Credit Cover Sheet Round 1

Green Star Office Design Version 2 - As Built Rating

INN-3: Environmental Design Initiatives

Points available: 5 between INN1 to 3 **Points claimed:** 1

Documents Provided

PDF number(s)	Document name
2 - 4	Detailed Description of MonkeyBar (includes Environmental Benefit)
5 - 13	MonkeyBar™ Brochure
14 – 15	Reodata Booklet
16 - 18	Email from ARUP's LCA Specialist confirming CO_2 values associated with steel
19 - 24	Copy of ENE-2 Credit Criteria used to formulate points claimed
25 - 28	Copy of Marked Up Monkey Steel Supply Register by Laing O'Rourke.

CIR rulings & Technical Clarifications used related to this Credit

NIL

GBCA correspondence related to this Credit

NIL

Discussion

This innovation initiative was awarded 1 point in the design submission.

The MonkeyBar is a reo coupling method of joining length of steel and has been used on all vertical in-situ walls on the 123 Albert Street project. The use of the MonkeyBar technology results in an overall saving of steel by significantly reducing the amount of steel overlap required when joining two steel reinforcing bars using standard techniques. MonkeyBar coupling is primarily on large civil projects, however, LORAC have adopted the technology for the 123 Albert St. In doing so, the project uses less steel than standard construction. It is estimated that the savings of steel for this project by using MonkeyBar is approximately 94.01 tonnes (equates to 193,657 $kgCO_2$)

Detailed Description of MonkeyBar (including Environmental Benefit)

ARUP

Subject	INN-3 Environmental Design Initiatives - MonkeyBar		
Date	20 December 2011	Job No/Ref	86006-33/DT

1 What is the Measurable Environmental Benefit?

1.1 MonkeyBar™ Coupling

MonkeyBar™ is a coupler system for joining lengths of reinforcing bars used in concrete construction. MonkeyBars are formed onto the ends of standard dimension steel bars through a forging and milling operation, allowing the two formed ends to interlock. A standard dimension sleeve tube is then fitted over the coupled joint to create the final interlock (Figure 1). The primary function of the product is to join reinforcing bars.

MonkeyBar system is produced in the six most common diameter bars used in concrete construction: 16mm, 20mm, 24mm, 28mm, 32mm and 36mm couplers.

Figure 1: MonkeyBar Coupling System

There is no other coupling system in the world that is integral to the reinforcement bar; it is a unique product invented and designed in Australia. Unfortunately, the company was sold in 2010 and closed down due to the lack of market demand for the product.

1.2 Quantifiable Environmental Benefit

There are a number of coupling systems commercially available. Current steel industry estimates are that about 80% of all coupling is done with overlapping of reinforcing bar, secured with steel wire wrapped manually by steel fixers. In vertical applications on a high-rise development the amount of overlap required, or the lap length, is approximately forty times the diameter of the steel bar being used (Figure 2).

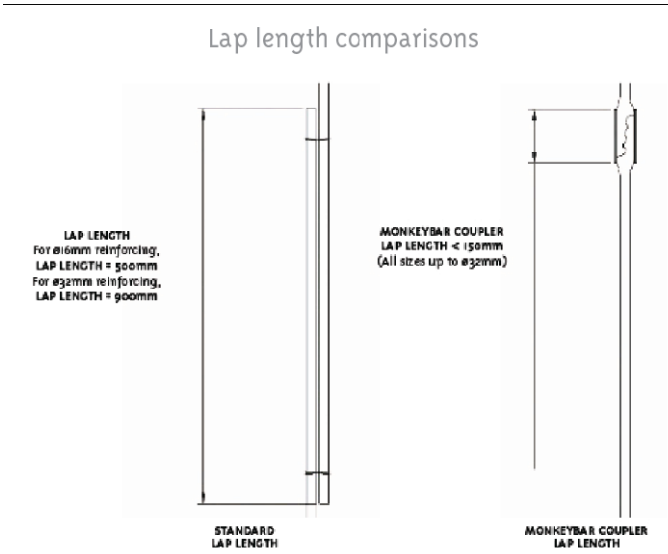


Figure 2: Standard Lapping Saving

Monkey bar is able to be used on all areas on the project but for ease of use on the project the use of Monkeybar was limited to use in the vertical in situ concrete walls. To quantify the savings made as a result of the use of MonkeyBar, the standard amount of lap (which is determined by 40 x the diameter of the bar) was multiplied by the weight per lineal meter (attached reodata booklet). Table 1 summaries the steel tonnage saving associated with the use of the MonkeyBar.

Size of Bar	No. of Bars	Weight (kg/m)	Lap required (based on 40 x dia.)	Weight saving (kg/bar)	Total saving (t)
N20	1204	2.5	800 mm	2.00	2.41
N24	1068	3.6	960 mm	3.46	3.69
N28	0	5.0	1120 mm	5.60	0.00
N32	1302	6.5	1280 mm	8.32	10.83
N36	6528	8.2	1440 mm	11.81	77.08
Total Tonnage Saving					**94.01**

Table 1. Tonnage Savings using MonkeyBar

The LCA Design Software assigns a CO_2 value to a material that represents not only the CO_2 impact of the product, but also the embodied energy required to manufacture the material. This means a factor of $kgCO_2$ can be assigned to each kilogram of steel saved as a result of the use of MonkeyBar. These savings are shown in Table 2.

Reo Bar Size	Tonnage Reo saved	Reo value of $kgCO_2$ /t	$KgCO_2$
N20	2.41	2060	4,965
N24	3.69	2060	7,601
N28	0.00	2060	0.00
N32	10.83	2060	22,306
N36	77.08	2060	158,785
Total $kgCO_2$ saved			**193,657**

Table 2. Total Carbon Savings

2 Points Claimed

In order to establish the number of points which could reasonably be claimed for this initiative, the Green Star points system for Ene-2 was utilised as it also allocates points based on a saving of kgCO2. The savings made on the project as a direct result of this initiative is 193,657 $kgCO_2$. This equates to a square meter saving across the project of 5.1$kgCO_2/m^2$.

The kgCO2/m2 for an NABERS rating of 4 is 111 $kgCO_2/m^2$ and if reduced to 94$kgCO_2/m^2$ achieves a NABERS Energy rating of 4.5. The difference between a 4 rating and 4.5 rating is 17$kgCO_2/m^2$ and would achieve 3 points.

It can be concluded that as the savings achieved in kgCO2 is one third of what is required in savings for required for 3 points on the ENE2 points system, then one third of the 3 points should be awarded.

Therefore, it is requested that 1 innovation point be awarded for this strategy (which was achieved in the Design Rating).

Which significant environmental benefits of the innovation have been addressed by Green Star – Office Design credits?

This initiative is not rewarded in Green Star. Material during construction, and waste from construction are both rewarded, but not in terms of the actual construction process which can have a significant impact on the quantity of resources required. The issue of the quantity of material use is addressed in other tools such as the Dematerialisation credit of the Office Version 3 tool. This shows it is an important environmental issues identified by the GBCA

What level of documentation would be appropriate to demonstrate that this environmental benefit has been achieved?

- MonkeyBar Brochure
- Reodata Booklet
- Estimated CO2 values associated with steel savings
- MonkeyBar Supply Register by Laing O'Rourke (Claim amount erased due to confidentiality) to show that products have been supplied

Annexure A : MonkeyBar Brochure

monkey®

Monkey Steel Product Brochure

June 2008

MonkeyBar™ Integral Bar Coupler

MonkeyBar coupler is a revolutionary, patented reinforcing bar coupling system offering 'best in class' advantages to builders and structural engineers.

The product is designed to simply join reinforcing bars in high-rise construction and in major civil construction projects.

More cost effective, stronger, easier to use, safer and quicker than any competitor product available, MonkeyBars are set to take over the Australian steel reinforcing market.

MonkeyBars will save your project money, take a significant percentage of reinforcing steel out of any building, save time on installation and provide peace of mind, with an established supply chain network.

Produced through reforming the end of existing reinforcement bar into a precise interlocking shape, the result is a unique 'integral bar coupler' that saves very large tonnages of steel by avoiding the need to overlap lengths of reinforcing bars in major concrete based construction projects.

Try comparing MonkeyBar coupler to any alternative reinforcing system available today, and you will soon see that our product is a clear winner on every front.

MonkeyBar™ Product Advantages

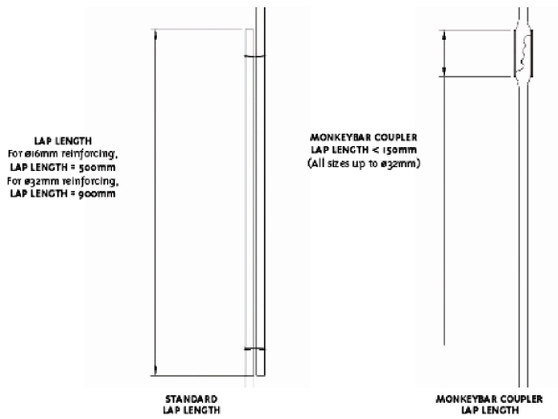
Steel reduction

Current steel industry estimates are that 80% of all coupling is done with overlapping of reinforcing bar, secured with steel wire wrapped manually by steel fixers as shown in the figure below.

In vertical applications the amount of overlap required, or the lap length, is 12-24% of the length of the steel bar being used.

The MonkeyBar construction system can remove this overlapped steel, significantly reducing congestion and increasing build efficiencies.

Lap length comparisons



Ductile failures

Structures are required to fail in a ductile or gradual manner rather than a brittle or catastrophic manner in the event of either seismic or explosive overloading.

Ductile type failures lead to lowering of potential harm to occupants of concrete buildings. As such the ductility of the reinforcing bar and couplers is a critical component of safety.

MonkeyBars are highly ductile as the coupling exhibits the existing reinforcement properties.

Less cracking of concrete

If a coupler slips after the concrete has cured, the concrete is likely to crack. A small slip in the coupler is magnified at the edge of the concrete column. Cracks appearing in columns are a significant expense for contractors. Cracks expose the reinforcing bar to moisture and are a source of fatigue movement in a joint.

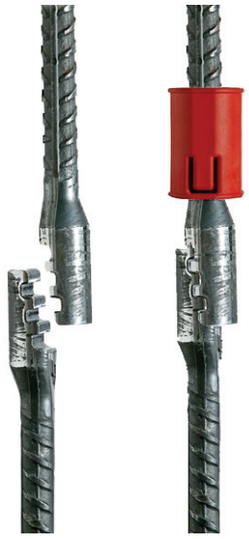
MonkeyBar's precise locking arrangement is such that slip is guaranteed to be less than 0.1mm.

Ease and simplicity of installation and Quality Assurance

Existing coupler systems require some form of on-site machining or labour intensive process. MonkeyBar is supplied ready to use on site, requiring a simple manual fitting of the two bar ends.

To complete the coupling process, a polymer sleeve is simply clicked into place to keep the coupling together while pouring concrete.

MonkeyBar in action with polymer sleeve



MonkeyBar will revolutionise the construction industry. We have introduced the fastest, simplest and safest fastening method, with the easiest checking method in the market. With no tools required and no welding necessary, MonkeyBars achieve a stronger result with half the fuss of conventional coupling systems.

Smaller teams can perform the same task, in a shorter time frame, meaning labour and time savings for you.

"Clip, slip ...done!"

Construction cost savings

The ease of fit of the MonkeyBar system delivers substantial cost savings to builders in high-rise applications as:

- Installation time is seconds, not minutes as with threaded bar couplers
- Fitting of the system is simple and safe
- Visual inspection ensures the coupler is secure
- No on-site machinery is required to fit the coupler

Additional savings will be available to builders using the MonkeyBar construction system through:

- Reduced crane times
- Faster steel fixing
- Reduced freight tonnage
- Reduced steel

In essence, the MonkeyBar is easy and fast to install and easy to inspect.

Operational health and safety

No tools, no welding, 1-man job, quicker, safer, easier to check... and the list goes on.

With the simplest, least labour intensive coupling system on the market, Monkey Steel is confident that not only is the process of combining parts safer than any conventional system, but that the limited overhang of our products means significant improvements to on-site health and safety.

"Safer to use, safer on-site, safe choice."

Greenhouse gas reduction

MonkeyBar eliminates the need to overlap steel reinforcing bars in major civil or high-rise construction.

The MonkeyBar System uses existing reinforcing steel to form the coupling. In 80% of intended applications where overlapped bar is replaced, 12-24% of the total reinforcing steel is saved. In a typical building this equates to 300 tonnes of steel or 255 tonnes of greenhouse gas. MonkeyBar could save more than 5 million tonnes of steel in overlapped bar a year around the world. This equates to 4.25 million tonnes of greenhouse gas per annum.

Use of the MonkeyBar products and applications will assist contractors in gaining access to valuable Green Star credit points under the new 'dematerialisation' provisions. Monkey Steel is a member of the Green Building Council of Australia.

green building council australia
MEMBER

100% Australian designed, owned and manufactured

Why look offshore when the best solution is home grown?

MonkeyBars are conceived, designed and manufactured in Australia by Monkey Steel Pty Ltd.

That means that they are developed to meet and exceed strict Australian requirements, and that the money stays in the country.

MonkeyBar proves that the Australian solution is the best solution.

Winner of Engineering Excellence Award - 2007

In September 2007 Monkey Steel was awarded the Engineering Excellence Award for Innovations and Inventions in the Sydney Division for 2007.

The Engineering Excellence Awards are the most prestigious awards available for the MonkeyBar technology in Australia. As a winner of the Sydney Division, the largest regional division of Engineers Australia, MonkeyBar also became a finalist in the National Awards scheme for Engineers Australia.

ENGINEERING EXCELLENCE AWARDS
ENGINEERS AUSTRALIA
WINNER SYDNEY 2007

MonkeyBar™ Performance

Performance Characteristics

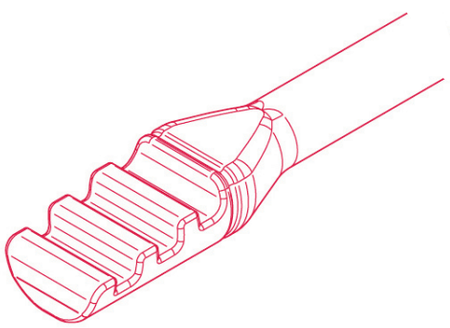
The advantages provided by the MonkeyBar coupler system are in its unique combination of strength, ductility and precision. The key performance data for the MonkeyBar are:

- Strength – at least 125% of the strength of the rebar being used
- Ductility – 8.5% Agt
- Precision – Less than 0.1mm slip
- Tensile Strength / Yield Stress Ratio – 1.20

Strength

The MonkeyBar coupler is always uniformly stronger than the reinforcing bar. As the coupler is integral to the bar its relative strength will always be the same independent of the particular batch of its host reinforcing bar, which can vary between 500Mpa to 650Mpa. This strength relationship is achieved through the unique design of the MonkeyBar.

MonkeyBar's unique interlocking shape provides the system strength.



Ductility

As the coupling section is integral with the reinforcing bar and not a separate cast part of different ductility, the coupled sections will always behave in the same manner as the host bar.

Unlike other coupler systems, the outer sleeve does not engage the coupled bar ends restraining lateral movement and causing stiffness at the joint. Other systems use cast threaded outer sleeves which are typically much less ductile than the bar being joined.

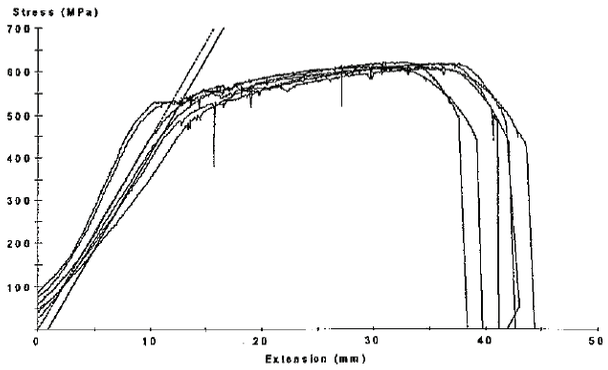
Precision

The MonkeyBar coupler is designed to have less than 0.1mm of slip under full load. Some of the existing screw-in coupling systems have slips above 0.3mm at each end of the coupler under minimal loads. This means that dynamic movement is possible and the effect of this dynamic movement is possible propagation of concrete cracks. The precision of the Monkey Steel's manufacturing process used to cut the final shape and the interlock of the two shapes cut in the same process, ensure that the MonkeyBar will be the joint with the least slip under load of any kind.

Tensile Strength/Yield Stress Ratio

Test results to date have shown that the integral coupler system will always produce bar break. This means that failure will always be ductile with the characteristic performance of the host bar.

MB16 test results for tensile strength (University of Southern Qld)



MonkeyBar™ Product Range and Applications

The product range is diverse enough to satisfy a significant amount of any major builder's requirements in vertical elements for high-rise construction – i.e. walls and columns.

Specifically the product range replaces three primary existing applications:

- Lapped bar
- Couplers
- Pullout bars or threaded inserts

All products are made from reinforcing bars with a nominal yield stress of 500MPa (AS/NZS 4671 N Class), and are produced in sizes N16, N20, N24, N28, N32, N36.

Bars are produced to be either single or double ended. Double ended bars can be produced in any length between 1.5m and 4m. Single ended bars can be produced in any length between 0.5m to 4m.

MonkeyBar Product Table

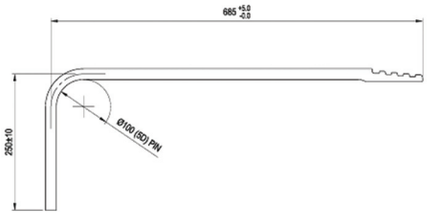
Product Code	Bar Diameter	Double Ended Length	Steel Grade
MB16	16mm	Min. 1.5m to Max. 4.0m	N500
MB20	20mm	Min. 1.5m to Max. 4.0m	N500
MB24	24mm	Min. 1.5m to Max. 4.0m	N500
MB28	28mm	Min. 1.5m to Max. 4.0m	N500
MB32	32mm	Min. 1.5m to Max. 4.0m	N500
MB36	36mm	Min. 1.5m to Max. 4.0m	N500

Monkey HookBars

In addition to our standard product we also have a Monkey HookBar, a 180° hooked bar with a MonkeyBar head designed for adjacent joins in concrete structures. This application is also used in precast panels.

Monkey HookBars and VoidFormers in rebate

MB20 cogged bar for 800mm thick wall



Monkey Steel has developed specialised VoidFormers to work alongside our Monkey HookBars and "L" shaped MonkeyBars in sizes 16mm, 20mm and 24mm utilising our base MB-16, MB-20 and MB-24 products.

Diaphragm Wall Construction

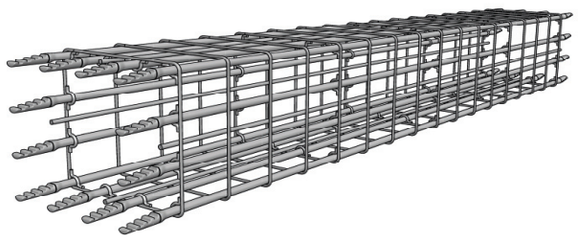
The use of "L" shape MonkeyBars in diaphragm wall construction is an excellent option for builders as the MonkeyBar installation is less labour intensive than any other available coupling system providing a practical solution and speeding up the building process. "L" shape MonkeyBars have been used in the diaphragm wall construction of the new Hilton Hotel in Surfers Paradise, Gold Coast (shown right).

Monkey "L" Bars in use for a diaphragm wall

Other Applications

New value-adding applications are currently in development for precast walls and columns in medium and high-rise buildings. These applications have the potential to save significant construction time.

MonkeyCage - MonkeyBars in a caged column



International Test Results

Tested by the University of Southern Queensland with testing independently overseen by D. Beal Engineer Pty Ltd, the MonkeyBar has proven total conformance to ASTM – A1034/ A1034M, the draft ISO 15835-2.2 dated 2006 and the draft ISO/DIS 15835-1.2 dated 2006, the benchmark international standards for mechanical splices. It should be noted that Standards Australia do not have any criteria for testing mechanical splices under the current AS3600:2001 "Concrete Structures".

The combined ASTM and ISO test methods specified for mechanical splices are:

1. Monotonic Tension Test
2. Monotonic Compression Test
3. Cyclic Load Test
4. High-Cycle Fatigue Test
5. Slip Test
6. Low-Temperature Test

The low cycle load tests stipulated by the ISO standards simulate elastic reverse loading of a reinforcing system during earthquakes. MonkeyBar has passed the highest category of these tests - LC2 and HLC2 for violent earthquakes.

Further in concrete tests were performed in addition to the above tests for Compression, Tension and Shear. These tests proved that the MonkeyBar operates as continuous reinforcement without splices.

The MonkeyBar has set a new standard in steel reinforcing bar coupling systems. We are not aware of any other product in the world able to meet these performance hurdles.

Independent Test Engineer – Mr D. L. Beal

Monkey Steel's test program has been professionally conducted by Mr David Beal, BE, MEngSc, MSc(Lon), DIC, RPEQ, FIE(Aust), CPEng.

Mr David Beal is the former National President of the Concrete Institute of Australia. He has worked in the concrete industry for 40 years, and has been involved in related academic and research work at University level for 25 years.

ISO Certificate of Compliance for MB-16

D. BEAL ENGINEER PTY LTD
ACN 065 567 893
CONSULTING ENGINEER
CONCRETE & MASONRY TECHNOLOGY & DESIGN
PO BOX 60, SHERWOOD QLD 4075

29 June 2007

CERTIFICATE OF COMPLIANCE

This certifies that the Monkey Steel Mechanical Splice for 16mm diameter reinforcing bars has been tested using Draft ISO/DIS 15835-2.2 dated 2006 and has satisfied all test requirements to Draft ISO/DIS 15835-1.2 dated 2006. This covers all categories (HC, HLC1, HLC2, LC1 AND LC2) under the two fatigue tests specified in this standard.

D. BEAL ENGINEER PTY LTD

D.L. BEAL
DIRECTOR.

With the highest possible ISO/DIS strength rating, MonkeyBars are not only strong, they require no tools, welding or threading making it the least labour intensive coupling system in the world.

Contact us

For more information on our products
and availability please contact:

Mr Tim Cowdery
Australian General Manager

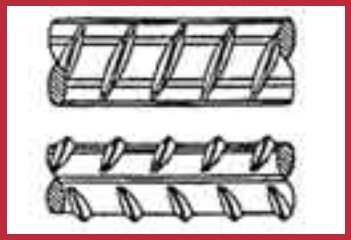
E: tim.cowdery@monkeysteel.com
T: +61 2 8354 4000

Annexure B : Reodata Booklet

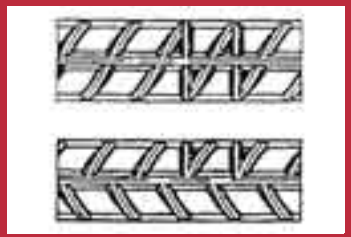
500PLUS REBAR Identifying on Site

To identify OneSteel Reinforcing's rebar on site, 500PLUS REBAR has distinctive markings.

TEMPCORE 500N Marking
(2 extra longitudinal stripes on 500PLUS TEMPCORE)



Microalloy 500N Marking
(2 extra transverse ribs on 500PLUS Microalloy)



OneSteel Mill Markings

Sydney Bar Mill

Newcastle Bar Mill

Newcastle Rod Mill-Coiled Product

500PLUS REBAR Stock Lengths & Approximate Lengths per Tonne

Bar Size	6m	9m	10m	12m	15m	Metres per Tonne
N10	264	-	-	-	-	1582
N12	183	122	-	92	-	1099
N16	103	69	62	51	-	617
N20	-	44	40	33	26	395
N24	-	31	28	23	18	275
N28	-	22	20	17	14	202
N32	-	-	15	13	10	155
N36	-	-	-	10	9	122
N40	-	-	-	-	7	99

Note: 1) based on invoice weight – includes rolling margin of 2.5% 2) Not all lengths and diameters stocked at all branches

Annexure C : Arup CO_2 Values

ARUP
123 Albert Street | A.B.N.

FACSIMILE

Ref No:	FAX-ARUP-000271			**Date Sent:**	20 May 2009
To:	Laing O'Rourke Australia Construction Pty Ltd	**Attn:**	Tom Moore	**Phone:**	07 3337 7130
Cc:	ARUP	**Attn:**	David Smith	**Phone:**	07 3023 6000
From:	Samantha Peart, ARUP			**Orig. Ref. No.:**	
Re:	RE: CO2 values for BIM Clashes			**Response required by:**	

Tom,

Factors below as discussed on the phone. They are in CO2 equivalent (CO2e) which is fine to use in the submission.

Steel reinforcement: 2060kg CO2e per TONNE of reo
Structural Steel Sections: 2060kg CO2e per TONNE of steel
Reinforced Concrete - 268kgCO2e per TONNE of reinforced concrete
Aluminium Extrusion - 18075kg CO2e per TONNE of Extruded Aluminium

I will have my mobile on me all day if you need anything. As I said, apologies for the delay, I wasn't expecting such significant errosr from the original database.

Regards,

Samantha Peart
ESD Consultant

Arup
Level 10, 201 Kent Street, Sydney, NSW 2000
PO Box 76, Millers Point, NSW 2000
T + 61 (02) 9320 9441
F + 61 (02) 9320 9321
www.arup.com.au

We shape a better world

Value used to calculate the total Carbon Savings in the Short report

----- Original Message -----
Reference: FAX-LORAC-003282
From: Tom Moore, Laing O'Rourke Australia Construction Pty Ltd
Sent: 13-05-09
To: Samantha Peart, ARUP
Cc: David Smith, ARUP
Subject: CO2 values for BIM Clashes

Samantha,

As discussed, please find attached additional information for the rectification methods for the standard clashes nominate in the Greenstar BIM innovation submission.

Can you also provide the CO2 value for Kg of Reo bar.

Thanks again,

Tom Moore

Design Manager

Laing O'Rourke Australia Pty Ltd

www.laingorourke.com.au

ARUP

Level 10 / 201 Kent Street , Sydney , 2000 , .
tel:02 9320 9320 fax :02 9320 9321 Email: samantha.peart@arup.com.au

Discipline: **Area:** **Location:**

Annexure D : ENE 2 Energy Improvement

CO2 REDUCTION REQUIRED BASED ON ENE-2

ITEM	UNIT	AMOUNT
NABERS 4 Star Conditional Requirement	$kgCO_2$	111
NABERS 4.5 Star	$kgCO_2$	94
Improvement from 4 star	$kgCO_2$	17
NLA	m^2	38,245
Total CO_2 Reduction	$kgCO_2$	650,165
Points awarded for ENE-2	Pts	**3**
NABERS 5 Star	$kgCO_2$	77
Improvement from 4 star	$kgCO_2$	34
NLA	m^2	38,245
Total CO_2 Reduction	$kgCO_2$	1,300,330
Points awarded for ENE-2	Pts	**6**
NABERS 5 Star + 20% CO_2 Reduction	$kgCO_2$	62
Improvement from 4 star	$kgCO_2$	49
NLA	m^2	38,245
Total CO_2 Reduction	$kgCO_2$	1,874,005
Points awarded for ENE-2	Pts	**9**
NABERS 5 Star + 40% CO_2 Reduction	$kgCO_2$	46
Improvement from 4 star	$kgCO_2$	65
NLA	m^2	38,245
Total CO_2 Reduction	$kgCO_2$	2,485,925
Points awarded for ENE-2	Pts	**12**
NABERS 5 Star + 60% CO_2 Reduction	$kgCO_2$	31
Improvement from 4 star	$kgCO_2$	80
NLA	m^2	38,245
Total CO_2 Reduction	$kgCO_2$	3,059,600
Points awarded for ENE-2	Pts	**15**

Ene-2 Energy Improvement

Aim of Credit

To encourage and recognise projects that contain design features that help to minimise operational energy consumption and greenhouse emissions of the base building over and above the conditional requirement in Ene-1.

Credit Criteria

Up to fifteen points are awarded where it is demonstrated that the predicted improvement in energy efficiency and greenhouse emissions above the conditional 4 star Australian Building Greenhouse Rating (ABGR) scheme (Ene-1) as follows:

3 points = 4.5 Stars ABGR

6 points = 5 Stars ABGR

9 points = 5 Stars ABGR + 20% CO2 reduction

12 points = 5 Stars ABGR + 40% CO2 reduction

15 points = 5 Stars ABGR + 60% CO2 reduction

If car parking has been included in the ABGR assessment then the points achieved can be increased as follows:

- add one point if at least 1 car parking space provided for each 200m2 of NLA
- add two points if at least 1 car parking space provided for each 100m2 of NLA

Compliance Requirements

Refer Ene-1 for ABGR rating and energy modelling compliance requirements.

The energy report must show the number of car parking spaces assumed in the energy modelling. The assessor will require as-built drawings of the car paring areas clearly showing which parking spaces were included in the AGBR assessment and which parking spaces are for the sole use of the building occupants.

The applicant will need to ensure that car parking space numbers are listed in the AGBR report. The applicant will also need to clearly show on as-built drawings where all user parking is located and the number of spaces provided, as well as the total Net lettable Area (NLA) and the average NLA per space.

The following documentation is required to demonstrate compliance:

- Summary document showing the total NLA for each carparking space provided, referenced to as-built drawings showing car park spaces in the final building.

Additional Guidance

The following table highlights the number of Green Star points awarded for the predicted greenhouse gas emissions of the building, by state:

Referred to in our calculation described in Section 2 of the short report

ABGR Rating	Greenhouse Gas Emissions by State (CO_2 /m²/year)							Points Awarded
	NSW/ ACT	VIC	QLD	SA	WA	NT	TAS (kWh)	
4 Stars	103	132	111	104	106	76	120	Conditional (Ene-1)
4.5 Stars	87	116	94	88	90	65	101	3
5 Stars	71	101	77	72	74	53	83	6
5 Stars + 20% CO_2 reduction	57	81	62	58	59	42	66	9
5 Stars + 40% CO_2 reduction	43	61	46	43	44	32	50	12
5 Stars + 60% CO_2 reduction	28	40	31	29	30	21	33	15

* Data obtained and calculated from ABGR documentation. Tasmania is measured in kWh/m².

Car park energy consumption is included in the ABGR rating as per the standard scheme methodology. To compensate for buildings which achieve a high rating with a car park included in this rating, additional credits will be added to those buildings which have small or large car parks. The number of credits added will be based on the area of NLA per parking space provided (based on the scheme developers advice relating average car park energy to overall building energy consumption). This will ensure equity for developments which provide parking if they are designed to operate in an energy efficient manner.

For example, we can consider three buildings. Building A is a fairly standard office building with standard HVAC technologies and does not include a car park. Building B is of a similar size and design to building A, but has naturally ventilated car park. Building C is of a similar size to building A, but has much a more sophisticated HVAC system and an underground car park with some rudimentary energy features.

Using ABGR, all of the above buildings score 4.5 stars. The Green Building Council of Australia considers it inappropriate that Building A performs as well as buildings B and C on the basis of not having a car park. In terms of energy, buildings B and C are clearly more efficient.

The additional credits reflect the fact that buildings B and C are providing more (i.e. a standard-sized car park) for the same energy output. In this case, Building B is rewarded for providing an energy efficient car park and Building C for providing a more energy efficient HVAC system.

Background

Refer Ene-1.

References & Further Information

BORDASS W. COHEN R. and FIELD J.

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Building Performance Congress, Frankfurt, April 19-24, 2004

http://www.usablebuildings.co.uk/Pages/UBPublications/UBPubsEPNDB.html

The Association for the Conservation of Energy

http://www.ukace.org/

Australian Building Greenhouse Rating

Rating Energy Efficiency of Non-Residential Buildings

http://www.abgr.com.au
Australian Greenhouse Office

Australian Commercial Building Sector Greenhouse Gas Emissions 1990–2010, Executive Summary Report 1999

http://www.greenhouse.gov.au
Department of Energy, Utilities and Sustainability (NSW)

Work Energy Smart:

http://www.energysmart.com.au

Tenant Energy Management Handbook (SEDA 2000)

http://www.deus.nsw.gov.au/

Sustainable Energy Authority Victoria

Energy & Greenhouse Management Toolkit

http://www.seav.vic.gov.au

Energy SA

http://www.sustainable.energy.sa.gov.au

Sustainable Energy Development Office (WA)

http://www1.sedo.energy.wa.gov.au

Queensland Government Office of Sustainable Energy

http://www.env.qld.gov.au/sustainable_energy

AIRAH (Australian Institute of Refrigeration Air-Conditioning and Heating)

http://www.airah.org.au

Annexure E: Monkey Steel Supply Register by Laing O'Rourke

LAING O'ROURKE

Monkey Steel Supply Register

Invoice No	Invoice Date	Delivery Date	Delivery Docket	Schedule No.	Steel Type	Qty	Rate	Description	Total Amount	PPC No	Paid Date	Claim Amount	Difference LOR - MON	Overclaim Check
9	23/02/2009			16923016	16s	60	2.7	MB 16 Single Ended		1	6/04/2009		0.00	0
					20s	42	#N/A	#N/A		1	6/04/2009		#N/A	#N/A
					24s	320	4.5	MB 24 Single Ended		1	6/04/2009		-18.00	Overclaim
					28s	36	6.83	MB 28 Single Ended		1	6/04/2009		-0.01	Overclaim
					32s	108	9.48	MB 32 Single Ended		1	6/04/2009		0.01	0
					36s	566	14.3	MB 36 Single Ended		1	6/04/2009		0.00	0
11	27/02/2009			16993023	36d	6	27.6	MB 36 Double Ended		1	6/04/2009		0.00	0
					20d	8	4.65	MB 20 Double Ended		1	6/04/2009		0.00	0
					36s	32	14.3	MB 36 Single Ended		1	6/04/2009		0.00	0
										paid			#N/A	
14	6/04/2009		88 & 89	17038220	16d	40	4.4	MB 16 Double Ended					0.00	0
			88 & 89		24d	292	8	MB 24 Double Ended		2	27/04/2009		0.00	0
			89		32d	88	17.95	MB 32 Double Ended		2	27/04/2009		-0.88	Overclaim
			87		36d	160	27.6	MB 36 Double Ended		2	27/04/2009		0.00	0
15	9/04/2009		92	16995883	16d	10	4.4	MB 16 Double Ended		2	27/04/2009		-10.00	Overclaim
			92		28s	20	6.83	MB 28 Single Ended		2	27/04/2009		40.98	0
			92		28d	36	12.65	MB 28 Double Ended		2	27/04/2009		13.00	0
			93		32s	20	9.48	MB 32 Single Ended		2	27/04/2009		113.76	0
			90, 91 & 93		36s	126	14.3	MB 36 Single Ended		2	27/04/2009		228.80	0
			90 & 91		36d	462	27.6	MB 36 Double Ended		2	27/04/2009		-220.80	Overclaim
16	16/04/2009	16/04/2009	94	16995883	Pls refer to Delivery Docket 92. This is a double up.					2	27/04/2009		-137.30	Overclaim
17	16/04/2009	16/04/2009	95	17020216	24s	20	4.5	MB 24 Single Ended		2	27/04/2009		0.00	0
18	24/04/2009	24/04/2009	97 & 98	17020216	16s	40	2.7	MB 16 Single Ended		2	27/04/2009		0.00	0
			97 & 98		20s	200	#N/A	#N/A		2	27/04/2009		#N/A	#N/A
			97 & 98		24s	272	4.5	MB 24 Single Ended		2	27/04/2009		-90.00	Overclaim
			97, 98 & 99		32s	64	9.48	MB 32 Single Ended		2	27/04/2009		0.00	0
			99		32d	128	17.95	MB 32 Double Ended		2	27/04/2009		-1.28	Overclaim
			96 & 99		36s	312	14.3	MB 36 Single Ended		2	27/04/2009		0.00	0
19	24/04/2009		100	17065769	24s	20	4.5	MB 24 Single Ended		2	27/04/2009		0.00	0
20	24/04/2009		100	17067236	24s	20	4.5	MB 24 Single Ended		2	27/04/2009		0.00	0
										Paid				
22	27/04/2009	24/04/2009	105	17020216	16s	10	2.7	MB 16 Single Ended		3	8/06/2009		0.00	0
			96, 108 & 109		28s	52	6.83	MB 28 Single Ended		3	8/06/2009		273.20	0
			106 & 108		28d	52	12.65	MB 28 Double Ended		3	8/06/2009		0.52	0
			106 & 107		32s	60	9.48	MB 32 Single Ended		3	8/06/2009		0.00	0
			104 to 108		36s	278	14.3	MB 36 Single Ended		3	8/06/2009		0.00	0
			104 to 109		36d	410	27.6	MB 36 Double Ended		3	8/06/2009		0.00	0
23	27/04/2009	24/04/2009	110	17069628	36s	26	14.3	MB 36 Single Ended		3	8/06/2009		0.00	0
24	11/05/2009	6/05/2009	115, 116	17021250	20d	200	4.65	MB 20 Double Ended		3	8/06/2009		2.00	0
		6/05/2009	113, 114, 115	17021250	28d	92	12.65	MB 28 Double Ended		3	8/06/2009		427.80	0
		6/05/2009	114, 115, 116	17021250	32d	164	17.95	MB 32 Double Ended		3	8/06/2009		-1.64	Overclaim
		6/05/2009	112	17021250	36s	22	14.3	MB 36 Single Ended		3	8/06/2009		0.00	0
		6/05/2009	112 to 116	17021250	36d	516	27.6	MB 36 Double Ended		3	8/06/2009		0.00	0

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Monkey Steel Supply Register

Invoice No	Invoice Date	Delivery Date	Delivery Docket	Schedule No.	Steel Type	Qty	Rate	Description	Total Amount	PPC No	Paid Date	Claim Amount	Difference LOR - MON	Overclaim Check
													Paid	
26	26/05/2009	21/05/2009	124, 125	17024640	20d	200	4.65	MB 20 Double Ended		4	22/06/2009		2.00	0
			121		28s	16	6.83	MB 28 Single Ended		4	22/06/2009		109.28	0
			120, 124		28d	76	12.65	MB 28 Double Ended		4	22/06/2009		455.80	0
			126		32s	32	9.48	MB 32 Single Ended		4	22/06/2009		0.00	0
			121, 124, 125		32d	164	17.95	MB 32 Double Ended		4	22/06/2009		1077.00	0
			120, 125		36s	80	14.3	MB 36 Single Ended		4	22/06/2009		686.40	0
			120, 121, 124		36d	440	27.6	MB 36 Double Ended		4	22/06/2009		8611.20	0
27	26/05/2009		126	17100100	36s	8	14.3	MB 36 Single Ended		4	22/06/2009		0.00	0
					36d	4	27.6	MB 36 Double Ended		4	22/06/2009		0.00	0
28	26/05/2009	21/05/2009	126	17065781	36d	20	27.6	MB 36 Double Ended		4	22/06/2009		0.00	0
			127	17065781	32d	20	17.95	MB 32 Double Ended		4	22/06/2009		0.00	0
			127		28d	20	12.65	MB 28 Double Ended		4	22/06/2009		0.20	0
			127		24d	20	8	MB 24 Double Ended		4	22/06/2009		0.00	0
			127		20d	20	4.65	MB 20 Double Ended		4	22/06/2009		0.20	0
29	26/05/2009		129	17112587	36d	48	27.6	MB 36 Double Ended		4	22/06/2009		0.00	0
30	2/06/2009		134	17024745	28d	40	12.65	MB 28 Double Ended		4	22/06/2009		50.96	0
			134 & 135		32d	136	17.95	MB 32 Double Ended		4	22/06/2009		1364.20	0
			134 & 135		36d	128	27.6	MB 36 Double Ended		4	22/06/2009		-5078.40	Overclaim
			134 & 135		20d	200	4.65	MB 20 Double Ended		4	22/06/2009		930.00	0
										Paid				
32	4/06/2009		138, 139 & 140	17113396	24s	16	4.5	MB 24 Single Ended		5	27/07/2009		0.00	0
					28s	8	6.83	MB 28 Single Ended		5	27/07/2009		0.00	0
					36s	8	14.3	MB 36 Single Ended		5	27/07/2009		-114.40	Overclaim
					36d	4	27.6	MB 36 Double Ended		5	27/07/2009		110.40	0
33	4/06/2009		139	17112625	36d	48	27.6	MB 36 Double Ended		5	27/07/2009		0.00	0
34	12/06/2009		141 - 144	17025763	20d	200	4.65	MB 20 Double Ended		5	27/07/2009		2.00	0
					28d	76	12.65	MB 28 Double Ended		5	27/07/2009		0.76	0
					32d	196	17.95	MB 32 Double Ended		5	27/07/2009		0.00	0
					36s	12	14.3	MB 36 Single Ended		5	27/07/2009		171.60	0
					36d	446	27.6	MB 36 Double Ended		5	27/07/2009		0.00	0
35	12/06/2009		145	17113416	24s	16	4.5	MB 24 Single Ended		5	27/07/2009		0.00	0
					28s	8	6.83	MB 28 Single Ended		5	27/07/2009		0.00	0
					36s	0	14.3	MB 36 Single Ended		5	27/07/2009		-228.8	Overclaim
36	12/06/2009		145 & 146	17112650	36s	12	14.3	MB 36 Single Ended		5	27/07/2009		171.6	0
					36d	36	27.6	MB 36 Double Ended		5	27/07/2009		-165.6	Overclaim
37	12/06/2009		129	17112587	36d	48	27.6	MB 36 Double Ended		5	27/07/2009		0	0
38	25/06/2009		162 - 164	17116395	32s	92	9.48	MB 32 Single Ended		5	27/07/2009		0	0
					36s	264	14.3	MB 36 Single Ended		5	27/07/2009		0	0
39	25/06/2009		152 - 161	17113846	16s	8	2.7	MB 16 Single Ended		5	27/07/2009		0	0
					20s	200	#N/A	#N/A		5	27/07/2009		#N/A	#N/A
					28s	76	6.83	MB 28 Single Ended		5	27/07/2009		0	0

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					32s	164	9.48	MB 32 Single Ended		5	27/07/2009		0	0
					32d	62	17.95	MB 32 Double Ended		5	27/07/2009		0	Overclaim
					36s	440	14.3	MB 36 Single Ended		5	27/07/2009		0	0
					36d	78	27.6	MB 36 Double Ended		5	27/07/2009		0	0
								TO BE PAID						
								Sub Total						
								TOTAL PAID						