/2010 9:08	25.55
1/10/2010 15:01	fri	36.70	33	39.093	1111	1/10/2010 15:01	20.500	2228	10/01/2010 15:08	23.641
2/10/2010 9:01	sat	28.90	71	26.573	1147	2/10/2010 9:01	26.500	2300	10/02/2010 9:08	26.646
2/10/2010 15:01	sat	36.50	33	39.205	1159	2/10/2010 15:01	33.500	2324	10/02/2010 15:08	33.235
3/10/2010 9:01	sun	31.20	62	28.320	1195	3/10/2010 9:01	28.000	2396	10/03/2010 9:08	28.196
3/10/2010 15:01	sun	37.40	36	40.114	1207	3/10/2010 15:01	35.000	2420	10/03/2010 15:08	34.466
4/10/2010 9:01	mon	30.20	72	26.182	1243	4/10/2010 9:01	21.000	2492	10/04/2010 9:08	22.369
4/10/2010 15:01	mon	36.10	46	26.720	1255	4/10/2010 15:01	22.000	2516	10/04/2010 14:08	22.513
5/10/2010 9:01	tue	30.30	67	27.087	1291	5/10/2010 9:01	20.000	2588	10/04/2010 20:38	24.919
5/10/2010 14:01	tue	34.90	41	32.278	1301	5/10/2010 14:01	31.000	2608	10/05/2010 1:38	26.134

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Approx Time	Ambient		#	Time, GMT+09:30	19.04	19.04	
	day	BOM Temp Celsius(°C)			R/H %	North Cabinet Inside Temperature Celsius(°C)	West Cabinet Inside Temperature Celsius(°C)
10/09/2010 9:01	fri	27.60	71	188	9/10/2010 9:08	22.537	23.064
10/09/2010 15:01	fri	36.00	33	212	9/10/2010 15:08	21.772	23.088
11/09/2010 9:01	sat	29.10	70	284	9/11/2010 9:08	23.497	23.761
11/09/2010 15:01	sat	35.90	40	308	9/11/2010 15:08	35.102	33.053
12/09/2010 9:01	sun	29.00	63	380	9/12/2010 9:08	25.574	25.939
12/09/2010 15:01	sun	35.60	33	404	9/12/2010 15:08	36.444	34.019
13/09/2010 9:01	mon	29.40	65	476	09/13/10 09:08:25 AM	22.489	23.569
13/09/2010 15:01	mon	36.10	36	500	09/13/10 03:08:25 PM	21.987	22.872
14/09/2010 9:01	tue	27.80	76	572	09/14/10 09:08:25 AM	22.848	23.424
14/09/2010 15:01	tue	35.60	38	596	09/14/10 03:08:25 PM	22.753	24.05
15/09/2010 9:01	wed	29.30	63	668	09/15/10 09:08:25 AM	22.657	23.016
15/09/2010 15:01	wed	34.80	36	692	09/15/10 03:08:25 PM	20.817	21.509
16/09/2010 9:01	thu	29.60	63	764	09/16/10 09:08:25 AM	22.609	23.689
16/09/2010 15:01	thu	35.10	45	788	09/16/10 03:08:25 PM	22.609	23.593
17/09/2010 9:01	fri	29.50	60	860	09/17/10 09:08:25 AM	22.968	23.304
17/09/2010 15:01	fri	36.10	21	884	09/17/10 03:08:25 PM	20.317	22.345
18/09/2010 9:01	sat	29.50	61	956	09/18/10 09:08:25 AM	23.593	23.905
18/09/2010 15:01	sat	36.10	31	980	09/18/10 03:08:25 PM	35.102	33.079
19/09/2010 9:01	sun	29.30	69	1052	09/19/10 09:08:25 AM	26.573	26.94
19/09/2010 15:01	sun	33.50	46	1076	09/19/10 03:08:25 PM	34.598	32.794
20/09/2010 9:01	mon	26.40	36	1148	09/20/10 09:08:25 AM	22.154	23.4
20/09/2010 15:01	mon	33.50	31	1172	09/20/10 03:08:25 PM	20.007	21.819
21/09/2010 9:01	tue	29.20	37	1244	09/21/10 09:08:25 AM	22.011	22.753
21/09/2010 15:01	tue	36.20	28	1268	09/21/10 03:08:25 PM	21.987	23.4
22/09/2010 9:01	wed	31.40	47	1340	09/22/10 09:08:25 AM	22.465	23.737
22/09/2010 15:01	wed	36.30	40	1364	09/22/10 03:08:25 PM	20.722	21.891
23/09/2010 9:01	thu	27.60	81	1436	09/23/10 09:08:25 AM	22.753	23.905
23/09/2010 15:01	thu	35.90	42	1460	09/23/10 03:08:25 PM	21.079	22.992
24/09/2010 9:01	fri	28.40	77	1532	09/24/10 09:08:25 AM	22.561	23.737
24/09/2010 15:01	fri	36.80	31	1556	09/24/10 03:08:25 PM	20.484	21.748
25/09/2010 9:01	sat	29.50	67	1628	09/25/10 09:08:25 AM	25.695	25.987
25/09/2010 15:01	sat	35.80	33	1652	09/25/10 03:08:25 PM	34.281	32.253
26/09/2010 9:01	sun	29.30	65	1724	09/26/10 09:08:25 AM	25.963	26.378
26/09/2010 15:01	sun	35.70	37	1748	09/26/10 03:08:25 PM	34.15	32.846
27/09/2010 9:01	mon	31.00	59	1820	09/27/10 09:08:25 AM	26.867	27.284
27/09/2010 15:01	mon	35.00	40	1844	09/27/10 03:08:25 PM	33.966	32.949
28/09/2010 9:01	tue	30.50	58	1916	09/28/10 09:08:25 AM	26.573	27.014
28/09/2010 15:01	tue	37.10	32	1940	09/28/10 03:08:25 PM	34.071	32.536
29/09/2010 9:01	wed	27.20	68	2012	09/29/10 09:08:25 AM	26.867	27.21
29/09/2010 15:01	wed	35.30	45	2036	09/29/10 03:08:25 PM	20.889	22.25
30/09/2010 9:01	thu	27.80	79	2108	09/30/10 09:08:25 AM	24.702	25.065
30/09/2010 15:01	thu	35.50	43	2132	09/30/10 03:08:25 PM	19.936	20.817
1/10/2010 9:01	fri	27.30	77	2204	10/01/2010 9:08	24.436	24.774
1/10/2010 15:01	fri	36.70	33	2228	10/01/2010 15:08	23.593	23.424
2/10/2010 9:01	sat	28.90	71	2300	10/02/2010 9:08	25.623	26.085
2/10/2010 15:01	sat	36.50	33	2324	10/02/2010 15:08	33.548	32.227
3/10/2010 9:01	sun	31.20	62	2396	10/03/2010 9:08	27.308	27.677
3/10/2010 15:01	sun	37.40	36	2420	10/03/2010 15:08	35.662	34.255
4/10/2010 9:01	mon	30.20	72	2492	10/04/2010 9:08	21.867	23.472
4/10/2010 15:01	mon	36.10	46	2516	10/04/2010 15:08	22.968	24.532
5/10/2010 9:01	tue	30.30	67	2588	10/05/2010 9:08	22.561	24.026
5/10/2010 14:01	tue	34.90	41	2608	10/05/2010 14:08	31.765	33.521