BIM and the Surveyor

- Coordinate systems,
- measured surveys for BIM,
- total station for BIM,
- as-built surveys,
- setting-out
Outline

- What is a BIM
- What does a BIM do
- Why use a BIM
- BIM Software
- BIM and the Surveyor
- How do they relate to us in the Surveying and Spatial industry
- LISTECH Neo – The surveyors interface to BIM
What is a BIM

The US National Building Information Model Standard Project Committee definition:

- Building Information Modelling (BIM) is a digital representation of physical and functional characteristics of a facility.

- A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle.
What is a BIM

Design
Model
Build
Maintain
Currently building design works with 2D plans and 3D CAD systems - (position and elevation).

BIM extends beyond 3D with:
- time (4D)
- cost (5D)
- Plus more…

In a BIM project:
- The professionals involved are able to access virtual information to allow data to be transferred:
  - from the design team
    - (architects, landscape architects, surveyors, civil, structural and building services engineers, etc.)
  - to main contractor and subcontractors
    - (surveyors, civil, structural and building services engineers etc.)
  - to maintenance / refurbishment
    - (architects, landscape architects, surveyors, civil, structural and building services engineers, etc.)
- It goes beyond the planning and design phases, it extends throughout the building life cycle.

Efficient communications + Fluent transfer = Integrated workflow and a better finished product
BIM Dimensions

3D – Model
  • Walk throughs
  • Clash detection
  • Visualisation
  • Virtual modelling
  • Prefabrication

4D – Time
  • Construction planning & management
  • Schedule visualisation

5D – Cost
  • Take offs
  • Real-time cost estimating

6D – Sustainability
  • Conceptual energy analysis and tracking

7D – Facilities Management
  • Life cycle strategies
  • BIM As Builts
Why use a BIM...

Current figures show:

- 20% reduction in build costs (buy 4, get one free!)
- 33% reduction is costs over the lifetime of the building
- 47% to 65% reduction in conflicts and re-work during construction
- 44% to 59% increase in the overall project quality
- 35% to 43% reduction in risk, better predictability of outcomes
- 34% to 40% better performing completed infrastructure
- 32% to 38% improvement in review and approval cycles
- 80% of a building's total cost in its lifecycle is maintenance
- To collect data on a building is 8 x more expensive after construction
Software designed specifically for BIM include:

- Bentley AECOsim Building Designer
- ArchiCAD
- Tekla Structures
- Autodesk Revit
- VectorWorks

*These packages have their proprietary data formats.*

Non-proprietary or open BIM standards

- BIM is associated with Industry Foundation Classes (IFCs) and aecXML

- IFCs have been developed by buildingSMART (the former International Alliance for Interoperability), as a neutral, non-proprietary or open standard for sharing BIM data among different software applications.
BIM and the Surveyor

Surveyor: Performs As Constructed Survey

Surveyor: Sets out Design for Builder/Contractors

BIM: Property Manager

Owner

Builder

Contractor

Architect

Engineers

Surveyor: Title Survey

Surveyor: Existing conditions / Detail Survey
Issues that Surveyors will and do encounter with BIM.

- Coordinate Systems
- Measuring with Total Stations and GNSS
  - Set out
  - As constructed
  - Creating Point Data
  - Attributing
BIM’s and the “real world”.

BIM’s a system for the management of the construction of a “Building”
- Usually on a “local” coordinate datum
- No scale factors

BIM’s now being used for larger infrastructure projects – rail, road and other such projects that are over a larger area.
- Need to work in the real world
  - Datum’s and Projections
  - Real world coordinates
Coordinate Systems Cont...

• **Geodetic Coordinates**
  In geodetic coordinates the Earth's surface is approximated by an ellipsoid and locations near the surface are described in terms of latitude, longitude and height.

• **A map projection**
  Is a systematic transformation of the latitudes and longitudes of locations from the surface of a sphere or an ellipsoid into locations on a plane.

• **Projected Coordinates (Rectangular Coordinates)**
  Are defined on a flat, two-dimensional surface.
• **GNSS** units basic measure and recording of points is in *Geographical Coordinates* which is based on the WGS84 ellipsoid.

• As measurements and computations are more difficult to work with in the angular mode.
  • we therefore convert these measurements to *Rectangular Coordinates*.

• Points are computed, displayed and recorded in a linear form.
  • easting (X-axis)
  • northing (Y-axis) Coordinates.
Issues that Surveyors deal with daily….

What is…

• a ground distance?
• an ellipsoid distance?
• a grid distance?
• a local distance?
• a plane bearing?
• a Grid bearing?
• a local bearing?
• Sea Level Correction?
• Projection Point & Line Scale Factors?
• Combined Scale Factor?
Ground distances are:
measured distances between two points by either a Total Station or measuring tape.

Grid distances are:
measured distances that have had Slope, MSL, Geoid Separation and Scale Factor corrections applied as follows:

1. Slope Correction = Horizontal Ground Distance
2. MSL Correction = Geoid Distance
3. Geoid Separation = Ellipsoidal Distance
4. Scale Factor = Grid Distance
BIM and Points

BIM – Object based

- From the objects.
- Need to be able to create points.
- Attributes of the points
LISTECH Neo

The Surveyors interface to BIM
LISTECH Neo is new generation geospatial software, offering exciting functionality with increased productivity and ease of use.
User Definable Attributes

Design and tailor attribute definitions to suit client needs.

- Create attributes automatically by importing from another system
- Add and edit them
- Automatically populate with default values
- Optionally increment as objects are created

Deliver product tailored to your client needs.
Seamless Transfer

BIM

GIS

Google Earth

CAD

LISCAD

SURVEY AND CIVIL ENGINEERING FIELD AND OFFICE SOFTWARE

PLUS MORE

XML

Neo
geospatial software

PLUS MORE

Hexagon

LISTECH
Create Objects from Total Station Imagery

Key Features:

- **Automatic Image Selection**
  - System displays all images that will compute 3D objects

- **Create:**
  - Points
  - Lines
  - Polygons
  - EpiPolar Line
  - Makes for easy digitising on second image
Integrated Measurement Database

Complete control over the processing and reduction of field surveys.

- Field data automatically imported
  - Appears in Neo as on the instrument
  - Automatic attributing
- Reprocess Measurements information
  - Update dynamically
  - Automatic Update attributing
Information can be manipulated using the extensive tools available:
- Create
- Examine
- Modify
- Find

Coordinate systems may be plane or geodetic.
Uses known Coordinate systems or user defined.
- ellipsoids,
- projections,
- transformations
- geoid models are supported.

Transformations can be performed between coordinate systems.
Thank you...