The Kuip Stadium
Unique Retractable roofing design using Oasys GSA

Free and Easy
Vectorworks Free-Form design tools

Asta Powerproject
BIM and 4D planning

Daylighting
AltoSUE highlights underground assets

Watch your Assets!
Bentley’s AssetWise adds Process Safety and Risk Management
Whole life management of your built asset

We all recognise the game-changing potential of BIM, but at CONJECT we think that built assets should be managed throughout the whole lifecycle if they are to deliver improved outcomes for contractors, owners and operators.

Accordingly, our SaaS solutions provide:

• A Common Data Environment “CDE” designed for your whole asset lifecycle – PAS1192 parts 1 and 2
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Soft Landings

by David Chadwick

The most significant figure in this issue is the difference between the cost of designing and building something, and the cost of running it. In the example we have here, describing the processes and benefits of Bentley’s AssetWise APM software for handling the assets in process plant, energy or other utility, it stands at between 60-80%. The figure often quoted for building construction is 80%. There are no figures for AltoSUE, the identification and tagging of underground assets using Altuiy’s hardware and software solution, but the emphasis there is also on the high cost of maintenance of such assets.

Using BIM to optimise the costs of the design and build process has been well understood and truly driven into our consciences, but the ways in which we can mitigate the far higher costs involved in looking after such assets throughout their entire lifecycle are not so obvious. The two articles, though, together with a fascinating example from an energy company in Malaysia, go some way to explaining the processes by which efficiencies can be introduced and operating costs reduced.

It all depends on the quality of the information being supplied to the operating companies. In the case of AssetWise customers, they would probably like the same courtesies extended to them that a construction company extends to the owner/operator of a building, a ‘Soft Landing’ that supplies the information it needs to maintain the building in a format they can understand - the raison d’existence of COBie.

There is a huge difference between the two types of assets, though. The purpose of a building is to accommodate different types of human activity and, apart from sundry environmental and performance issues analysed by companies like IES - another contributor in this issue - the building is a completed entity. Process plant and similar, however, are constructed for a specific purpose. They are basically huge machines, built to perform a task at a pre-defined level, according to the prospective owners’ requirements.

Designers and contractors, therefore, have to work closely with the owners, in order to ensure the operating characteristics, particularly energy, which is one of the biggest costs, are designed to produce a proper return on assets.

They want the information they are supplied with to be the same as the original design - the as-operated to be the same as the as-designed and as-built. They also want designers to take into account the reliability and maintainability of their assets during the design phase, and, moreover, to warrant the operational performance of the assets they design and build.

But mainly they want ‘co-creation’ of value, looking for the same soft landing from the contractor that links their financial return to the designed capability of the asset, which is determined by the asset performance of the plant during the first four to five years of its life.

SUE is somewhat different. The companies involved in maintaining the underground assets are usually involved in installing them in the first place. There are also the problems of the subterranean plumbing installed by our ancestors - and the fact that multiple utilities may need access to the same bit of real estate. Hence the need for accurate 3D sub-surface models, a means of assessing the state of hidden assets, and the ability to share the same with planners, utilities, highways and other agencies.

Squaring the circle, that means whoever is planning and laying out a network of assets - water, electricity, gas, fibre optic or whatever that may entail - needs to take into account the performance of the equipment they specify and also the maintenance requirements of the operators - another Soft Landing, if you like!
IMAGINE DESIGNING
AN 77,000 m² HOSPITAL THAT NEEDS TO BE BUILT IN 30 MONTHS

Meeting the demands of complex projects requires everyone to be on the same page. Learn how Bluebeam® Revu®’s PDF-based collaboration solutions enabled Mortenson and their partners on the Saint Joseph Hospital project to coordinate design changes in seconds – not days.

Imagine the possibilities
bluebeam.com/learnhow
GREENSPEC MOVE TO TACKLE 'GREENWASH'

GreenSpec’s PASS Green Building Products label aims to help design professionals and the self-build audience easily identify what are truly green construction products from the ever-growing ‘greenwash’ that are now ‘out there’.

Devised and operated by practising architects and specifiers for the benefit of building designers and manufacturers, PASS’s evaluation criteria and specialist peer review process ensures that only ‘green’ products are endorsed.

PASS has been developed by GreenSpec, the UK source of green construction design guidance, which started as a BRE project over 10 years ago. Offering evaluation and endorsement of building products, materials, equipment and systems featuring green characteristics, PASS also promotes competent and environmentally sound construction.

Sandy Patience, architect and editor of GreenSpec, said: “Unfortunately, greenwash is on the rise and, in a world with thousands of products to choose from, it is essential to have a label so that architects and specifiers can understand and trust.”

The GreenSpec PASS provides manufacturers with a route to apply for this valued third-party accreditation through its website, www.greenspecpass.co.uk

TALENT SPOTTING AT THE SKILLS SHOW

Is your business future-ready? Businesses in all areas of the construction sector can build long-term financial security and protect future profits by recognising and nurturing the talented young people available to join their workforce, according to Find a Future, the organisers of The Skills Show event.

The annual event, which this year takes place at The NEC Birmingham from 19-21 November, is the nation’s largest free-to-attend skills and careers event. It provides a showcase for a broad range of vocational sectors to an audience of 75,000 young people, and gives employers the opportunity to inspire their future workforce about the possibilities that exist within the health and fitness sector.

Said Ross Maloney, Find a Future’s chief executive: “The Skills Show gives businesses a unique opportunity to engage directly with these future employees, providing insight into the world of work and careers inspiration to motivate them.”

www.findafuture.org.uk

ACUTE3 IS BENTLEY’S LATEST ACQUISITION

Bentley Systems has been on the acquisition trail again (see CAD User, Jan-Feb 2015, page 6), adding France-based Acute3, provider of Smart3DCapture software for reality modelling, to its stable. Through reality modelling, observations of existing conditions are processed into representations for contextual alignment within design modelling and construction modelling environments.

Acute3D software automates the generation of high-resolution, fully-3D representations from digital photographs taken with any camera, whether highly specialised or embedded in a smartphone.

Bentley Systems founder and CTO Keith Bentley commented: “The world-class Acute3D developers have already achieved two breakthroughs, which remove the barriers to the adoption of reality modelling. First, Acute3D has made it possible for anyone to sufficiently capture existing conditions with just a camera. Of equal importance is the value of the Acute3D result. Rather than a voluminous cloud of discrete points, Acute3D produces a 3D ‘reality mesh’ - intrinsically in the same geometric idiom as engineering models, readily aligning the real-world context.”

www.bentley.com/Acute3D

DEM REVEALS ITS GEMM

DEM Solutions has launched the Generic DEM material model database (GEMM). The database addresses one of the key challenges of DEM simulation: getting suitable material inputs for accurate representation of bulk materials.

GEMM contains thousands of models, representing a wide range of materials such as rocks, soils and ores, and is particularly suited for engineers in the mining, construction and agriculture industries. DEM Solutions has been able to populate the database with thousands of material models ready to use in their DEM simulation software to represent a wide range of material behaviours. This ensures DEM users will no longer have to rely solely on guesswork, but be able to access a material model that reflects the material behaviour they are looking for.

The system asks users to input a set of basic information about the material to be represented, which then triggers a search through the extensive database and returns a recommended material model, based on both their application and specific requirements.

www.dem-solutions.com
Bentley offers comprehensive solutions for the collaborative design and multi-discipline engineering, construction, and delivery of building, industrial, and other infrastructure projects of any scale or complexity.

Bentley’s BIM portfolio includes applications for design, analytical, construction, reality, and asset performance modeling, along with an information and collaborative framework to manage all aspects of project delivery. This comprehensive solution empowers architects, engineers, contractors, and owner-operators to leverage BIM advancements successfully for better performing projects and better performing assets.

Find out more at: www.bentley.com
**HDR | RICE DAUBNEY SCOOPS 5 DESIGN AWARDS**

HDR | Rice Daubney, a GRAPHISOFT client based in Sydney, Australia, has won five prestigious global healthcare design awards for the Chris O’Brien Lifehouse Centre, the highest honour in all categories recognising excellence in research and practice of global healthcare design.

Designed using ArchiCAD, the vision for Chris O’Brien Lifehouse was to become Sydney’s premier integrated cancer centre - a genuine, patient-focused facility, with broad-based holistic treatment, in a world-class clinical environment with integrated research programmes.

Patients have been made central to the design, from the point of arrival through to the experience of moving through the facility. Waiting areas and corridors are celebrated - views and aspect showcased, with the quality of the filtered light defined as the central concept.

http://www.ricedaubney.com.au

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**2015 TEKLA UK AWARDS OPEN FOR ENTRIES**

Celebrating its tenth year, the Tekla Awards are now open for entries - continuing to reward the hard work and innovation that goes into solving structural engineering challenges in the construction industry.

The awards are focused on projects where Tekla software has been used as a part of the process for designing and modelling structures, or indeed where the use of Tekla software has aided collaboration.

Emily Brown at Tekla explained: “As a part of the new-look Tekla awards, the award categories have been expanded to encourage businesses and projects of any size to be submitted.

“We’ve rescheduled the award entry deadline and simplified the admission process with an online entry submission - so we are looking forward to receiving a wide range of entries featuring all manner of projects. "Previous entrants have found real value and business benefits from the awards in demonstrating success, innovation and efficient collaboration across projects, not to mention growing an organisation’s profile,” she added.

www.tekla.com/uk/awards

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**SHOW OFF YOUR SKILLS AND EXPERTISE**

The 2015 Bluebeam eXtreme Conference London Call for Presentations is now open - with speaking proposals being actively accepted from Revu users who are looking to show off their skills, knowledge and expertise. So, if you’re ready to demonstrate how your project team is developing innovative processes that are helping to shape the future of the built environment and challenging the limits of project communication and collaboration, this is your opportunity.

If you have any immediate questions regarding the Bluebeam eXtreme Conference London itself, taking place on 1 October, or the speaker submission process, email: atremelondon@bluebeam.com.

NB: speaking proposals are only being accepted until 30 April 2015, so hurry!

www.london.bluebeamextreme.com

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**CAUSEWAY SOLUTIONS DELIVER CONTROL**

Causeway’s Tradex eTrading and MyRegister supplier accreditation hosted software solutions are now included in the Crown Commercial Service’s G-Cloud 6 framework.

The actual framework provides a general term for agreements with suppliers, and sets out terms and conditions under which purchases can be made.

The Tradex eTrading solution, for its part, enables supply chain partners to electronically send and receive trading documents such as invoices, requisitions and purchase orders.

Once connected, companies can trade electronically through a scalable and flexible integration hub that supports multiple document types and user services. MyRegister is an online supply chain management software system for managing both suppliers and subcontractors within the construction industry.

As such, it is claimed to improve the efficiency of vendor management and PQQ management, while at the same time reducing the risk associated with accrediting and managing suppliers.

www.causeway.com
Tekla Structural Designer is here.

Revolutionary Analysis & Design Software.

Work faster, more efficiently and win more projects. Tekla Structural Designer helps you do all this and more.

NEW for Structural Engineers.

> www.tekla.com
A significant number of the finalists at last year's Bentley Systems' Be Inspired Awards were in process plant, power generation and other utilities. The projects they presented ranged from small-scale facilities to major installations, one of which, the Malaysian power generation company Tenaga Nasional Berhad (TNB), we have focused on in this issue. Two major facts stand out. The first is the large scale of some of the installations, with many a myriad of systems and components involved, and the second is the planning that needs to be undertaken to maintain and run such an installation throughout its complete lifecycle.

That lifecycle is usually measured in decades, with most of the accumulated lifecycle costs, estimated at between 60% to 80%, occurring during the operate and maintain phase. Efficiency in the day-to-day running of such plant, therefore, is essential to minimise downtime and to run reliably at peak performance levels.

Peak performance levels, though, may already have been compromised. Recent studies have found that up to 65% of large projects fail to meet schedule, budget and production goals for various reasons, so that, on handover, they fall far short of production targets, and are unlikely to reach and maintain that lost performance. Lower performance levels make it more difficult for the operating company to bridge the gap between CapEx and OpEx.

The problem is exacerbated by the way in which operators maintain their plant. At one end of the scale, equipment is only replaced when it wears out or breaks down - run to failure - the dead light bulb procedure, except that unplanned maintenance causes unplanned stoppages, with all of the extra costs that entails. An improvement on that is time- and wear-based preventive maintenance, usually determined by manufacturers' recommendations or historical knowledge of a component's reliability.

With advanced equipment monitoring tools, though, we can go further and implement maintenance schedules that are based on analysis following condition monitoring or predictions of wear. The optimal solution focuses on reliability-centred maintenance (RCM), used to 'engineer out failure' on high value assets. With advanced equipment monitoring tools, though, we can go further and implement maintenance schedules that are based on analysis following condition monitoring or predictions of wear. The optimal solution focuses on reliability-centred maintenance (RCM), used to 'engineer out failure' on high value assets.

Then there is the human end of the operation, with the usual problems of aging workforces using paper-based records to maintain plant, resulting in knowledge lost when employees retire, discontinuity between processes and maintenance engineers working in isolation from each other.

**BENTLEY ASSETWISE APM**

An industrial-strength process is therefore required to manage the performance and reliability of assets throughout their working life. This is provided by Bentley's Asset Performance Management methodology, AssetWise, which not only drives the process using reliability-centred maintenance practices for an entire operation, but also manages change, ensures that skills are properly maintained, and that employees develop competency and understand their roles and responsibilities, and are accountable through key performance indicators. It provides an all-in-one analysis and information management system for ensuring an asset's reliability and integrity.

In the latest version of the software, V7.3, AssetWise adds process safety to the management process, ensuring that, whilst an asset is run with total efficiency, it is both safe and reliable, and inspected and maintained to reduce or eliminate risk. According to Alan Kiraly, Bentley senior vice president, server products: "AssetWise APM V7.3 meets the demanding requirements of reliability, integrity, safety and maintenance managers and engineers, in industries ranging from oil and gas, petrochemical, and mining and metals to power generation and other utilities."

**SAFETY SYSTEMS AND HAZARDOUS PROCESSES**

Now safety and risk management can be factored into the process at the strategy development phase of a project, closely aligning the goals of operations and maintenance with the business goals of the company, and identifying the physical assets that pose the highest risks, in terms of personal and equipment safety and environmental risks.

The new process safety features include safety instrumented function (SIF) analysis, safety instrumented systems (SIS), safety integrity level (SIL), and safety provisions, overrides and incidents. AssetWise APM V7.3 also...
provides version control and approval, the analysis of loss of containment scenarios - should a chemical or other vessel be breached - and the identification and assessment of risks at system level, as well as for related assets (risk matrix): how a failure would impinge on other assets.

AssetWise APM reduces unexpected downtime, increases asset availability and utilisation through being able to prevent or spot critical issues immediately and act upon them. The software upgrade also includes support for relevant regulations and safety standards, including ISA 84, IEC 61511, IEC 61508, and IEC 61882.

Other noteworthy features of AssetWise APM V7.3, made feasible by the creation of a single platform for plant information, include Spatial navigation, which enables maintenance, reliability or integrity engineers to quickly identify assets through the use of early warning alarms, or work that needs attention by asset type or type of problem in a particular geographic area, using the results of the maintenance analyses outlined above.

Flashing alarms and asset health scores displayed on the map provide at-a-glance notification of the severity of the asset problems and actions can be taken directly from the map, including viewing the asset's i-model to understand the design basis and compare against the current condition. The APM model can also be used for production loss accounting, enabling users to identify and improve factors and assets that have a significant impact on production and maintenance costs, to ascertain ‘bad actor’ assets, prioritising projects to update or improve them and to reduce risk. Or, using a more formal approach, using Root Cause Analysis (RCA) diagrams within AssetWise APM V7.3's expanded RCA capabilities to assess root cause, and accurately identify and correct the root causes of specific asset failures, as opposed to simply addressing their symptoms.

At a component level, atmospheric storage tank (AST) analysis is assisted by risk-based inspections within the extended support for AST analysis. Probability and consequence severity evaluations, confidence evaluations, remnant life and next inspection date now support AST.

**OTHER ASSETWISE APM V7.3 FEATURES**

Users can now benefit from the software's ability to leverage i-models (for the conveyance of AECO deliverables) to allow for immersive APM, visually guiding inspection and maintenance activities. This extends the value of mobile devices to operations by making it possible to bring the virtual model to the field and align it with the physical plant, enabling observed conditions of an asset's performance to be analysed and guidance provided as to the best courses of action for peak performance and safety.

It is also possible to develop risk-based, reliability-centred strategies to define the proactive maintenance work and modifications required to optimise performance. The resulting program generates actionable, data-driven insights on asset performance and reliability.

Although remote monitoring of assets provides much of the operational data for AssetWiseAPM, engineers on site can also monitor asset condition and performance, using tablet/mobile devices, and even to access design and engineering information models when inspecting or performing corrective work on assets. The software, in fact, will consolidate and analyse condition data from all sources of inspections and real-time monitoring devices, and display it using a centralised asset health dashboard.

The key strategies of Bentley’s AssetWise APM are, therefore, to align maintenance strategies to business goals, improve maintenance productivity, detect the onset of failures and to extend asset life. It enables operating companies to consolidate and analyse data from disparate sources, schedule work more effectively, share information between functions and sites, and share information across phases of the asset lifecycle. It then makes that knowledge available for consistent decision-making, enabling maintenance decisions to be based on ‘what is really happening’. It’s also very useful for handling plant renovations, expansions or repurposing, and the implications of each on the asset lifecycle.

[www.bentley.com](http://www.bentley.com)
In a real turnaround, Bentley has been given an award from one of its clients. One of the 2014 Be Inspired finalists - the category they competed in was, appropriately enough, ‘Innovations in Asset Performance’ - recently awarded Bentley with its Best Vendor Award (2014), under the ‘Services Category’.

The award was presented by Tenaga Nasional Berhad (TNB) Generation headquarters in September 2014, and Bentley achieved the highest score, as rated by their engineering staff and management for delivery and implementation that met tender specifications and TNB requirements in all of the main criteria:

- Quality and skill in services rendered
- Documentation
- Adequate staffing and resourcing for services implementation
- Teamwork and feedback
- Safety compliance
- Product and quality of goods implemented.

Bentley was chosen above 1,000 other TNBG contractors and suppliers, emphasising the absolute scale of operations that software like Bentley’s AssetWise was designed to handle, with large and dispersed power generation sites, power transmission facilities and all of the supporting equipment, personnel, accommodation and supplies. Tenaga Nasional Berhad is the largest electricity utility in Malaysia, with 33,500 employees serving 8.3 million customers, and almost MYR 87 billion in assets (the Malaysian Ringgit is approximately 5.2 to the pound). Prior to taking AssetWise APM Ivara on board, the company held vital information in multiple databases of paper-based records. It was decided that centralising all asset information would enable managers to make timelier and more informed decisions, thus reducing reactive maintenance.

Reactive maintenance is probably the most inefficient method of conducting large-scale maintenance - responding to failures in equipment as they occur, which can cause unplanned stoppages in supply, breakdowns in schedules and disruption to working patterns, loading un-budgeted and unforeseen costs on the operator.

Centralising all asset information within a single source, and making that available to maintenance engineers, planners, co-ordinators and suppliers, gives operators the ability to respond more quickly to incidents and therefore immediately provide accurate asset information to maintenance engineers, enabling them to arrive on site armed with the tools and knowledge that they need.

More importantly, it also provides a means of analysing asset lifecycles, wear rates, breakdown histories and so on, and to use that information to prepare maintenance schedules based on time, wear and other factors, mitigate against unscheduled shutdowns, organise staff better and, basically, run a leaner and more efficient operation. With information about the reliability of equipment to hand, TNBG was able to implement a full Reliability Centered Maintenance (RCM2) approach to its maintenance programme. The end result was a better return on operating expenditure, better use of resources and happier customers.

TNBG, therefore, implemented AssetWise APM (Ivara) to incorporate asset prioritisation into some of their other business processes, allowing the benefits to be shared throughout the utility, whilst leveraging existing investments. Tightly integrating the software with other systems provides a single platform that captures real-time plant data. This allows the utility to integrate information from multiple data sources - the system is employed by plant operators to collect critical asset condition information, using a range of handheld devices.

Commenting on why TNB chose Bentley, Shahed Latif, senior manager, TNBG, said: “Having decided to implement the Reliability Centered Maintenance (RCM2) approach to our infrastructure maintenance program, TNB Generation (TNBG) searched for an industry leader in asset performance management solutions to help achieve their strategy. Bentley’s AssetWise APM was chosen as the preferred solution and we have awarded them Best Vendor 2014, as recognition for their implementation of the solution, which helped TNB Generation meet all of its project technical, timing and cost objectives. We chose Bentley over 1,000 other TNBG vendors as the organisation that best delivered tender specifications and TNBG requirements for resourcing, documentation, safety compliance, and product and quality of goods implemented.”

www.tnbg.com
By January 2016, everyone working in the UK construction sector needs to understand the potential of Building Information Modelling (BIM) and how they can use it to produce better quality buildings and landscapes more efficiently. For 25+ years, Nemetschek Vectorworks Inc has been a global leader in design technologies providing elegant architectural, landscape and lighting design software that offers Building Information Modelling capabilities in a flexible, hybrid-design environment. Act now and contact us to make sure you are ready for BIM.
The average construction project creates a mountain of documents, drawings, spreadsheets, schedules and similar instruments, all of which have to be printed, collated, revised, updated and ultimately archived or binned. The demise of such an archaic solution has been mooted by the printing industry for a couple of decades at least, but the construction industry rightfully considered itself a special case - the ability to display, review and mark up 2D and 3D drawings on line not quite delivering on all its promises.

With a diversity of applications, standards and file formats, generating a number of proprietary document review and mark-up solutions, it was inevitable that the most common of them - PDF - became the format of choice. It is a rare device now that doesn't have one or other of the two most prominent PDF document management solutions installed.

The one I use, Bluebeam Revu, is taking the paperless office to new extremes - with particular reference to the construction industry. With the ability to create PDFs with one click, handle 2D and 3D PDF markups, collate single-file PDFs from diverse document sets and much, much more, and to make it available on iPads and tablets, the sheer delight of having an entire project’s documentation at your fingertips renders any physical solution slow, wasteful and obsolete.

BLUEBEAM REVU 15
Designed not just for the construction site, but for any project that involves extensive paper handling, Bluebeam Revu 15 comes in three editions - Standard, CAD and eXtreme. Revu combines powerful PDF editing, markup and collaboration technology with reliable file creation, pushing the limits of project communication. It also includes direct plug-ins for one-button PDF creation out of Microsoft Office and Bluebeam Studio (Revu's free cloud-based storage and collaboration solution) for real-time, document-based collaboration, and, for the CAD version, for AutoCAD, Revit, Navisworks Manage, Navisworks Simulate, SolidWorks, SketchUp Pro and Sketch Tools.

The eXtreme version takes Revu CAD one step further, adding OCR+, PDF forms creation, Redaction, Scripting, Batch Link, Batch Slip Sheet and Structures.

For workers who need to take the office with them on site, Revu iPad lets you work without limits, regardless of Internet access. Users can redline PDFs with customisable symbols, verify measurements in the field on the fly and collaborate with colleagues in real time using Bluebeam Studio.

NEW FEATURES FOR REVU 15
I remember my first job, years ago, as a junior officer - to bring my very own copy of Queens Regs up to date, with a sheaf of amendments that outnumbered the active pages three to one! Slip sheeting must be similar - keeping file sets up to date with new revisions, amendments, additions and so on. Just the job for the junior office clerk. With Revu, but only in the eXtreme version, Batch Slip Sheet keeps complex file sets up to date by automatically appending, prepending or replacing existing page content with new file revisions.

The feature matches revisions with their corresponding current sheets and carries over all markups, hyperlinks, spaces and bookmarks, while at the same time stamping superseded files. In conjunction
with the new Sets enhancements, the software also carries over markups, hyperlinks, spaces, bookmarks and other data to file revisions. There is another batch utility which is quite useful. Batch Overlay and Compare Documents simplifies the process of overlay comparisons, by assigning different colours to each page to visually compare and display differences between multiple pairs of files - 'current and revised' files - the more meaningful new name for 'Set A and Set B' files. The setup options auto-match files by pulling file names, page labels or page regions, and automatically highlights all differences between multiple drawing revisions. It also includes similar auto-matching functions. Which brings me to Sets themselves. Sets provides the ability to more easily manage large drawing sets and to navigate a large single page PDF file as if it was a multi-page PDF file. Revu 15 facilitates this by allowing users to categorise Sets under architecture, structure, design, MEP and so on, improving navigation between categories.

Automatic filters handle revisions, ensuring markups etc. as mentioned above, are carried forward when the set is updated. A convenient dialogue box allows users to set up, define and manage the whole process.

Spaces 2.0 is another useful feature, for the ability to copy and paste spaces to other pages or different files, create area measurements or add hyperlinks to spaces.

Cloud+ combines the convenience of clouds and the clarity of callouts into a single tool - giving users the ability to combine clouds and callout markers. The Cloud+ markup tool, which can be accessed using a quick key ‘K’ command, draws the cloud, then prompts for the callout line for users to type in their notes. Users can also customise the appearance properties for both components, independently, and ‘to use the markup function Actions’ to add hyperlinks to text.

Another markup function allows tool set groups to be set to scale, so that, when the document is calibrated and furniture markups, etc., are created, they are automatically set to scale.

SKETCH TOOLS

Apparently a frequently requested feature, Sketch tools allows polygons, polylines, rectangles and ellipses to be drawn on PDF documents to scale, either by selecting the shape or line from the markup, placing and editing them, or by entering precise measurements in a convenient dialogue box adjacent to the sketch, which provides real-time length and angle feedback. You can get even more out of this feature, if you remember to check that the scale has been set to correspond with the scale of the drawing, found, of course, in the drawing scale dialogue box.

Talking about scales, the Dynamic Tool Set Scaler eliminates the need to manually rescale tool sets repeatedly. Markups are now automatically resized precisely and proportionately when used on documents with different scales or viewports. Grouped markups can also resize proportionally, regardless of the scale setting.

VIDEOS IN PDFS

Capture 2.0 enables users to capture and embed photos and videos into markups using Revu’s Camera tool, as well as adding image files saved on a local or network drive. Markups containing Capture 2.0 media can be found in a separate column in the Mark-ups list and exported as a PDF summary. The summary itself has also been enhanced to display images more prominently, and support embedded photos and videos as attachments.

BLUEBEAM STUDIO

Bluebeam Studio is the free cloud-based collaboration tool that most users forget about. It’s a great collaboration tool, though, allowing users to create folder permissions to control access to project files, but also to share PDF files with anyone, even if they don’t have Bluebeam, allowing users to set how long you want the file open for, or to set project expiry dates that automatically cut the project off - after, of course, notifying the rest of the project team!

And, finally, in a sort of reverse mode, Microsoft Office Export enhancements allow users to export scanned PDFs in Revu into Word, Excel and PowerPoint documents that contain editable text - to select specific page regions to output, such as a section of table columns and rows from a PDF into an Excel spreadsheet. Actually, there is more, but you could learn about that at the Bluebeam eXTreme conference to be held in London later this year - details on its website.

GET MORE FOR LESS

For a limited time only, when you purchase 4 seats of Bluebeam Revu, you’ll receive a complimentary 5th seat of Revu with maintenance. This promotion applies to all editions of Revu, including Standard, CAD, and eXtreme. The deal is only valid through June 30, 2015. Don’t miss this opportunity to get more for less! Contact Bluebeam for more information.

www.bluebeam.com
Optimum 3D Printing

You can make a rational choice and get up to £1,000 off a new Stratasys 3D desktop printer with ArtSystems’ new trade-in programme

The 3D printing market has shot up by leaps and bounds over the last couple of years, with everyone and his dog bringing out new machines, new technology and new applications, ranging from the eminently practical to the weird and whacky. Of most significance, though, is the technological breakthroughs that have made 3D printing technology easier to use and more affordable.

The downside is that you have to scrutinise what’s coming on the market more thoroughly, look at the pros and cons of some of the devices, which use techniques that might seem very cost effective, but have side issues, in terms of performance and the work that needs to be done on the object once it is removed from the machine. Meanwhile, at the other end of the scale, the comparable performances of the first generations of 3D printers now coming to the ends of their lives can’t match the capabilities of current mid-range professional 3D printers - and that still cost an arm and a leg to run.

Architectural model-making is an ideal application for such technology, but, like wide format printers and scanners, the equipment involved is ancillary to the main role of creative architects and designers, and must, therefore, be efficient, easy to use and thoroughly reliable. Of necessity, that means buying well-known and respected brands from knowledgeable resellers, at the best price you can achieve.

Nottingham-based ArtSystems falls neatly into place here, having just introduced a new trade-in programme that gives users up to £1,000 off a new Stratasys Idea Series 3D desktop printer - a series that falls squarely into the most desirable slot - professional quality printers, at a medium price, using the latest technology and backed by a company that can advise on the most suitable model to meet your needs, demonstrate how to get the most out of it, and offer full scale back-up and support. And with regard to getting the best price, customers can simply trade in any old 3D printer in full working condition to be eligible.

Three models from the Stratasys Idea Series are included in the promotion, which is offering £400 off a Stratasys Idea Series Mojo, which prints professional-quality models at your desk, and is as simple to use as a document printer, building spot-on functional concept models and rapid prototypes in ABSplus thermoplastic. The ready-to-run Mojo 3D Print Pack arrives equipped with everything architects need to start 3D printing, including a startup supply of materials and bases, the Mojo Print Wizard and Control Panel software and the WaveWash 55 support removal system - ask vendors of bottom-end 3D printers how they clean their 3D models after they take them off the machine. .

You can get £800 discount on a Stratasys Idea Series uPrint SE, which comes with higher performance, optional dual material bays for more uninterrupted print time and CatalystEX software; and £1,000 off a top-of-the range Stratasys Idea Series uPrint SE Plus.

Stratasys are one of the world’s leading manufacturers of 3D printers and the Idea Series is their professional entry-level 3D printer range, which brings professional 3D printing to any desktop or small team workspace. The range uses Fused Deposition Modelling (FDM) Technology, a powerful Stratasys-patented manufacturing method that produces durable 3D models that are suitable for a wide range of 3D modelling applications.

Customers, moreover, can trade in any old 3D printer models, including Z Corps, 3D Systems (Cube), AutoDesk 3D, Leapfrog, Ultimaker, HP DesignJet 3D, AirWolf, BeeCreative, TierTime (Up!Print), Cel Robox and more. (Makerbot printers are excluded.)

ArtSystems is delighted to be launching this programme into a competitive marketplace. As Ted Freer, design sales division manager at ArtSystems, points out: “We’re very happy to be able to put this programme in place. Stratasys Idea Series printers offer superb performance and bring real business benefits to any user. Our promotion enables them to purchase any one of the three models included in the promotion at an even better price. We expect significant take-up of the offer.”

ARTSYSTEMS

Established in 1986, ArtSystems, the Nottingham-based specialist systems distributor and service provider, has seen significant growth in the past six years. Today, ArtSystems has a turnover in excess of £30 million, employs over 60 people and is one of the largest value-added distributors in the UK.

The company serves the design, graphics, signage and display markets with large-format imaging and printing solutions from market-leading manufacturers such as HP, Canon, Summa, Onyx and Colortrac.

www.artsystems.co.uk
STRUCTURAL ENGINEERING SOFTWARE

Today’s engineers need to do more, do it faster, and with a greater degree of accuracy than ever before. For structural engineers working on buildings, bridges and tensile structures, a comprehensive design program is needed – GSA is the right solution.

- Finite Element Analysis
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- Concrete Design
- Soil Structure Interaction
Sitting upriver from the mouth of the Clyde, and surrounded by the beautifully rounded hills of the Scottish Lowlands, Glasgow is certainly in the right place to be concerned with environmental issues. It has also earned all of the right credentials for itself, as the last time I was up there, visiting someone in a notorious part of the city which I shall not name, the area had been transformed into something quite desirable. So go there sometime and any preconceptions you have may well be demolished.

I have written about the forward-looking inhabitants of the city before - you may recall the article on Strathclyde Fire Authority - and now Glasgow City Council has come up with a couple of initiatives to drive the energy-saving process further, in conjunction with IES (Integrated Environmental Solutions, which is headquartered in the city.

The first is a new energy app that is being offered to Glasgow residents to help them cut their energy bills by making their houses - with the council's help - become more energy efficient.

**HOW THE APP WORKS**

Glasgow residents are being offered the chance to compare their home’s energy use to similar properties and get tips on how to make it more efficient. They can download a new free app from Future City Glasgow - software developed in conjunction with IES - which could help households cut their energy bills and save cash.

City residents who input information about the type of building they live in, the types of energy they use and their energy consumption will receive information on similar properties for comparison. If it shows their home could perform better, they will be able to access advice about steps they could take to improve it. Information will also be available about possible sources of grants to help fund the work.

The app can also be used by businesses to evaluate their premises. It is one element of Glasgow City Council’s drive to give people access to affordable energy, cut carbon emissions and secure sustainable energy supplies.

The council is also setting up an energy services company to foster and oversee the creation of district heating projects in the city, similar to the one at the Athletes Village - the accommodation provided for visiting athletes for the recent Commonwealth Games. That system will heat the 700 new East End homes, as well as the neighbouring Emirates Arena. The local authority already has a 3MW wind turbine at Cathkin Braes, with the prospect of more at other sites.

Future City Glasgow is also scoping vacant and derelict sites in the city to assess their suitability for use as mini solar farms.

Most importantly, data supplied by Glasgow Energy app users will help build up a more detailed picture of the type of energy used in different properties across the city and how energy efficient the buildings are.

As councillor Gordon Matheson, leader of the city council and chair of Glasgow City Council, with the help of IES, has embarked on a couple of environmental projects to boost the energy-saving potential of its citizens and notable buildings.
TECHNOLOGY focus

Future City Glasgow points out: “Despite recent reductions, energy bills still represent a major outlay for everyone, and are especially worrying for the elderly and those on low incomes. Ensuring city residents have access to affordable energy is a priority for the council. This new app will help people find out if there are steps they can take to help make their homes warmer, while cutting their bills.”

Future City Glasgow chose to work with IES to ensure the app used the latest technology. IES is internationally recognised as an expert in 3D simulation technology for making buildings and communities more sustainable.

Don McLean, IES founder and managing director, comments: “For cities to manage an ever-increasing influx of people, they must become smarter, more energy efficient and sustainable. Working with Future City Glasgow has allowed us to apply our unique technology to help the city manage its energy consumption and integrate renewables.

“We are very excited to see the results as more and more people use the app.”

ENERGY MANAGEMENT ANALYSIS

The second project was a conceptual case study that explored how analysis of data already available could be used to refine Glasgow City Council’s building management and energy investment strategy, and ROI targets.

The buildings selected were: Glasgow City Chambers; Exchange House; Collegelands; Riverside Primary School. IESVE models created at design stage were used to run scenarios, modelled by incorporating AMR (Automatic Meter readings) and BMS (Building Management Systems) data. The project began in July 2013 and was completed by August 2014.

Data availability was an obstacle, with 90% of the available data to IES being AMR data and 10% BMS data. With the AMR data, gaps existed and had to be overcome. To do this, IES consultants intelligently filled the gaps with suitable data - i.e., data from the same month, but from the previous or subsequent year. The consultants extracted the AMR data from the platforms provided by the utilities companies and uploaded it into the IES SCAN technology.

BMS data collection was also challenging. At best, only 7-10 days’ worth of data was being stored. To work around this, IES set up a recording system for the BMS data.

One of the biggest tasks was in taking all this raw data and converting it into a consistent universal format that ironed out inconsistencies across time steps, frequency, data gaps, naming conventions and units etc. IES used proprietary algorithms and its unique SCAN technology to achieve this.

A key finding was that BMS installations are being massively under-utilised by facilities managers. Currently, BMS systems are being used primarily for plant control and basic fault detection, and this project showed just how much data was available, but was either not being logged at all, not stored for any length of time or not being used for analysis.

It also demonstrated how powerful data could be where there is a robust framework of data collection upon which advanced analytics can be performed.

The potential for analysis extends across the building systems functionality, including relationships between indoor conditions and equipment performance, occupancy periods, and seasonal weather variations.

By doing this, IES proved the energy investment strategy and ROI targets were possible. Annual cost savings for this group of buildings would be a substantial £85k, therefore 3-5 year paybacks are readily feasible. Follow-on projects will include a review of BMS specification within both a new build and refurbishment project. Also, a high-level AMR study in the Education Estate will take place to support development of a coherent BMS strategy. If you are a Glasgow resident, you can download the Glasgow Energy app for free from www.glasgowenergyapp.org, the App store and Google Play. You can also find out more about Future City Glasgow at http://open.glasgow.gov.uk.

www.iesve.com

March/April 2015
Product licensing can become a bit of a minefield, so, in response to requests from customers, Graphisoft has introduced a simplified and more flexible licensing system for its BIM presentation app BIMx. There are now just three options - available from the Apple Appstore or Google Play. BIMx, the option recommended for clients, is available free of charge, allowing access to 3D building models in BIMx format. Besides the 3D content, basic BIMx includes a Stereo Mode, Gravity, Floor-plan cutaways, Egress Recognition and the Cloud connection.

The basic app can be upgraded to BIMx Pro, recommended for architects, which provides access to both the 2D and 3D content in BIM projects (Hypermodels - linked to 2D documentation) and allows access to any number of full BIMx projects on one device. Other capabilities include all-round 3D Cutaways and 2D in the Model Context. The additional features do come with a small charge.

For a similar sum, Graphisoft will give users access to BIMx Model Sharing, an in-app purchase option, which allows BIMx Pro customers to make BIMx hypermodels available to any number of their clients without time limit.

Sharing hypermodels with project team members or clients is straightforward. From the model, an email is sent to either, giving them the code to access the hypermodel. For team members, who presumably already have BIMx installed, the app asks which device they want the model downloaded to.

Clients, on receiving an invitation from the architect to view a 3D model of their project, are given the appropriate link to, first of all, download BIMx onto their device. Once that had been carried out, they can then use the access code for the 3D model, provided on the original email. They will find, however, that they now have access to the complete hypermodel - the full 2D/3D documentation set.

With BIMx capabilities to hand, they can navigate through with the same facility as the architect and comment on the design, bringing up 2D plans, 3D models, photographs, check specifications and being able to peruse any other associated documentation - and send questions and observations to the architect using the inbuilt BIMx messaging system.

BIMx is an award-winning application from Graphisoft, providing advanced viewing capabilities for both Apple- and Microsoft-based devices. With cloud-based data transfers and synchronised updates from the model site, it gives architects and clients quick and direct access to small- and large-scale building projects. In fact, when typical construction documentation amounts to hundreds of pages, viewing large layout books will be immeasurably quicker than being faced with having to upload and print PDF versions.

Working with 2D and 3D simultaneously is also made easy in BIMx Pro, with smooth transitions between both dimensions and context-sensitive information overlays. Context sensitive hyperlinks, similar to those used on the web, also make navigating models easier, with 3D cutaways making virtual cuts through buildings using interactive sliders to ensure model detail is even more accessible and understandable. And you can go one step further by taking interactive 3D tours of a building model! Using Zeiss OLED stereo glasses, you can undertake complete immersive 3D experiences in BIMx. BIMx is just as useful, therefore, for presenting ideas to clients as it is for collaborating with project team members.

Deciding which version to use has been made that much easier. Says Akos Pfemeter, vice president of marketing at Graphisoft: “By simplifying the licence options available and following naming standards in the Appstore, our users will better understand whether to choose the FREE version or the paid PRO version. The best news,” he adds, “is that, even with paid licences, the purchase decision boils down to the following very simple decision: all models on 1 device OR 1 model on all devices - for the same low price.”

www.graphisoft.com
There's never been a better time to buy a professional desktop 3D printer from Stratasys

With the new Stratasys Trade In, Trade Up programme you can get up to £1000 off the professional Idea Series 3D desktop printers. All you have to do is trade in your old 3D printer, and as long as it's in full working order you can get:

• £400 off a Stratasys Idea Series Mojo
• £800 off a Stratasys Idea Series uPrint SE
• £1000 off a Stratasys Idea Series uPrint SE Plus

You can trade in any 3D printer models including: Z Corps · 3D Systems (Cube) · AutoDesk 3D · Leapfrog · Ultimaker · HP Designjet 3D · AirWolf · BeeCreative · TierTime (Up!Print) · Cel Robox and more.

It all means that these superb Stratasys 3D desktop printers are now an even better buy than before!

Want to know more? Then call the ArtSystems Design Team now on: 0115 938 0399
email: marketing@artsystems.co.uk  www.artsystems.co.uk
Cidon Construction finds that Tekla empowers the company to win more business by enabling it to both make - and keep - its promises

“...Adopting Tekla enables us to take a much simpler and leaner approach to our business, ensuring that we are always offering a high quality, dedicated service”

“You’ll deliver it when?” A common enough question when asked by customers, expecting suppliers to give a straight answer, not noticing the crossed fingers behind their backs. UK-based reinforced concrete contractor Cidon Construction, though, having recently adopted Tekla model-based software, has found that it can make promises to deliver projects quickly, efficiently and reliably for clients...and stick to them. This successful integration has led to a significant uplift in work won, estimating costs halved and has led to the software paying for itself in just six months.

With a company ethos that is rooted firmly in providing the very best customer service, it is vital that Cidon Construction operates as efficiently as possible to be able to deliver the high quality service its customers have come to expect. By choosing to integrate Tekla Structures 3D modelling software into its operations, a more intelligent way of working has successfully been achieved.

Ciaran Donnelly, managing director at Cidon Construction, comments: “We are completely accountable to our customers; promises have to be delivered and, in order to do that, we have to work smarter and bring efficiencies to all areas of the business. The consequences of not performing efficiently are too great, as they can result in significant time and cost delays to the project. Adopting Tekla enables us to take a much simpler and leaner approach to our business, ensuring that we are always offering a high quality, dedicated service.”

Tekla’s purpose-built solutions for concrete construction can be used at any stage of the design and construction process, with easy-to-use tools to create concrete models that behave like real concrete, meaning that what is actually created in the model is also accurately created on site.

Ciaran explains further: “We required a simple-to-use software model that could be accessible to everyone within Cidon and the wider supply chain. Tekla’s 3D software ticked the box for us, as it can easily be adapted for each individual project, it’s incredibly user-friendly and highly sophisticated to keep everyone informed, as the model can be shared freely across different companies.”
For concrete contractors, having an accurate 3D modelling system delivers benefits at every stage of the construction process and this is where Tekla software leads the way, as it serves the whole concrete construction workflow. From initially creating accurate 3D models, which are used to organise, plan, estimate and efficiently prepare to pour, to taking the model on site to pour the concrete, contractors can have complete confidence in the entire process.

Additionally, the software is capable of producing highly detailed schedules and drawings, combined with the ability to precisely build and visualise large quantities of material, further aiding accurate forecasting and project understanding.

Due to all the information being recreated in 3D perspective, it is easier to adapt to any changes in design, highlight any possible errors and avoid any potential difficulties in the overall build.

"By using Tekla software, our estimating costs have been halved. We are a lot more selective on tenders, as we now have the ability to submit high quality bids quickly and efficiently, resulting in our tenders versus secured work up by a factor of 2.5 from one in 10 jobs to one in four," continues Ciaran.

"Ultimately, the software has given us the flexibility and the confidence to offer a highly credible, efficient and competitive service to our customers, which is completely in line with Cidon’s company ethos.”

**MODEL, PLAN AND POUR 3D CONCRETE**

Tekla's concrete modelling software for concrete contractors enables them to preconstruct, or build accurate 3D models with all of the turndowns, pile caps, stepped slabs and other details that they need for construction, whether they start directly within the Tekla modelling process or from imported construction drawings, or using models from other applications.

Once the model has been created, they can begin to plan the construction process, using the software’s production planning tools. Being able to visualise the process, sequence pours and pour breaks makes them easy to set up, using the model.

Contractors can also use it to get organised, so they know for certain how much, when and where they are going to use concrete, formwork and rebar.

The model can also be used to generate accurate quantities more quickly, allowing concrete contactors to respond to bidding requests faster, and, because all of the information is contained within the 3D model, any changes in the bidding process will enable them to update figures instantly. And, of course, using the same model for bidding and production means that estimates are rooted in solid planning information.

Tekla’s concrete modelling also includes tools for rebar planning, enabling users to model and visualise large amounts of fully detailed rebar quickly and easily, using clash detection to find and resolve faults before fabrication. Placing drawings and schedules gives site workers the ability to foresee and avoid difficulties in installation.

When it comes to actually pouring the concrete, Tekla’s Site Management capabilities manage the pours on site, while formwork teams can view schedules and see layouts in 3D. For example, users can start the process in the model and then send the points out to their total stations for accurate, easy layout without a tape measure.

As a result, concrete contractors are able to work both more efficiently and cost effectively. Waste is curtailed, as extracting quantities and drawings directly from the Tekla model reduces the risk of ordering too much concrete, and accurate planning of rebar enables them to be delivered in the right sequence, only when they are needed, and finally placed correctly.

www.tekla.com
David Chadwick describes the free-form concept creation, using Vectorworks’ amazing set of modelling tools.

This is probably going to be a bit of a free-form article, too, on free-form modelling using Vectorworks, mainly because I am not sure where to start: with the very useful set of tools for modelling different 3D shapes that most Vectorworks users never come across or from the usual starting point where I can bring in the latest free-form modelling features. It would be best, I think, to leave the cherries on top of the icing until the end!

Vectorworks is a very comprehensive architectural design package, covering terrain and landscape design, visualisation, lighting and stage design, as well as the standard building design. It also allows users to develop conceptual design quickly, do a bit of mass modelling, and play around with shapes and styles of buildings. Although the free-form modelling tools incorporate similar features to SketchUp, extrusion and manipulation of faces, it does it in a much more intuitive and simpler way, using both parametric modelling and a history tree. Even though direct modelling is the principal tool in use, Vectorworks embeds history-based modelling into the design, normally invisible to the user, detailing how the building was built. Users can tap into the history tree and make changes that modify the design, whilst retaining its parametric constraints.

FREE FORM STARTING POINT

But back to the beginning once again. Start off by drawing a series of rectangles and trim them to create a typical floor plan. Create an offset inside the outer polyline to produce a 2D representation of walls, and then switch the view to isometric and extrude the walls to produce a 3D model. Using Vectorworks automatic face selection, you can click on and draw on any face, and then extrude that shape to create openings for doors, windows or to add further solid shapes.

A neat feature here is the ability to select faces you can’t even see, behind the model, just by holding down the alt key, and replicate a bit of modelling without having to rotate the model.

It’s not just geometry either. Clicking on an element brings up its dimensions, allowing its volume to be calculated, to be used, for instance, as a guide to concrete requirements or for outline material costing. As models become more complex, another couple of Vectorworks tools can be brought into use - the Clip Cube, for example, which can be used to isolate parts of the geometry and X-Ray Selection Mode that follows the cursor over the rendered model, showing the wireframe design behind the render. This allows elements within a model to be isolated and selected, without turning off layers.

Another time saver: having carried out the above, elements can be selected and copied to another part of the model. The history tree, having recorded each design process, allows the steps inherent in that element to be applied elsewhere in the model, but constrained by and conforming to the local geometry. This is easily accessed by double-clicking the model.

THE FUN STARTS

Instead of extruding a representation of walls, filleting or chamfering the extruded 3D shape and then hollowing it out using...
the Shell tool allows more interesting shapes to be created, without losing the ability to select and modify each of these shapes, including the fillets. The Shell tool, along with a couple of other complex tools, however, blocks the history tree. This minor inconvenience can be circumvented by bypassing the steps and restoring the history after shelling.

Then we come across the Deform tool. Create a 2D hexagon, for example, and then extrude the shape to produce a tall structure, which can be tapered and given a twist! An axis is created across the topmost face of the tower and rotated. We’ll play about with each of the faces in a minute. But first of all, imagine using the software like a pastry cutter - creating a rectangle with some thickness to it, like a wall, and drawing a series of polygons on it. Right clicking on the Clip Surface Command removes the polygons from the surface, creating a patterned fascia wall, allowing a glass texture screen to fill the openings.

The wall can then be bent into a curve, using Vectorworks Deform tools’ bend capabilities to anchor one point, and select the other to drag into the required curve, going back to the regular tools to combine both curved wall and glass as a solid.

**NURBS SURFACES AND SURFACE ARRAYS**

Going back to our twisted tower, the faces created are NURBS surfaces - ie, they are complicated curved surfaces that curve in more than one direction. Using the Surface Array command, these profiles can be extracted and used to create an array - of windows or other facade feature - with the ability to specify the number of elements to be created as individual smaller NURBS surfaces to optimally fit the original NURBS surface. This is a complex process, which with the Vectorworks new 64bit conversion tools can be dynamically edited very quickly. Going yet further, the NURBS surfaces can be converted to mesh arrays - another feature that drops out of the history tree, but which can be bypassed - to build up extremely complex facades. And, having created your fancy tower, all can be exported as IFCs for conversion into construction models.

**THOSE HIDDEN TOOLS**

Besides the Basic Draughting and the BIM modelling tools palettes, Vectorworks provides a Free-Form modelling palette, which includes some basic shapes.

The palettes are, of course, entirely customisable, allowing users to select or discard those most frequently or seldom used to hone the software. Elsewhere, however, in the Solids palette, which is hidden until added to the standard workspace, there are a number of basic 3D shapes - box and cone objects, paraboloids, ellipsoids and torus objects etc, that can be dragged into the Free-Form tool box and used as the starting point for some serious free-form modelling. As all of these elements, comprising shapes that are usually quite complex to model, are parametric, they can be modified using the same free-form tools, NURBS, Surface Arrays and Deforms, as our initial hexagonal tower.

Jonathan Reeves, who was kind enough to demonstrate the capabilities of each during the extended demonstration that I had in his architects studio at Ilfracombe, described the set of objects as a bonus on top of an amazing tool set for Free-form modelling. Like the architectural Lego I saw in Jonathan’s studio, the free-form tools are fun to experiment with - he uses them to pass the time on a train journey and to explore the possibilities inherent in the software. “Free-form design,” he says, “all stems, initially, from simple 2D shapes. The tools that Vectorworks provides gives users almost unlimited scope to extend those shapes.”

Jonathan Reeves is an award-winning architect and Vectorworks specialist reseller, who also provides professional Vectorworks 3D BIM Training and Consultancy.

He is currently working on a book on Innovations in Vectorworks BIM, to be published later this year.

[www.jra-vectorworks-cad.co.uk](http://www.jra-vectorworks-cad.co.uk)
Asta Powerproject and BIM

Asta Powerproject hones its capabilities in Version 13, whilst providing access to the application’s BIM version and 4D planning.

Project or portfolio management is a well established tool, enabling companies to manage tasks and resources within a building project more effectively. Enhancing the software’s capabilities therefore, at this stage of the game, depends more on listening to users of the software, and making additions and improvements to the way they use the software, rather than dramatic innovation. Having said that, the only real game changers are the ability to take advantage of mobile technology and the inclusion of BIM capabilities. The Version 13 release, therefore, comes with some useful enhancements to its core Project Management application, the popular and widely used Asta Powerproject, and also access to Asta Powerproject BIM, which combines 3D planning and scheduling in one application to give users an affordable entry into 4D planning - complete with 3D model representation for visual confirmation of project development.

The two main parts of project development concern the handling of project resources, a euphemism, perhaps, for those employed on the project, classified by their skills, which are allocated to different cost centres, and the tasks upon which they are employed. The relationships between each are recorded in both chart and spreadsheet format, the former to provide a rapid tool for evaluating the progress of a project over a period of time, and the latter to tabulate, quantify and calculate the state of the project, in terms of cost and other, similar factors.

VERSION 13 ENHANCEMENTS
One of the first enhancements that you come across in Asta Powerproject Version 13, is the ability to allocate resources or costs on a non-linear basis, reflecting the fact that neither of them always remains constant throughout a task, but can fluctuate or occur sporadically. Version 13 allows project managers to plan non-linear assignments by breaking down tasks into discrete segments or points, each of which defines a percentage of duration and a corresponding level of allocation. The resulting resource curve reflects the different levels of resources, effort, quantity and cost throughout the duration of the curve. Permanent resource allocations can also be used together with individual allocation profiles - like a resource curve, but applicable to just one individual; and consisting of a number of discrete segments, each of which defines a duration and level of effort.

The advantage of such a distinction is that, instead of breaking down tasks into shorter time scales to reflect the different allocation of costs and resources, complete tasks can be accommodated in their entirety, simplifying the accumulation of cost and other data.

Resources can be actual for planned or real assignments on a daily, weekly, monthly or quarterly basis, providing period-by-period work plans for resources, as well as a retrospective view of actual effort, and can be used to compare cost centres in different projects.

RESOURCE ANALYSIS BY SKILLS
In the same way that resource allocation can fluctuate, resources can come multi-skilled. A resource can be categorised as available for one skill at, say, 60% of the time, and for 40% of the time with a second skill. Version 13 enables the availability of resources of resources as a whole, and also the availability of resources under each skill.
Complications can occur, however, if one or more permanent resources are multi-skilled, and resources allocations have been made under a second skill, whilst you are attempting to allocate someone as using their first skill. This could lead to a warning of over-allocation of resources.

In order to counter this therefore, Asta Powerproject can be configured to take into account only permanent resource allocations that have been made under the same skill.

**RESOURCE ANALYSIS BY COST**
Within the spreadsheet, the type of cost can be specified more accurately - the cost of pending allocations only, scheduled allocations only, fixed costs only, and so on. A new Cost Type field has been added to the Table Definition Properties dialogue box that allows users to specify additional cost types.

**TASK CHART CREATION**
A number of enhancements have been made to the task chart, making it easier to both lay out, and to summarise, the information on complex charts.

First of all, tasks can be linked automatically whilst they are being created, using the Link Tasks Mode, or as they are selected one-by-one in the bar chart, whereas previously they had to be drawn individually.

Another enhancement allows users to ‘neck’ or ‘pinch’ summary tasks and hammocks to show where subordinate tasks are located. Hammocks group sub-tasks that are not related in the hierarchical sense of a Work Breakdown Structure - i.e., they are not logically related in a task dependency state where one task waits for another, but do ‘hang’ between two end dates - a sort of abstract grouping of unrelated items, which can be summarised on one line, showing the position of each, perhaps as an aid to providing periodic reports, or even to define the overall project management task itself.

Necking or pinching is merely a term to show where each subordinate task is placed within the summary, or hammock-pinched where there are no tasks, and normal height where there are.

Staying with tasks for the moment, unique task IDs can be renumbered within the current view, or in a selection of tasks, reflecting, perhaps, the need to re-order them in the sequence in which they are to take place; or the order in which they are to appear in the bar chart. Alternatively, a series of tasks can be located using an alphanumeric string, replacing it with an alternative string.

**ACTUAL & CONSTRAINED EVENTS**
Start and Finish fields representing actual dates or dates constrained by a start or finish flag can now be configured and highlighted within the spreadsheet, providing a more convenient way of seeing which dates are actual or constrained, without having to display the Actual start, Actual finish, Start constraint date and Finish constraint date fields in separate columns in the spreadsheet.

Other enhancements relate to additional access rights, the ability to apply default appearances to different types of tasks, and default codes to resources and cost allocations and allocation groups, and numerous others that improve the use of and usefulness of the application.

**ASTA POWERPROJECT BIM**
Asta Powerproject Version 13 provides access to Asta Powerproject BIM, allowing users to create a flexible 4D enabled planning platform, using the ELECO BIMCloud to share information.

This allows users to directly create project plans from IFC4 model files by dragging and dropping objects between the 3D view and tasks. It also uses structured templates with predefined searches to automatically link to the IFC model objects.

The end result is a planning tool that allows users to compare ‘planned’ and ‘actual’ schedule; plans with full 3D visuals, and to create and play ‘time-lines’ of a project linked to milestones and baselines within the project. Larger projects, meanwhile, can be viewed through snapshots for setting up quick navigation through the project.

All of the standard tools for model visualisation, the hiding and viewing of objects and graphical formats for viewing or site reporting on projects are available, including the ability to use the model to prepare tenders and manage progress in 3D, and even to import costs from estimating applications that support the IFC4 file format.

To find out more about Asta PowerProject 13 and how to add Asta Powerproject BIM to your management tools, contact Asta Development at:

www.astadev.com
A challenge to design a retractable roof for Rotterdam’s much-loved De Kuip stadium (The Tub or Cockpit in English) attracted ideas from leading and established structural engineering consultancies; but perhaps one of the most innovative approaches came from post-grad students who, rather than bidding for the contract, simply wanted to get good marks for their coursework. In the process, they also won the Oasys Software competition for the most innovative use of its software in the Academic Structural Engineering category. Sadly, the stadium is still without a new roof, and the fate of the project lies in the hands of the financial wizards who must try to make the project stack up. Perhaps, by the time it comes back to life, Oasys’ winners will be in a position to be part of a real, commercial bid project team?

Students Ruud van Kippenburg, graduating in Innovative Structural Design, and Simon Cox, similar for Concrete Structures, both from Eindhoven University of Technology, prepared a paper describing the study of a new roof design for the stadium, maintaining the same philosophy as the original stadium, comprising a lightweight cable structure, instead of a superstructure with large rigid elements.

They have come up with a unique design where, in contrast to most closable stadiums, the roof is closed by sliding the membrane from the outside - a permanent roof structure - to the inside, obviating the need for large elements in the middle of the stadium. The closing membrane with six segments rather resembles the iris aperture of a camera; an innovative feature, however, for a roof.

There are two main elements to the slightly oval roof: an outer, permanent roof and an inner retractable one. The outer consists of a lightweight stressed cable structure, with two inner tension rings and an outer compression ring. The inner roof uses the two tension rings to support six radial pre-stressed cables trusses, which in turn support the movable roof membrane.

LOAD CASES
To maintain the same elegant and smooth design of the Kuip Stadium, the roof had to be similarly lightweight. A number of analyses and considerations had to be taken into account through time constraints ruling out the assessment of more than one snow and two wind load cases.

The pair were aiming to keep the maximum deflection below one hundredth of an elements length and, to prevent vertically instability, no relaxation was permitted in any of the cables. The form-finding calculations for the cable roof structure were started with one secondary inner cable, increasing the complexity of the structural model with each study. Cable sections were determined for 68m secondary inner cable trusses by initially splitting the upper cable into 10 elements, freezing the deformed cable loaded by a triangular pattern, after it had been pinned on both ends and then mirroring the node co-ordinates to create the geometry of the lower cable.

To satisfy structural requirements, force densities (pre-stress) and snow loads were applied. This provided force distribution due to self-weight pre-stress affects. Cable sections could then be determined, based on the maximum force present.
THE MAIN CABLE TRUSSES
The six main inner cables were first modelled independently to get their vertical curved form. Pinning the end supports at this stage allowed the vertical geometry of the main cable to be determined, while ignoring complications from the movement of the supporting outer roof. The pre-stress in the main cable is directly related to the pre-stress of the secondary cables and on the structural requirements of the model, and the cable sections determined likewise.

The second study established that no relaxation occurred in the governing load case and that the largest relative deformation occurs with wind under pressure. The model was then extended to include three main cables and 6 x 9 secondary inner cables.

SECONDARY CABLE TRUSSES
The radial cable trusses were then form-found with the lateral secondary cables to get the curve on plan. Once this was resolved, the outer roof’s tension rings and radial cables were added to the model simultaneously, taking 2 factors into consideration - where the radial cables shape and stress the tension rings, and where the strong radial cables transfer the load of the main and secondary cables to the pinned supports. After determining the required pre-stresses in both systems, they are added together to calculate the total structure.

Fine-tuning and the increase of the system length to 246m required the pre-stress in the subsystems to be increased to meet maximum deflection requirements in the inner retractable roof - a significant factor in its deformation, and which was increased until requirements were met.

The outer pinned supports were then removed, to be replaced by a compression ring globally supported in both its horizontal and vertical direction, but which can change shape in the horizontal plane, the dimensions of which were determined by strength requirements and the influence of the deformation ring on the deformation of the cable structure.

All in all, a remarkable structure, owing its strength to the tensions between the main elements. The lack of relaxation in the secondary cables is a vital element in the design that gives the structure ‘backbone’ against which the pre-stress and wind deformations can occur.

OASYS GS
Ruud and Simon used Oasys GSA Suite for their analysis on the Kuip Stadium roof. Described as the essential tool for anyone designing tensile or gridshell structures, GSA is increasingly the software tool of choice for aesthetically driven projects - which, these days, means virtually every project. By taking care of form finding and fabric analysis, this ingenious software finds the optimal geometry for a structure and leaves designers free to pursue new ideas like the closing membrane of this concept.

GSA solves two of the core challenges of current design thinking and building with modern lightweight materials: how do you make tensile structures the right shape to resist applied loads or cope with highly non-linear fabric materials? In the latest release, geometrically non-linear shell elements can accurately model deflection and rotation problems such as those that occur where nonlinear elements, such cables and beams, interact with concrete walls and steel plates - the anchor points for the main and secondary cables, perhaps, in the Kuip Stadium model. Curved and explicit members, also a feature of this Kuip stadium design, deal with a wide variety of complex shapes.

User friendliness is another key attribute of all Oasys software. Interfaces are intuitive and, in GSA 8.7 mesh generation, a complex, time-consuming but unavoidable part of finite element analysis, is streamlined by an enhanced mesh generation engine and new analysis tools.

All Oasys software is available to try free for 30 days: www.oasys-software.com

CASE study
Sue’s back! We’ve taken a peek at SUE before - Subsurface Utility Engineering - but here’s another way of keeping track of underground assets.

Digging a trench and dropping a couple of cables or drain pipes in is the favoured way of keeping town and country uncluttered by services. We have big arguments going on locally, for instance, as protesters fight to bury the transmission of power from Hinckley point, instead of distributing electricity through a network of massive pylons - the cheaper option.

The cheaper option is also the cheaper option when it comes to maintenance and repair. Underground assets - gas, electricity, water, fibre optics - may be out of sight, but are always located under someone’s real estate; could well cross or run side by side with other assets; and involve high risk and cost when excavating them for repairs or upgrades.

Add to that the fact that civil engineers have been laying down such assets for a hundred years or more and that the documentary evidence of their efforts is either lost or sketchy; and even modern assets, once laid and tarmacced over a couple of times, may be difficult to locate, if they are made of plastic or fibre optics, and you have a situation that cries out for some high-tech solution.

Did you know that there are four levels, A to D, for the collection and depiction of subsurface data, the highest of which, A, is called ‘Daylighting’, the precise vertical and horizontal position of the underground utility, along with the type, size, condition and, of course, material and other asset characteristics?

Such underground assets can be found using a number of methods: Passive RFID (with or without GPS), GPS, geo-tagged photographs, engineering survey methods such as GPR and textual or documentary descriptions. Each system has its own validity and usefulness appropriate to the quality of information required. Less critical areas of infrastructure, for instance, could simply be recorded by geo-tagged photographs.

Besides keeping up-to-date records on the location and maintenance of assets, knowing about them has other benefits - the reduction of accidental damage during subsequent site work, minimising health and safety risks for on-site workers and the disruption to local communities, the reduction of traffic congestion - and the increase in profitability of works via improved pre-site planning, more targeted excavations and fewer dry digs.

Here’s another nice acronym for you - DIRT (Damage Information Reporting Tool), which recorded a 10% increase in underground utility damage between 2011 and 2012 in Canada and America.

ALTOSUE

There is very little that can be done about the legacy of pipes, cables and conduits left by our ancestors, if there is no evidence of its existence. New installations, however, and anything subsequently dug up, can be kept track of using the latest technology, which goes beyond merely recording the location of the asset, but links it to spatial data and other management systems to provide a whole-of-life record of its existence. Such a solution is provided by Altoity Solutions.

Altuity Solutions releases new cloud-based SUE product AltoSUE, which provides lifecycle location information for underground assets.

AltoSUE enables users to accurately tag and record attributes on installation, such as asset type, depth and material, capturing additional information via a photograph and then uploading and viewing the asset alongside others within complex underground networks on maps or site plans, reducing the risk of service strikes, while improving site safety.

Altuity Solutions is a cloud-based asset management software provider, which has just announced the availability of the new Subsurface Utility Engineering (SUE) solution. It uses highly accurate 3M Radio Frequency Identification (RFID) markers,
GPS and geo-tagged imaging, and makes invisible underground assets visible. The solution is targeted at owners, contractors and workers in the construction and utilities sector - or any organisation that lays underground assets that need to be accurately recorded before being handed over to a site owner.

The passive RFID tags used are all the same type, operating on one frequency and eliminating complexity for onsite operators. The unique key of each tag is read and data about the asset recorded via Site-Track™ operating on a tablet or smartphone that connects to AltoSUE. An RFID locator enables the operator to get within a spade's width of the asset. Site-Track uses the RFID’s unique key to query AltoSUE - displaying information such as the asset’s attributes, photographs and other associated records. Photographs taken at the time of installation or repair, prior to reinstatement, effectively ‘open up’ the ground beneath the operator’s feet.

**ALTO SUE GEOSPATIAL CLOUD**

Data stored within the AltoSUE geospatial cloud database utilises maps and site survey plans to provide an enhanced visual location of assets - a detailed backdrop for underground assets to be recorded against.

Resolution and scaling differences between a site survey plan and a map may require adjustment for the system to show an asset’s correct location on the plan and on the map. AltoSUE manages this translation for users, allowing an asset’s real world position to be shown on a tablet or smartphone, helping with proximity searches.

3D models from CAD packages form another type of data that add value to the repository of underground asset data. However, this data should be treated with caution, as it often represents the ‘as designed’ state and not the ‘as built’ nor the subsequent ‘as maintained’ states. The industry is still working towards pragmatic and cost-effective solutions to the challenge of using 3D models and keeping them up to date throughout the lifecycle of an asset.

Building Information Modelling (BIM) is coming of age and will improve the use of models throughout the lifecycle of an asset and remove data silos that currently exist. However, it is already possible to access such 3D models on site where they add value to the data that a worker needs. For example, AltoSUE enables models to be displayed via a browser.

Accessing these data sources on site provides significant benefits, in terms of helping to reduce damage caused by accidental strikes, and provides greater confidence that the onsite team knows what lies beneath their feet, thus reducing accidents.

Works are less likely to suffer from delays and there will be fewer dry digs, reducing costs and improving profitability.

Placing the AltoSUE solution in context, Steve Voller, founder of Altuity Solutions, explained: 'AltoSUE is different from other SUE solutions, in that it provides a cost-effective way to record 'as built' and 'as maintained' information about underground assets using integrated hardware and software. AltoSUE uniquely uses map and CAD site plans as the background to view data, and combines this with the ability to record underground asset locations using a variety of techniques - rather than a 'one size fits all' approach. We've placed huge importance on ease and simplicity of use to ensure AltoSUE's acceptability by back office and onsite workers.'

RFID tagging is not a new technology, but is rapidly gaining ground as a method of transmitting information over short distances - from its use in subsurface utility engineering to, even, Oyster cards and cashless debit cards. It's an easy step, once the asset has been located, to link the information to corporate GIS and management information systems or, alternatively, to go on site and dig out the information on what is under your feet using mobile technology - laptops, tablets and so on.

A final word from Steve Voller. "The AltoSUE geospatial Cloud database is hugely beneficial when multiple contractors or sub-contractors are involved in a project. Having shared access to highly detailed representations of underground assets can reduce the risk of service strikes that result in delays, injury and potentially even a fatal accident."

Altuity Solutions' tiered pricing options for AltoSUE allow businesses to only pay for the functionality needed - taking out a subscription for a licence from either three to 12 months.

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BIM Toolkit

Time for BIM users to go it alone - with the help, of course, of NBS and its new Digital Toolkit, providing a free Digital Plan of Work

You can’t say that BIM hasn’t yet fully permeated the consciousness of the construction industry. The BIM Task Group, with the encouragement of the Government, has spread its message far and wide, and you would be hard pressed to find anyone who hasn’t heard the message at least three times, been told to ‘look into it’ by the firm’s principals or is not actively engaged in implementing parts of it themselves.

With no more than a year left before companies running Government contracts must include BIM Level 2 in their working processes, it’s time for them to stand on their own two feet, with the BIM Task Group bowing out gracefully and leaving the day-to-day running to others.

One of those ‘others’ is NBS, which has been awarded a Government contract from the BIM Task Group, in association with Innovate UK, to undertake the development of a Toolkit for BIM. Hence the April release of the new BIM Toolkit, which will be accessible online, and which will offer users a Digital Plan of Work tool and new unified classification system, creating much-needed synergy in building projects.

Of course, with a project of this magnitude, it was important for NBS to assemble a high-performing team. Therefore, in addition to the company’s technological in-house expertise, it sought specialist assistance from several other BIM-focused organisations.

DIGITAL PLAN OF WORK

It might be ‘hands off’ for companies now, but the BIM Toolkit will provide step-by-step support to define, manage and validate responsibility for information development and delivery at each stage of the asset lifecycle, in preparation for the Government-mandated use of Level 2 BIM on all public sector projects by 2016.

The Digital Plan of Work is a free tool specifically designed to enable the project leader to clearly define the team, responsibilities and an information delivery plan for each stage of a project - who, what and when - in terms of documents, geometry and property-sets. For the first time, the Digital Plan of Work will unify data and product descriptions.

To start a project using the Digital Plan of Work, the user simply creates an account and logs in, together with his or her colleagues - the project can then be shared with each member of the project team. It’s as simple as that!

A NEW CLASSIFICATION SYSTEM

The Digital Plan of Work will be intrinsically linked to a new pan-industry classification system, based on an extended version of Uniclass, building on the work that NBS has already carried out over recent years under commission from the Construction Information Committee (CPIC).

The industry will have a unified structure, providing mapping and guidance, so that objects can be configured at a project level to have the correct multiple classifications where required.

Some 5,000 templates will be developed, setting out guidance for Levels of Detail (LOD) and Levels of Information (LOI) for construction objects.

Initially, these will be spaces, systems and products for architecture, building services, structural engineering, landscape design and civil engineering. These will be freely available online, and will also be accessible in both IFC and Microsoft Excel format. They will form the ‘construction language’ that all project teams can use to define their information exchanges for a particular stage of a project.

The Digital Toolkit was a highlight of the NBS-curated BIM programme at this year’s Ecobuild, where attendees were given an early opportunity to preview and comment on the development of the government-sponsored BIM Toolkit.

Daily BIM programmes featured live demonstrations, as well as seminars with David Philp, head of BIM Implementation at the Cabinet Office, and Stephen Hamil, head of BIM at NBS.

Commenting on the event, Stephen Hamil said: “This free resource will guide users through the construction process and, at Ecobuild, we had users getting a first look at the Toolkit, and got some feedback on how we can continue to develop and improve the software.”

A BIM DAY OUT

A host of other BIM-related topics featured throughout Ecobuild’s three days of workshops, case studies and talks, with representatives of NBS and RIBA Enterprises, industry experts and leading authors. Masterclasses, led by technical experts such as Dale Sinclair, director of technical practice at AECOM, also featured prominently in the programme, while Mark Bew, chairman of HM Government’s BIM Task Group and Steve Lockley, professor of building modelling at Northumbria University, alongside Richard Waterhouse, CEO at NBS, spoke about BIM Beyond 2016, focusing on the next steps.

A range of current hot topics were covered - from the latest research on BIM, to the new pan-industry classification from NBS, to the next generation of BIM users. In addition to the programme of seminars, attendees had the chance to take part in 1-to-1 discussions with industry-leading experts, technologists and consultants at the BIM Genius Bar, where ‘genii’ covering all aspects of BIM answered questions throughout the duration.
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