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The River Till, Saxilby, Lincolnshire

The Society of Professional Engineers was founded in 1969.

Features in this Issue

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The Editor Writes

Welcome to the Winter 2009/2010 publication of the Bulletin, in this issue we feature articles on 'Friction and Lubrication', 'Chessington Community College', 'Engineering Heritage – Finch Foundry', 'Space & Copenhagen – the roll of satellites in combating Climate Change', 'the Pitfalls of Importing Electrical Equipment into Australia', and 'Severn Barrage threat'.

In the next bulletin we hope to include photographs of our 40th Anniversary Dinner at the House of Lords and a selection of articles and photographs of the history of the Society, it will be a special 40th Anniversary publication with an extra 4 pages.

And finally, I continue to require articles from Society members for future Bulletins, and look forward to hearing from any member who would like to contribute.

Brian R Dixon, BA, P.Eng
Editor

Annual General Meeting

The Annual General Meeting was held on Monday 26th October 2009 at the Societies head office in Weston Favel, Northampton, at 12.00 noon prompt. The minutes of the 39th A.G.M. were approved and signed, and the Statement of Accounts for the year ending 31st December 2008 along with the Report of Council for the year were also approved.

Council were authorised to appoint Auditors to hold office until the next A.G.M, and D.Hardcastle, D.Parratt and R. Elders were re-appointed to Council. A Special Resolution to amend the Articles of Association by deleting the word 'All' in the first line of Article 16.7 and substituting the words '75% of' was approved. There being no further business the President declared the meeting closed.

Space and Copenhagen
The Role of Satellites in Combating Climate Change

A Parliamentary Space Committee & European Space Policy Institute event (at Portcullis House, House of Commons, Westminster) during the XI European Interparliamentary Space Conference, 26-27 October 2009.

Essentially, this was about earth-observation satellite technology & its part in monitoring events. We were addressed by a chair & panel of six eminent & titled international experts, introduced by Ian Taylor MP, Chair of the Parliamentary Space Committee.

Key topics included: environmental monitoring, tracking carbon footprints, carbon-free (satellite) telecommunications, live imaging of disaster zones, space data highways, optimal transport routing, checks that carbon trading works, resilient telecommunications, streamlined air traffic control, & policing carbon reduction undertakings. Not all of these initially seemed pertinent, but they all monitor, reduce, or mitigate anticipated effects of climate change.

We heard about space and climate change work in the United Nations Office for Outer Space Affairs http://unoosa.org/, about using space-based earth observation in support of reduced emissions from deforestation & forest degradation http://www.ctcd.group.shef.ac.uk/organisation.html, & international regulatory, propietorial, & about legal aspects of space & climate change http://www.weber-steinhaus.com/bereiche_engl/02.html.

However, clear highlight was a pacey, wide-ranging talk from the European Space Agency, Earth Observation Directorate, Exploitation & Services Division, which showed the power of coordinated observations. Some 60 nations had been cooperating for over 30 years & now observed 44 earth variables, including 26 from satellites.

One example is sea ice, & we were shown images of 30 years of seasonal change & striking shrinkage overall. Other quantities sensed were ozone concentrations, Arctic ice thickness & height of sea surfaces (to millimetre resolution), these rising by typically some 50mm in the past 30 years. This rise is not uniform: off the USA West Coast, the sea level is falling, but its rise seems greatest in the South Pacific where many islands are doomed.

Sea surface temperature measurements have been made, but are less clear. However, new measurements of soil moistures & Ocean salinity now show great promise.

Atmospheric carbon dioxide concentration has risen from some 355 to 380 ppm from 1994 to 2006, with annual variations. Deforestation is monitered; & this activity was said to account for some 17% of global carbon dioxide emissions (equated to a cost of some US $15billion per year), through the deforestation activity directly, & by reducing the potential for carbon capture. There are great differences between Nations,

Hugh Wynne

presumably arising from policy. We saw images of the Paraguay/Argentina border area over the period 1993 to 1998 showing massive deforestation in Paraguay but relatively very little in Argentina.

The future seems to lie in multi spectral imaging for global combined purposes, civilian, commercial, & military. We learned that most of the work to date had been funded from research budgets, but that an operational budget was now required for the future. Investment was presently mostly made by Germany, France, Italy & UK & (on a smaller scale) by many other European nations. A new centre of excellence was presently being established at Harwell & this would have a major future role to play.

It seemed too early to say if the future of climate change will be good or bad, but there was ample evidence to suggest that some of the world's best brains are now working on it.

Hugh Wynne, SPEng, Member of Council

Keep In Touch with The Society

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The Presidents' Notes

I would like to welcome within the Society's best wishes for success all new Members, including those listed in the last issue of the Journal.

In the media we are learning of ever increasing numbers of fraud and greed, it is even more important that Engineers work in a professional manner, even with I.T and all computer operations, without face to face contact I feel that professionalism must be to the fore such that trust and efficiency are maintained without delays.

This is the 40th year of the Society of Professional Engineers, and I look forward to our celebratory Luncheon this December.

We are in a state of change, or so our government informs us.

I do hope that our multi-discipline, and International Engineers will treat change as opportunity, and look forward to the future with confidence.

David Hardcastle, P.Eng
President

40th Anniversary Celebrations

This publication of the Bulletin is being produced a little early to ensure it is available for our special luncheon at the House of Lords, London, on Monday 14th December 2009.

We are looking forward to meeting a number of influential politicians, educationalists and senior practicing engineers who have accepted our invitation to attend, along with a number of our members, in particular those from overseas.

Let us hope for pleasant weather and a wonderful day.

Olympics Site Visit

The new Stratford Station is a bustling area around the rebuilt station concourse and shopping centre. It will be well served by trains with the new Stratford International station connecting to St. Pancras and the Channel Tunnel rail system.

The cranes, rapidly rising Athletes Village, dominate this side of the park. The colourful hoardings with Games Logo screen the high level of activity going on inside the huge site. The visit travelled North around the site past Eton Manor, an existing leisure facility being upgraded for training and Paralympics and planned for conversion after the games to tennis, football and hockey coaching.

Turning into the main site the visit saw the substructures for hockey and basketball arenas, the Press Centre and the Energy Centre. The energy centre is using bio-mass fuel through a district heating system, including the Athletes Village.

The site has required major diversion of power cables, previously on pylons, into a tunnel system and drainage is also collected in a new sewer system. Much remediation has been carried to the heavily contaminated site and an impressive 96% of excavated material has been re-used on site.

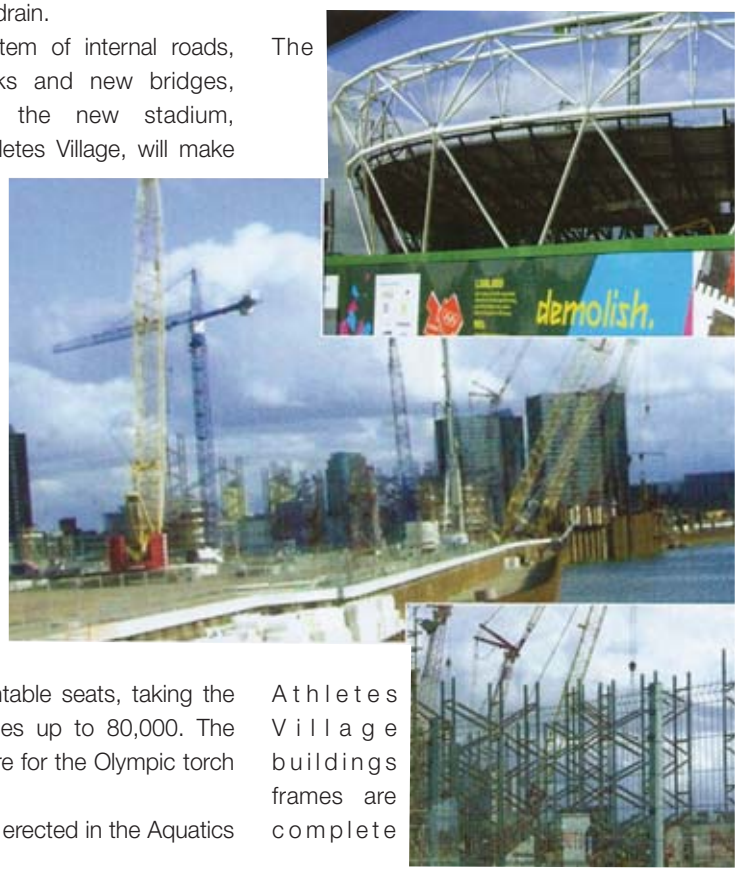
The traffic management and road system onsite is notable – the tour bus shared site roads with delivery lorries and dump trucks moving earth around, quite safely. The restoration of the River Lea is a central part of the Olympics Park vision, where banks have been regraded to give access to what was originally an industrial drain.

The proposed system of internal roads, paths, riverside walks and new bridges, landscaped around the new stadium, connected to the Athletes Village, will make the whole site one of the most effective Olympic venues ever, providing a huge legacy of remediation and regeneration to this once forgotten area.

The main Stadium is already looking most striking with the lower concrete bowl holding 25,000 seats. The upper tier steelwork now being built contains demountable seats, taking the capacity for the Games up to 80,000. The opening in the structure for the Olympic torch is already formed.

False work is being erected in the Aquatics Centre to carry the 120 metre span roof structure over two 50 metre pools. The pool building will also be reduced in size after the Games to revert back to community use with cafes and a public plaza.

The Athletes Village buildings frames are complete



Keywords: Electrical, Hazardous Area, NEC (National Electrical Code), Australian Standards

Abstract. *This paper identifies some of the difficulties and problems encountered in importing major electrical and instrument items in to Australia, particularly from the U.S.A. The author specifically identifies those problems encountered when imported plant and equipment contains devices that are to be used in a hazardous or zoned area, traditionally used in the petrochemical, mining or extractive (dust) industries, or where the equipment itself represents a hazardous area. To some people this paper will appear to be anti American - this is certainly not the intent.*

For many years the business and economic structure of Australia has been based upon primary industries, with manufacturing industries following a very poor second. It is not my intention to enter the political arena as to why this is so, suffice to say for this paper that two of the major reasons for this situation are the size of Australia's population and the limited demand for specialised industrial products, in relation to the larger European, North American and Asian markets.

For the purposes of this paper I define 'specialised industrial products' to be represented by such items as packaged boilers, turbine driven generating equipment and compressors, pumping systems and specialised process equipment, that contains electrical and instrumentation equipment, electric motor driven compressors and other utilities type equipment. This type of equipment or plant is utilised in the petrochemical, mining, paper and power industries extensively.

To simplify matters I have utilised a gas turbine driven generator as a typical example to demonstrate some of the difficulties encountered, I could have used another example, however I do have more recent experience with this particular item. However, it must be acknowledged that whilst this item of equipment is used as an example, the difficulties described are applicable to many of the major items of packaged equipment imported into Australia, and, the installation of that imported equipment.

At some specific stage in a project, the decision is made to generate power (although this could be a pump or compressor) for the site via a turbine driven generator(s). This turbine may be gas or liquid fuel driven. The normal process for the purchase of such a machine being the preparation of performance requirements, e.g. the number of megawatts, and an engineering specification detailing any specialised items that may be required, e.g. acoustic enclosure, turbine fuel type etc. These purchase specifications being prepared by the end user of the equipment, or purchasing agent. This type of equipment is used extensively in the oil and gas processing industries, particularly off shore, and, in the mining industry at remote locations.

It is normally assumed by the end user that because the machine is being purchased as a complete package, e.g. fully equipped and guaranteed, there is no need to specify anything in regard to the internals of the machine. It is also commonplace for such items as acoustic enclosures, fuel metering skid and other peripherals to be supplied at the same time. It not being an unreasonable assumption that the machine manufacturer knows what they are doing and do not need to be instructed on how to build and control their machine. In Australia the integral electrical and instrument components and their installation are normally required to be compliant with AS/NZS 3000. This standard, known in Australia as the "wiring rules" references many other standards to ensure compliance. The mandatory authority for this standard (AS/NZS: 3000) is achieved via various State Acts and Regulations. The machine suppliers are normally instructed, via the purchase specification, to ensure that the equipment "shall be compliant to AS/NZS: 3000".

Within Australia there is a *'prescribed item'* list of equipment and material that is required to demonstrate that it is compliant with Australian Standards, prior to importation. This list, generally managed by the various States, Work Safe and Work Care authorities, is primarily aimed at domestic type products. In the event of non-compliance, these smaller domestic items are frequently the subject of a national "recall". It does not accommodate large items of plant and equipment as related to in this paper. To ensure compliance with the Australian Standards the equipment, and certainly the installation, is normally subject to an inspection by an accredited authority or inspector upon completion of the installation. I have experienced on many occasions where the electricity authority has inspected the installation up to the point of connection and declined to comment on the item of equipment itself. However, it is still a major area of contention and confusion who takes responsibility for the compliance of the internal electrics of a major item of equipment.

I shall point out at this stage that Australia probably has the most Acts, Regulations, Standards and prescribed practices for hazardous area installations than any other country. This situation is also exacerbated by individual states also having their own requirements in addition to Federal requirements, which are not always the same or compatible. For example, the department responsible for electrical safety in each State varies.

In my example, e.g. a gas driven turbine generator, the very nature of the fuel type (LNG) necessitates the need for suitable hazardous area zoning to be taken into consideration. The zoning requirements are normally established by the machine manufacturer in conjunction with the end user via HAZOPS and other methods. Suffice it to say that parts of the machine and surrounding areas become zoned; with the subsequent requirement for the electrical, instrumentation equipment and installation to be of a type suitable for use in a zoned area.

This equipment (and installation material) is known as Ex rated equipment. This Ex rating defines the method of protection to be used in the installation and the zone (hazardous area) that it may be utilised in. There are several different methods that can be utilised; each method has a specific Australian Standard that applies. (It is assumed that the reader has some familiarity with zoning requirements and the methods of protection utilised in those zones.)

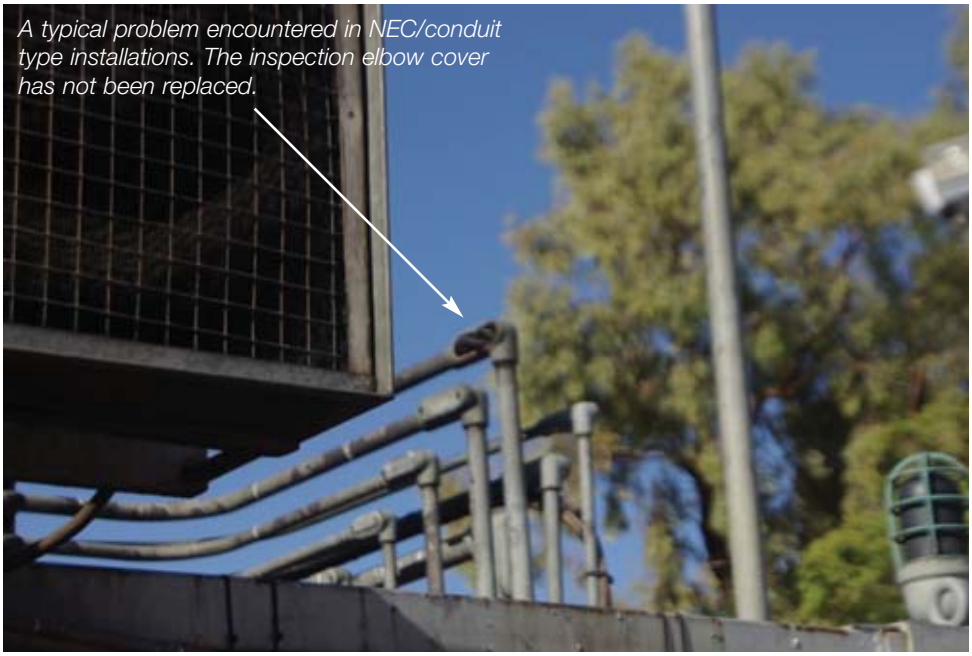
A significant number of gas turbines are supplied out of the USA or Europe.

In the USA the method of protection most widely used is defined as being 'explosion proof', on the Ex scales this is referenced as Ex'd'. Many other alphabetic and numerical characters are utilised in this Ex'd' identification. In my example, they are not particularly relevant in demonstrating the principle problems encountered. The term 'explosion proof' is very often misunderstood by those who are not familiar with the concept. Briefly, the idea is not to protect the equipment inside the enclosure from an external explosion; rather it is intended to prevent an explosion within the enclosure from reaching an external source of ignition, e.g. a gas cloud.

This method of protection (EX'd') is accepted and is fully compliant with the Australian Standards and thus would meet the mandatory requirements, if installed correctly.

In Europe, this method of protection (Ex'd') is also utilised to a lesser extent. The European suppliers utilise Ex'i' intrinsic safety and Ex'e' increased safety, methods of protection more frequently than the USA. These intrinsically safe type installations are far less arduous to install in terms of cost and do not involve the sometimes large and heavy enclosures that are a inherent to explosion proof (Ex'd') type installations. For reasons I have never had a satisfactory answer to, the USA suppliers do not utilise the intrinsic safety method of protection anything like as frequently as the Europeans. It is however a practice that has been in place for many years. I am told by American friends that it is a carryover from earlier agreements between trade unions as to who installs what, e.g. electricians and plumbers. I have not been able to confirm this explanation in any way.

The Pitfalls of Importing Electrical Equipment into Australia



A typical problem encountered in NEC/conduit type installations. The inspection elbow cover has not been replaced.

It is not my intention in this paper to argue the case for and against different methods of protection. They are all suitable and are all accepted in Australia under the jurisdiction of specific standards.

An Ex'd' junction box can be very large and very heavy. Many items of plant, supplied out of the USA to the Australian market use this Ex'd' method of protection. When connecting two Ex'd' junction boxes together, e.g. connecting a piece of wire between them, the North Americans utilise metallic conduit.

When using conduit in an Ex'd' installation, all the fittings and the method of installation are required to be compliant to the applicable standard, as well. This means that conduit seals have to be utilised with filling compounds, threads have to be of a specific type and length etc. Conduit is also rigid; it has to be fitted correctly with the appropriate approved fittings. When the machine leaves the factory, everything is compliant. An installation of this type meets the Australian statutory requirements.

The reader may by now be asking themselves "so what's the problem?", assuming that everything has been complied with, and the machine is on the end users site.

The machine has been functioning perfectly well for some time.

A change or modification is required. In this example I want to install another cable pair between the two junction boxes. The first assumption is that the conduit has enough space in it to enable me to install another cable pair. In my experience this is very unlikely, the manufacturer is not prepared to meet the cost of installing spare or half empty conduits for a change that he may not be carrying out.

If the conduit does have sufficient space in it I still have to break all the seals and pull another cable pair in. Not an easy task. An Ex'd' installation can still be utilised and be fully compliant by using steel wire armoured (SWA) cable with the necessary approved cable glands. Installations using the Ex'd' methods of protection do not necessarily have to use metallic conduit, that is a requirement of or tradition of, the NEC codes and requirements. Many of the frustrations, cost and problems associated with conduit installations are eliminated if Ex'd' enclosures are used without the need for metallic conduits. The SWA cable can be installed quicker, cheaper and easier than running additional conduits or trying to get additional cable cores through an existing conduit.

Within Australia the use of SWA cable is considerably more frequent than a metallic conduit installation. This being the accepted norm for industrial electrical installations.

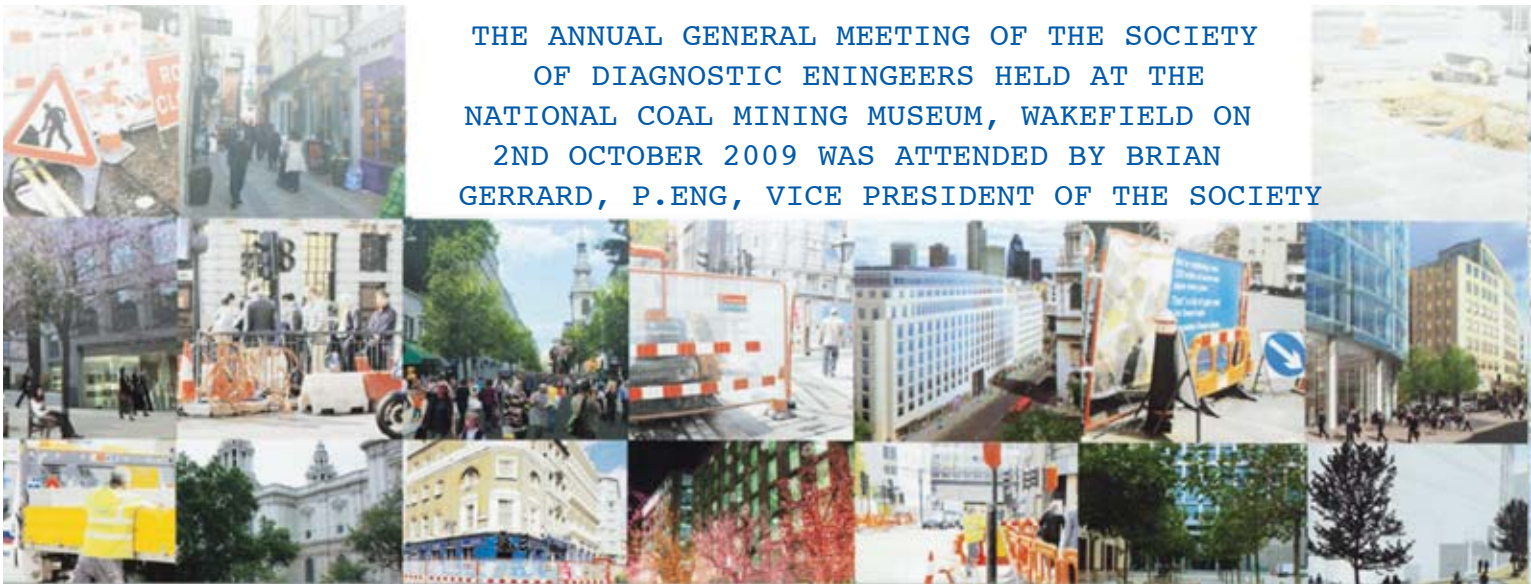
Within the USA, the NEC code of electrical installation practice is used. This code of practice is considerably different to the Australian installation requirements.

The USA of course is not unique in this situation. Equipment coming out of the UK and mainland Europe encounters similar problems, but of a lesser magnitude. I am still receiving queries in regard to ATEX approved equipment. These situations have led to a plethora of companies and individuals setting themselves up in Australia, as consultants who claim to be able to obtain all the necessary approvals.

It can be argued of course that if the end user called up their own 'in house' specifications as part of the original enquiry, the vendor would have no excuse but to quote against those specifications, or at the very minimum bring it to the attention of the end user that they are non compliant with the enquiry specification.

I am therefore proposing that when specifying plant or machines of this nature; specify an installation technique that you can work with in the future.

To reinforce my comments further in comparing an NEC conduit installation to Australian requirements. I have been on numerous installations where the cable conduit has been damaged due to misuse. When (typically) the compressor is being removed for maintenance, those conduits



THE ANNUAL GENERAL MEETING OF THE SOCIETY OF DIAGNOSTIC ENINGEERS HELD AT THE NATIONAL COAL MINING MUSEUM, WAKEFIELD ON 2ND OCTOBER 2009 WAS ATTENDED BY BRIAN GERRARD, P.ENG, VICE PRESIDENT OF THE SOCIETY

provide the ideal step ladder or means of being able to secure a chain block to!

The conduit becomes damaged; the installation no longer meets the requirements of a hazardous area installation and hence you have a potential explosion.

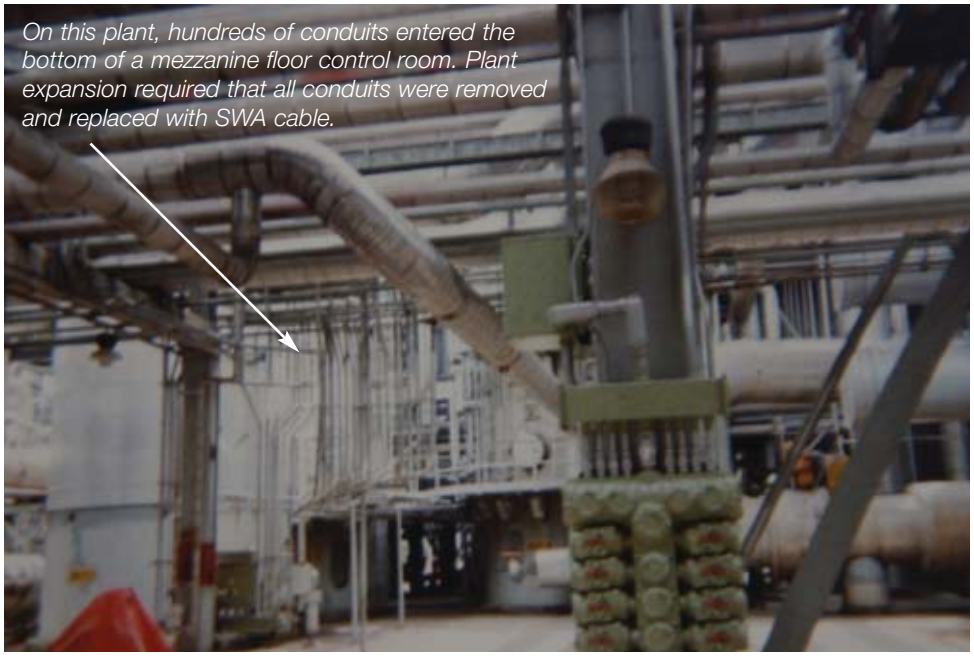
I have had numerous meetings with North American suppliers of packaged equipment on this matter. The response is normally one of indifference after supply.

A source of extreme frustration to many end users is the type of fittings utilised by the North American suppliers. Australian conduit threads do not fit the NPT and tapered fittings found in the USA, hence you have to source an Ex approved adaptor or replace the installation completely. I have recently had the experience whereby an overseas supplier shipped all the conduit and fittings out with the equipment to find out that the fittings and threads were not compatible with anything in Australia.

Collectively the problems encountered thus far, are installation technique problems rather than zoning compliance problems. They are also problems that tend to be encountered after the machine or item of plant is up and running – rather than at the time of purchase. However, it can be argued that if the original specification had recognised these problems, they could be overcome.

I have previously purchased a very large custody transfer metering installation going into the Middle East, from a US supplier. After several meetings with the supplier, and the need to demonstrate to the local electricians 'how to' we did finish up with a very good installation utilising steel wire armoured cable and cable ladder. The suppliers being very impressed with the alternative and the approvals obtained.

As an example of the complete opposite



On this plant, hundreds of conduits entered the bottom of a mezzanine floor control room. Plant expansion required that all conduits were removed and replaced with SWA cable.

I was involved in the purchase of a gas turbine compressor going into Brunei. Regrettably the specifications for the machine had already been issued. A request was made to the US based machine supplier to utilise an installation method using steel wire armoured cable. The response was a 'can do' with a cost of approximately $100,000 for the hardware change and a cost of approximately $250,000 for a complete documentation change. Needless to say the changes were not made, but, the problems described previously were encountered some 18 months later, with the associated production losses.

This paper is primarily intended for the Australian end user and the equipment manufacturer/exporter; however, the installation practices used on electrical installations in Australia are almost identical to those practices used on several other continents, even through mutual recognition agreements. The paper is an attempt to demonstrate that by specifying certain installation practices it is to everyone's advantage, including the manufacturer.

I have written this paper in the hope that both supplier and end user give this discussion some forethought, rather than afterthought. By considering my hypotheses' in the early stages of a project many thousands of dollars could be saved; considering them after the project is committed can cost even more.

The author: John Seeger – Snowden is a Director and Principal Engineer of ExITS Australia Pty Ltd and a Director of ExITS (UK) Ltd. He is a Fellow of the Society of Professional Engineers.

The Editor wishes to state this is not the full article submitted.

"If you wait long enough everything changes" - Carl Sagan

Engineering Heritage - Finch Foundry


David Parratt

There are many facets of engineering of which some engineers may be totally unaware, particularly those which concern the history and background of engineering development. Recently I had the privilege of having some of the gaps in my education filled by a visit to the Finch Foundry at Stickleback near Okehampton, Devon, where the last working waterpowered trip hammer in the UK has been rescued by the National Trust.

One water wheel was of the undershot type and it was changed by the Finch family into overshot working by the provision of an overhead flume to bring water from higher up the valley so as to make it much more efficient in running the fan which feeds air to the foundry fires in which steel bars are heated as part of a demonstration by the Custodian. The second wheel which was already of the overshot variety, runs the grindstone, the polishing wheel and a bandsaw for cutting wood. The third wheel (already overshot) was purchased specially by the Finch family from Pearces foundry in Tavistock to operate the two trip hammers. Only the smaller of the hammers can be used because the last time the larger one was used, the vibration was sufficient to shake the ground so much that the glasses fell off the shelves of the nearby pub and eventually the whole structure of the foundry building collapsed.

Finch Foundry was built originally as a woollen mill in the Middle Ages and later converted to become the local blacksmith's forge in 1814.The import of a trip hammer from which came originally from the Midlands made it possible to undertake the creation of an early form of tool steel by heating wrot iron bars with carbon in fireclay tubes. The resulting bars had surface blisters and they would then be repeatedly reheated, folded and beaten with the trip hammer to make "blister steel" which was much harder than the wrot iron from which it was produced. The next part of the process was to sandwich a narrow strip of blister steel between two strips of wrot iron and "forge weld" the sandwich into a strip which had a hardened core capable of being ground to produce a good cutting edge and which could be forged into the shapes suitable for making sickles, scythes and other agricultural tools.

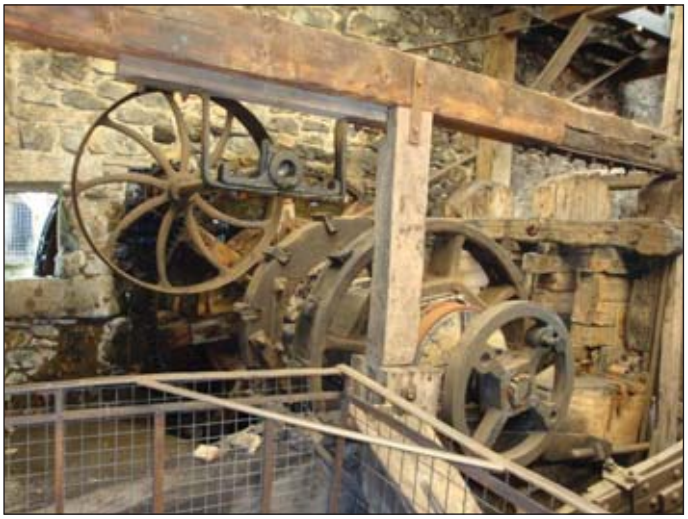
The key to this process was the "trip hammers" which are operated by waterpower to large wheels with a number of "trips" around their perimeter which in turn lift the hammers and let them drop suddenly. The speed depends on the number of these trips and also on the speed of the waterwheel which is controlled by the hammer operative by adjustment of the height of the gates (penstocks)which govern the amount of water which is delivered to the main water wheel. The smaller of the two trip hammers weighing 726 kg is the only one which can be used today and then only for a limited time. With its maximum strike rate of 240 blows per minute, the vibration is enormous. If the larger hammer weighing 1171 kg were to be used, the vibration would probably cause the whole building to collapse again. The trip hammers were purchased at auction second-hand in about 1820 from the Tavistock Iron Works and they are thought to date back into the mid-1700s.

An extension of the shaft of the driving wheel is used to supply power to shears which can cut red hot steel like butter. The shearing blade is hooked on to a boss on the side of its own driving wheel. To turn the machine off it is only necessary to put a block of wood under the operating mechanism to allow it to unhook itself from the wheel.

In its day the Finch Foundry had a workforce of 20-25 men. As well as the traditional work of a blacksmith such as shoeing horses, making ploughs, harrows and general ironwork for gates etc. the foundry was a major supplier of tools such as sickles, scythes, shovels etc. Around the mid 1800s, the production of edge tools was by far the main preoccupation of the foundry. 400 tools were made in a day and these were sold as far away as Taunton, Yeovil and Bridport.

Nowadays, the methods of producing steel have been revolutionised and the means of producing power for industry have been improved out of all proportion. The foundry now exists only to give working demonstrations of the ingenuity of engineers of the past. For that we must thank the North Dartmoor Museums Trust and presently the National Trust for the preservation of a unique working example of our industrial heritage. This shows that engineering is unique as a profession on which all other professions rely and which is vital for the continued existence of mankind.

David G. Parratt, SPEng.,
Member of Council



INTRODUCTION

In October 2005, the then DfES announced that it was giving Royal Borough of Kingston upon Thames £23M to transform one of its secondary schools under it's Building Schools for the Future One School Pathfinder" initiative.

Chessington Community College was one of thirteen schools in England benefiting from the scheme and was elected as the principal beneficiary of this funding.

The Chessington Community College is a five form entry Co- Educational Secondary School with a 6th form of 150 students.

BRIEF

Our main brief to the designers was to transform the college to a school of the future.

To retain the sports hall and make the facilities more accessible to the wider community in line with the DfES extended schools and every child matters policies.

DESIGN

The "Feilden Clegg Bradley's" "All through School Model" was adopted by our Architects and accepted by us.

This exemplar model features a large, central, covered space – an atrium serving as the heart of the school and represents a functional, cost effective design which is based on specifications that are straightforward and robust, using well known inexpensive technology.

The scheme is essentially three sided around a central space with the existing sports hall forming the fourth side.

It is designed on three floors around its atrium and covered by a roofing membrane which is capable of adjustment to control light transmission and solar gain.

The two upper floors provide for teaching and learning areas, accessed from circulation galleries surrounding the atrium.

These are accessed by two number open accommodation stairs rising through the atrium so that movement around the building is visible to assist in supervision of behaviour.

A lift will be provided close to the main entrance. Three additional evacuation stairs are to be provided which sole use is emergency evacuation.

The main structure of the building consists of pre-cast concrete columns and beams with pre-cast concrete floor sections fitted in between supported on re-enforced concrete piles into the ground.

Internal walling was constructed from acoustic dry lined partitioning with double glazed vision panels which provided the interior with openness and transparency whilst preserving the necessary acoustic isolation.

SUSTAINABILITY

RBK wanted to increase locally generated renewable energy to 15% of college demand. This is in excess of the 10% requirement recently sought by the GLA.

To help us achieve this, the following systems were looked at:

Photo-Voltaic: These are fixed to the roof of the Energy centre

There are 26 panels equating to 34m2 of panelling giving an output of around 4.7kWp.

Wind Turbine: This was omitted due to the lack of sufficient wind speed.

Bio-Mass Boiler: The two gas boilers providing heating for the college will be supplemented by a 320Kw biomass boiler fuelled by wood pellets. This boiler will provide 47% of the space heating system requirement. This accounts for approximately 6% carbon savings of the total building carbon emissions.

PROGRAMME

The Programme of the Works was divided into 3 phases.

Phase 1. 16th of April 2007-21st of April 2008.

Phase 2. 01st of May 2008-12th of January 2009

Phase 3. 09th of January 2009- 06th of June 2009

Phase 3 of the Works has recently been completed on the 20th of July 2009 currently there are minor snagging works being finished.

The Grand Opening of Chessington Community College was on the 28th September 2009.

As a Team we carried out regular progress meetings on a fortnightly basis with all of the Consultants and the Main Contractor which was Willmott Dixon.

"Core Group" meetings were held on a monthly basis with the end-users/stakeholders i.e. the College, Consultants and us the Client.

Antony Wedge the Professional Engineer/Project Manager representing the Client and overseeing the Framework Consultants comments:

'Right from the outset, all who have been involved with this project have committed themselves to delivering the best possible learning environment within the severe budget and programming constraints set by the then DfES.

The re-building of Chessington Community College has been one of the most successful projects we have ever worked on thanks to the collaboration between RBK (the Client), Contractor, their Sub-Contractors and Design Team. It has been a joy to have been part of the team '

Antony Wedge can be contacted on 020 8547 5280 or email: aw@integralpm.com

Friction and Lubrication

Whenever one body slides over another friction is created and a resistance is set up at the contacting surfaces in a direction tangential to those surfaces. It is present whenever motion exists and whenever motion is about to take place. It always exerts a drag in the opposite direction to the motion or attempted motion. If the friction between two bodies is sufficient to prevent motion it is known as STATIC friction. When motion exists it is known as KINETIC friction.

Static friction is friction that holds the lumps of earth together in a railway embankment and prevents the embankment collapsing when a train passes over it. It prevents tyres skidding when power is transmitted through them. Kinetic friction is the friction which exists between bearing surfaces of moving machinery.

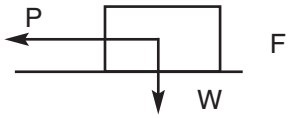
Static friction is usually greater than kinetic friction a fact that is demonstrated when a man attempts to push a heavy rails goods wagon along the rails. He will need all his strength to set it in motion but little effort will be required to sustain that motion once it has been started. A rail locomotive can pull any train that it can start.

Coefficient of Friction

The coefficient of friction is the measure of the frictional resistance expressed as a fraction of the force pressing one surface onto the other.

Fig1. illustrates a block resting on a horizontal plane. If force P is applied parallel to the horizontal plane it will be opposed by the frictional force or reaction F.

Fig 1.



The reaction F is always equal to the applied force P. If P is the force in kilograms, W the weight in kilograms and F is the frictional resistance, then the coefficient of friction u will be :-

$$\mu = \frac{F}{W}$$

If the force P is the largest that can be exerted without the block sliding the result of the above equation will be the static coefficient of friction. If P is just sufficient to keep the weight moving the result is the kinetic coefficient of friction. The same relationship holds true when the surfaces are cylindrical or circular as they are in a journal bearing.

Kinetic Friction

It has been customary to classify kinetic friction under four headings: 1) dry or solid, 2) boundary lubrication, 3) fluid friction, 4) rolling friction.

Dry Friction

In practise dry friction is non existent for the surface of the metal is inevitably covered by a film of oxide or other contaminant which affords a measure of lubrication. When two surface areas are placed together they will be supported on the irregularities of the surface finish and the real area of contact will be small. When loaded the region of contact will be high and could easily exceed the yield point of the metal and deformation occurs at the point of contact.

Boundary Lubrication

The condition that rules when a film of lubricant only a few molecules thick exists on the mating faces of metal bearings. It occurs in machinery with circulatory lubrication at start up. Bearings lubricated by hand (oil can) work for lengthy periods under boundary conditions.

Fluid Friction

A lubricant of correct viscosity, clearances that do not depart from the ideal and a smooth finish, a bearing is basically self-lubricating once it moves at a sufficiently high speed to build up an oil film.

The more accurate the lubricant clearance and manufacture the lower will be the coefficient of friction, longer bearing life and higher load capacity.

Design of the bearing relative to its performance and method of lubrication are the most important factors.

Rolling Friction

If pure rolling friction were possible in any bearing there would be no need for lubrication other than as a protection against corrosion.

Unfortunately, owing to the elastic deformation of the balls and rollers and their tracks sliding friction exists. Because of this deformation a certain amount of sliding friction between balls or rollers and their tracks is unavoidable.

There is also sliding friction between the balls or rollers and their cage. It is important that correct lubricant grade and quantity is in the housing otherwise additional losses due to churning will occur.

Speaking Frankly...

My employer is asking me to accept a reduction in pay. Is this legal?

It is unlawful for an employer to make arbitrary of unauthorised deductions from salary, wages or fees. That said, the wider circumstances giving rise to the employer's request warrants further consideration.

Whilst you cannot be lawfully compelled to accept a reduction in pay, an unwillingness to consider the options open to you could prove troublesome. If, for example, the employer's request is one that has been put to the entire workforce then consider discussing this with other, trusted colleagues. This is important because where the context applies to all employees you may consider it expedient to accept temporary reduction in pay if this could help your employer to survive in the present climate and to avoid financial detriment to the company.

Try to avoid accepting an 'open-ended' reduction in pay but establish the precise nature, extent and duration of any proposed reduction and do obtain as much detail as possible about the business criteria for the re-instatement later, to your original level of pay.

Articles for the Bulletin - We are always looking for news of members and project articles for publication in the bulletin, do you have something of interest, lets hear from you. Please supply

Collaborative and Membership Agreements with other Professional Bodies

Collaborative and Membership agreements are in force with the bodies mentioned below. In every case Members wishing to apply should first contact the Society for an Application Form and/or a letter of recommendation.

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PO Box: 2500, 9, San Li He Rd., Beijing 100835, China
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www.cces.net.cn

Societe Nationale des Ingénieurs Professionnels de France (ipf)
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Email: info@dtmsi.co.za • Website: www.dtmsi.org

Self Inking Personal Stamps

As Members will be aware the Society has for many years had on offer a Stamp for use on notepaper and drawings containing the name of the Society and the name and Registration Number of the Member. The Firm that supplies the Stamps can now offer a self-inking Stamp which produces an even more finished appearance and is enclosed in an impressive case that will sit well on the office desk. These are now available from the Society at the modest price of £30.00 each which includes VAT, postage and packing.

Lapel Badges

Lapel Badges are now available from the Society at a cost of £3.00 each inclusive of postage. All paid up members are encouraged to purchase a lapel badge to indicate their membership of the Society, and to be proud to wear it among their professional colleagues.

Society Ties

We are pleased to advise members that we now have good quality ties in stock of polyester satin in Silver Grey, Navy and Maroon with the Society Logo picked out in gold, They are very striking and will certainly provoke discussion when worn in the office and at business meetings and training. Support the Society by ordering one now at the modest price of £11.50 (including postage and packing).

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Severn Barrage Threat

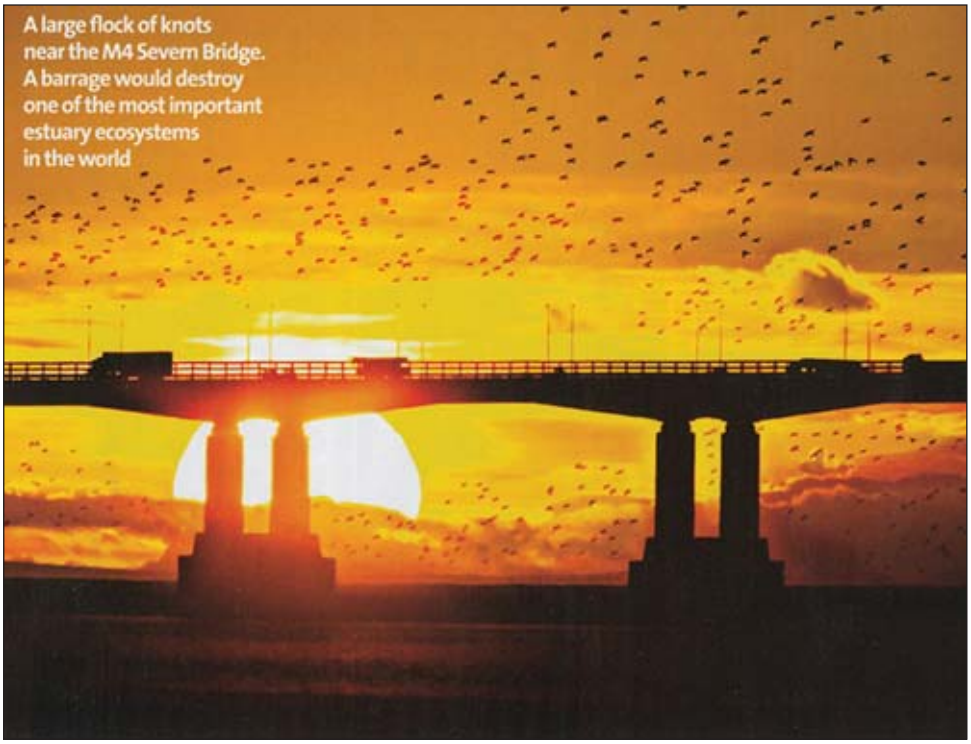
Trusts fear wrong energy decision could wreck the Severn Ecosystem.
The Wildlife Trusts are calling for a truly sustainable solution, with minimal environment impact, following the UK Government's decision to consider five options to generate electricity using the tidal power of the Severn Estuary.

The estuary's natural habitats and wildlife are among the finest examples of their kind in Europe, and are protected by international laws and agreements. At the same time, the Severn's tidal range of 14m is the second-largest in the World, and offers significant potential for generating renewable electricity.

The options include three barrages (one large barrage, the Cardiff-Weston; the smaller Shoots Scheme; and the even smaller Beachley Barrage) and two lagoons (Bridgewater Bay and Fleming).

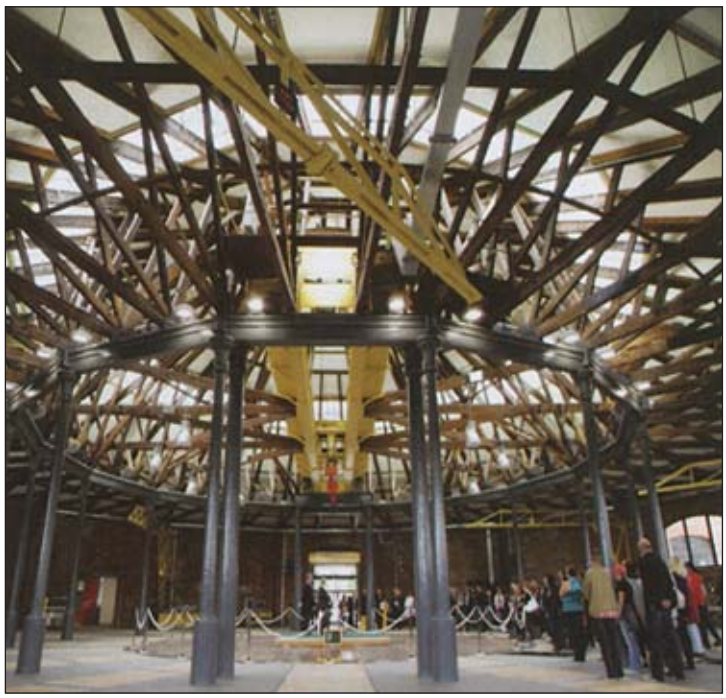
The Government is also investing in two proposals for tidal fences (which harness tidal flow rather than range) and another barrage option. The wrong decision could fundamentally change the Severn Estuary's unique ecology, affecting people and wildlife alike.

The Wildlife Trusts believe that if the UK is going to proceed with energy production on this scale, it is essential to get the right technology, and in the right places. "We want to ensure the chosen option will not be something that society regrets in decades


A large flock of knots near the M4 Severn Bridge. A barrage would destroy one of the most important estuary ecosystems in the world

to come." said Joan Edwards, The Wildlife Trusts' head of Living Seas. "In particular, we believe that the large Cardiff-Weston Barrage would cause unacceptable damage to the estuary and should be dropped from the list of options."
Dr Lissa Goodwin, marine policy officer, commented "If renewable energy is to be harnessed from the estuary, it should be done in the least damaging way. Compliance with the EU-Habitats and Birds Directive is vital. We must ensure the least environmentally damaging and most cost-effective option is selected, to tackle our climate change targets and safeguard the estuary for the future."

A Good Place To Train



The £48m restoration of the grade II-listed Roundhouse railworks complex in Derby has been completed by Bowmer & Kirkland. It now forms a vocational campus for Derby College.

The 16-sided former railway works building, which features a spectacular 40m-diameter central space that once housed a train turntable, has become a social hub open to students and the public.

The new campus includes teaching facilities in four refurbished Victorian buildings and a new-build wing that features coloured individual learning 'pods' designed to echo railway carriages.

Pedal Power in the City of London

From next May those who live in, work in or visit the City will be able to pick up a cycle from a docking station, use it and then return it to the same of another station under a new Cycle Hire scheme.

The scheme will also cover Camden, City of Westminster, Hackney, Islington, Kensington and Chelsea, Lambeth, Southwark, Tower Hamlets and The Royal Park with 6,000 cycles and around 10,200 docking points, between 400 docking stations. It will be ideal for businesses wanting to provide employees with alternative transport options or residents who need short trips.
The scheme will

- Offer a sustainable and low emission form of transport
- Be convenient and easy to use
- Encourage local trips within central London
- Be available 24 hours a day, 365 days a year
- Alleviate congestion on the Tube and buses
- Encourage a shift from car usage
- Provide an addition to London's transport network