BIM and the Surveyor

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

Outline

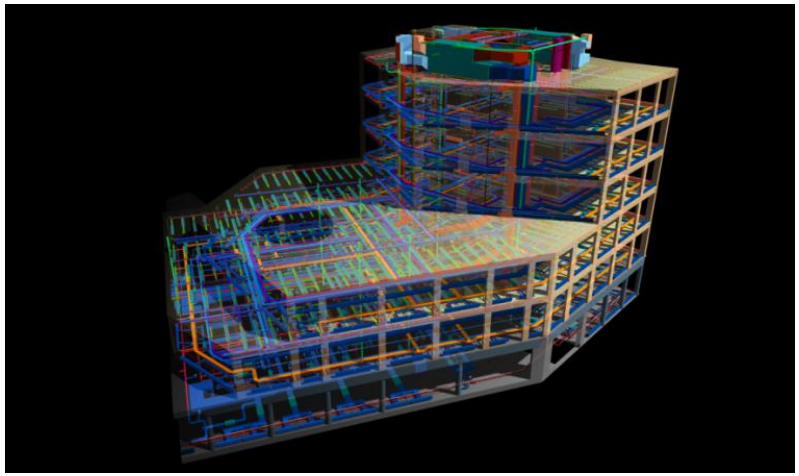
- What is a BIM
- What does a BIM do
- Why use a BIM
- BIM Software
- BIM and the Surveyor
- How do they relate to us in the Surveying and Spatial industry
- LISTECH Neo – The surveyors interface to BIM

What is a BIM

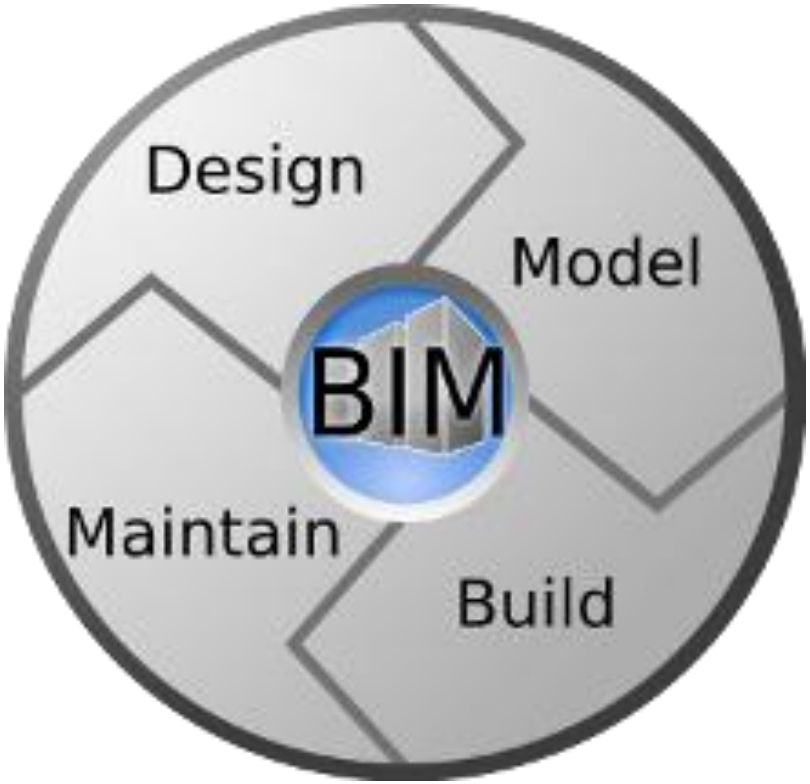
The US National Building Information Model Standard Project Committee definition:

- *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



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What does a BIM do?

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

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BIM Dimensions

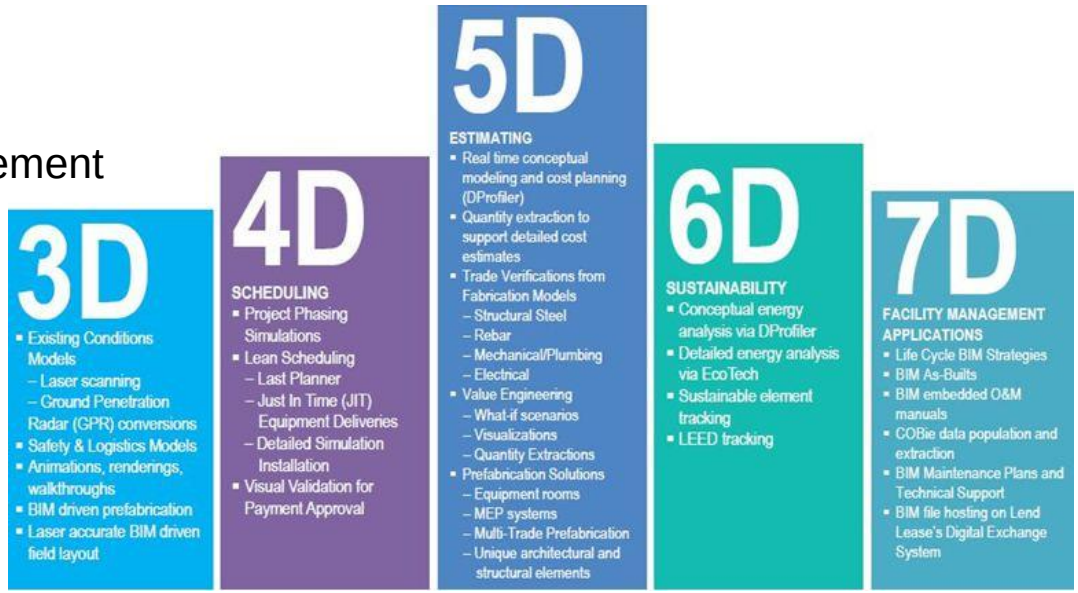
3D – Model
- Walk throughs
- Clash detection
- Visualisation
- Virtual modelling
- Prefabrication

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



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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 buildings total cost in its lifecycle is maintenance
- To collect data on a building is 8 x more expensive after construction

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BIM Software

Software designed specifically for BIM include:

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

These packages have their proprietary data formats.

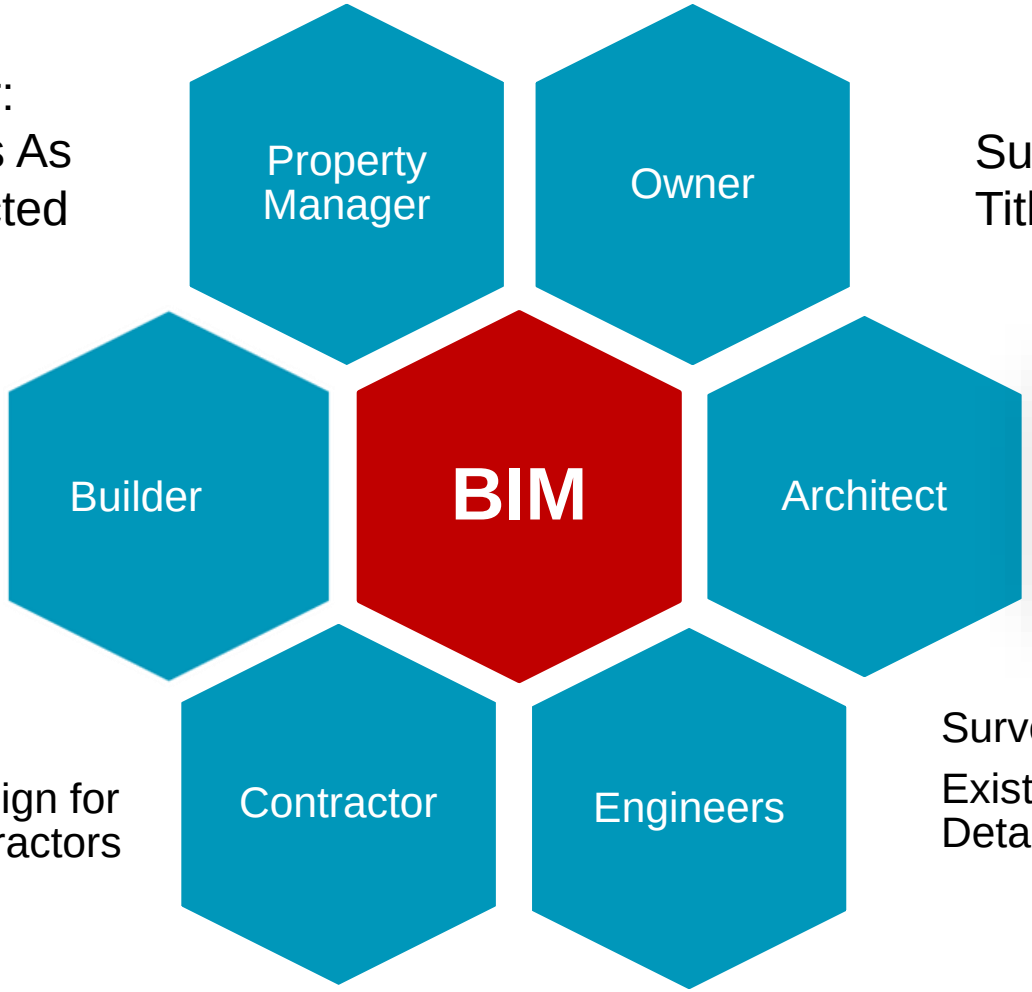
Non-proprietary or open BIM standards

- 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



Surveyor:
Title Survey

Surveyor:
Existing conditions / Detail Survey

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BIM and the Surveyor Cont..

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

Coordinate Systems

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

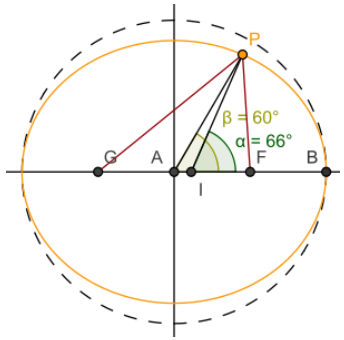
BIM's now being used for larger infrastructure projects – rail, road and other such projects that are over a larger area.

- Need to work in the real world
  - Datum's and Projections
  - Real world coordinates

Coordinate Systems Cont...

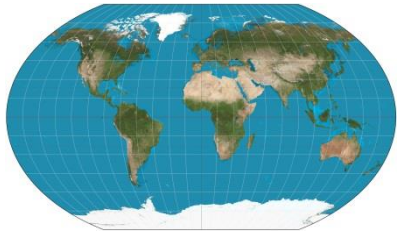
- **Geodetic Coordinates**

  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



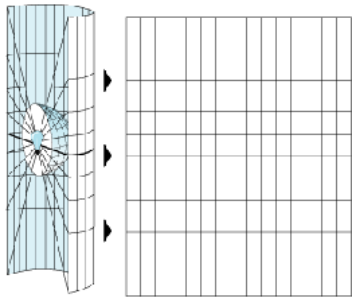
- **A map projection**

  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 & Total Station Measurements

- **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.

Coordinate Systems Cont…

Issues that Surveyors deal with daily….

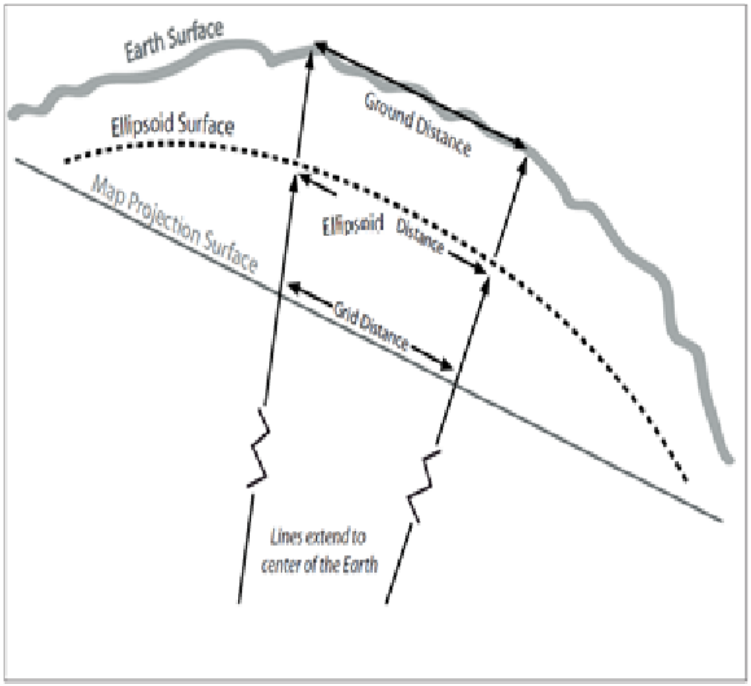
What is…

- **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?**

Coordinate Systems Cont…

Ground distances are:

measured distances between two points by either a Total Station or measuring tape.



Grid distances are:

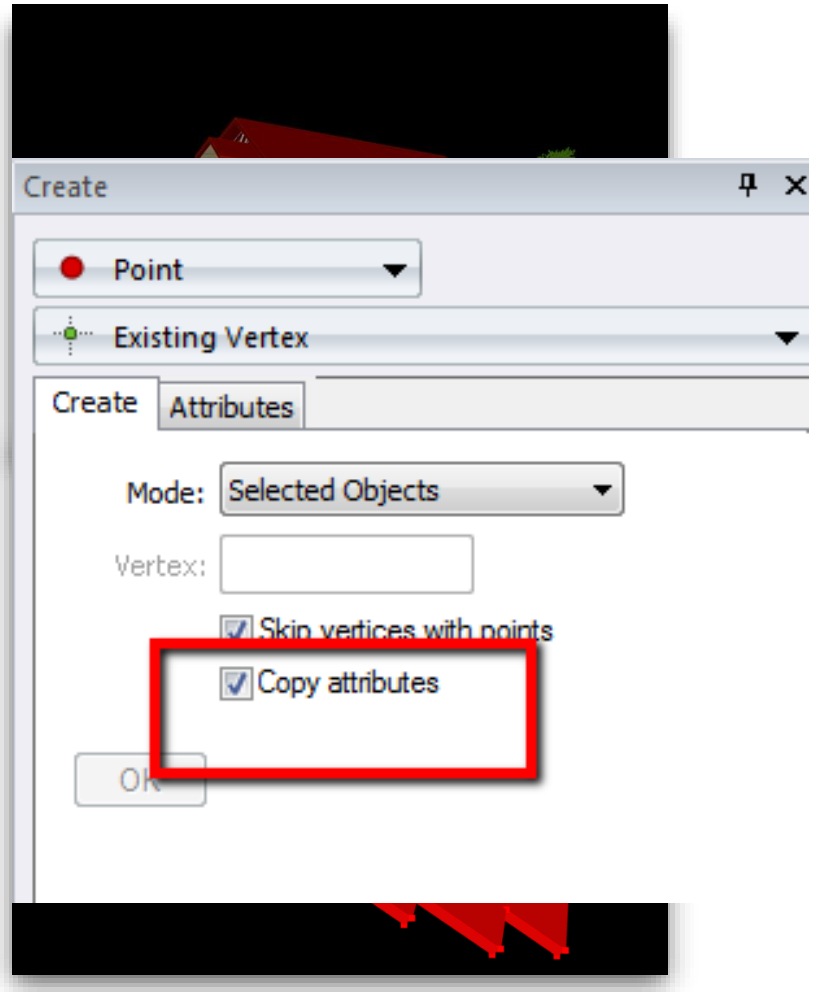
measured distances that have had Slope, MSL, Geoid Separation and Scale Factor corrections applied as follows:

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



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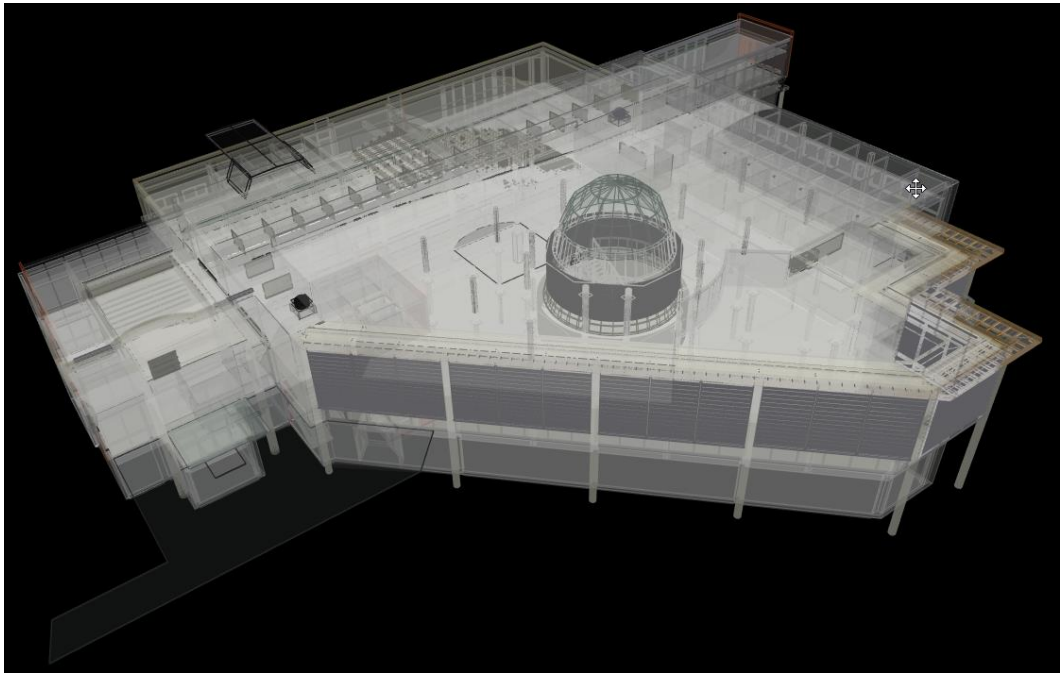
LISTECH Neo

The Surveyors interface to BIM

Introducing

LISTECH Neo is new generation geospatial software, offering exciting functionality with increased productivity and ease of use.



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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.

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Seamless Transfer

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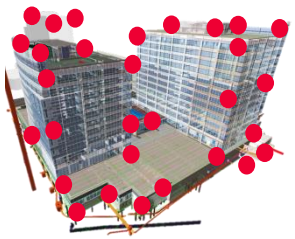
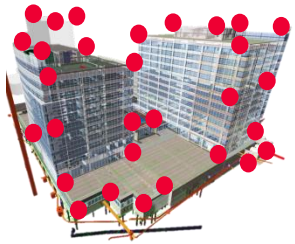
BIM Processing & Exchange





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Neo – *BIM*

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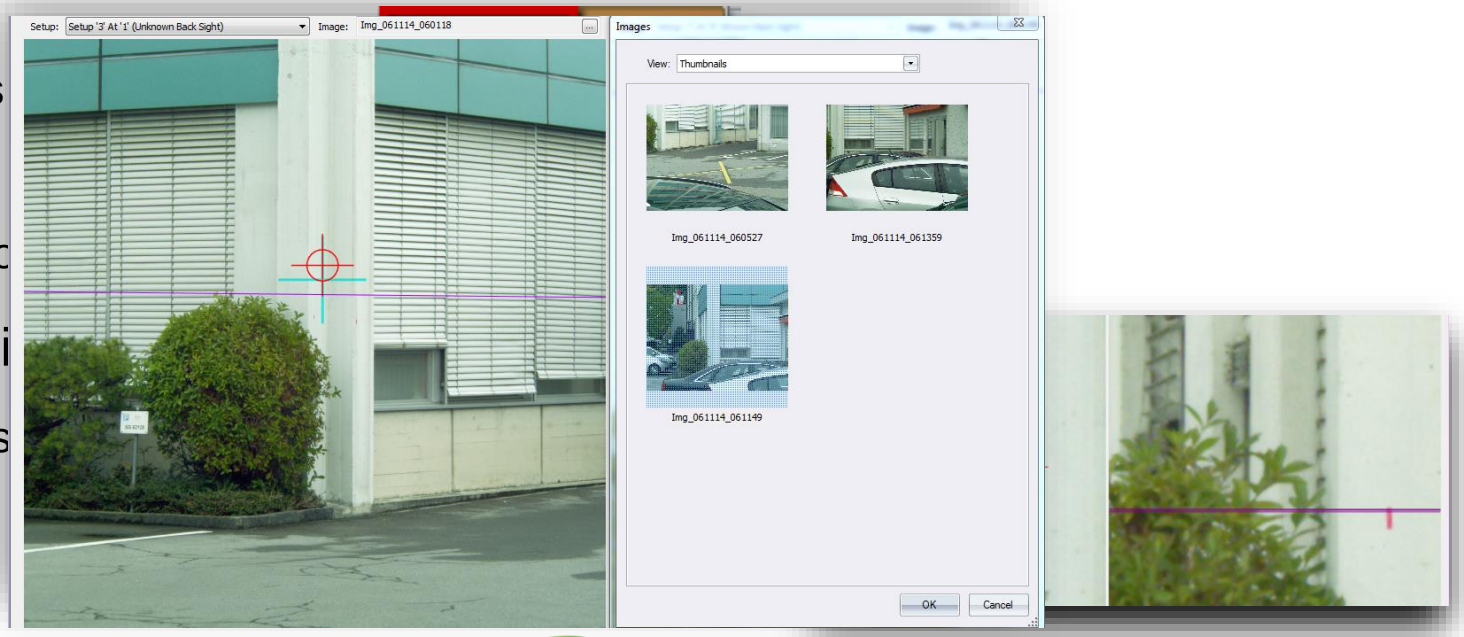
Creation of Objects from Images

Create Objects from Total Station Imagery

Key Features:

- Automatic Image Selection
  - System displays all images that will compute 3D objects
- Create:
  - Points
  - Lines
  - Polygo
- EpiPolar Li
  - Makes



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Integrated Measurement Database

Complete control over the processing and reduction of field surveys.

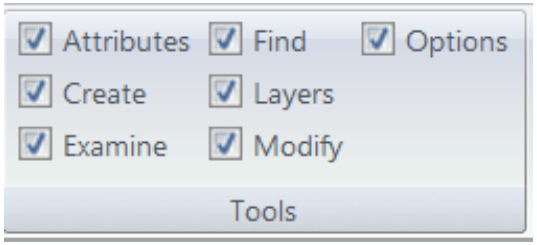
- Field data automatically imported
  - Appears in Neo as on the instrument
  - Automatic attributing
- Reprocess Measurements information
  - Update dynamically
  - Automatic Update attributing

Rigorous Geodetic Computations

Rigorous geodetic computations and editing functionality

Information can be manipulated using the extensive tools available:

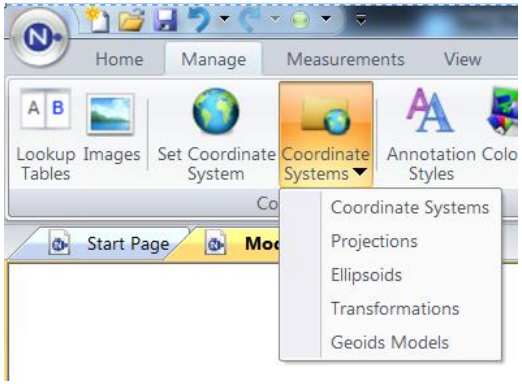
- Create
- Examine
- Modify
- Find



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.

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Thank you...

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