Week 1 – Lecture 2: Drawing Conventions

Language of Building = 2 Types: Legal (Contracts, Regulations and Permits) **&**

Construction (Specifications and Drawings)

Construction drawings focus on a building's shape, appearance, and dimensions, while the written construction specifications, or specs, focus on what materials will be used and how they should be installed.

A *specification* is a written document with technical directions and conditions describing the quality of materials and standard of workmanship of the project and forming part of the tender and contract documents. A specification deals with items that *cannot be shown on the drawings*. They are either written as product specifications, installation specification, or performance specifications.

Typical contents include: preliminaries, concrete, excavations, drainage, steel framing etc.
Also *instillation specifics* (how we're going to fix things)

Drawings are diagrammatic representation showing a building. They need to be understandable to a variety of people and so they use conventions.

- **Sketch plans** (rough idea of what the client is thinking)
- **Presentation drawings** (formalised visual idea of sketches, usually in 3D to help those not familiar with other building drawings but can't see measurements or specifics)
- **Town Planning drawing**
- **Construction drawings (Working drawings**) = goes to builders and subcontractors
    - Demolition drawings (knocking buildings over)
    - Architectural drawings
    - Engineering drawings (by engineering consultants for structural components)
    - Shop drawings

the conventions include types, scales, set-outs, line-types and symbols = *to scale*

Who uses the drawings?

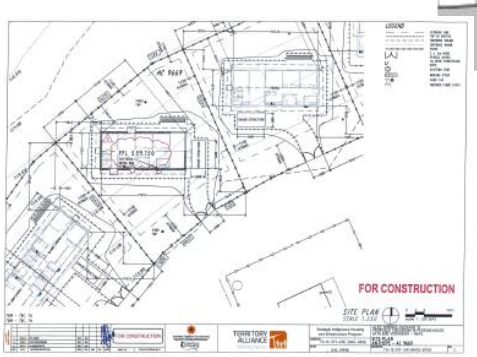
- Clients or their representatives
- Authorities including Local Council, Water, Sewer, Gas, Telstra
- Builder and their employees
- Subcontractors including Concreters, Bricklayers, Carpenters, Roofers, Plumbers, Electricians, Plasterers etc.
- Consultants including Engineers (Geotechnical, Structural), Building Surveyors / inspectors, Interior designers, Landscape architects
- Suppliers including Window manufacturers, Plumbing suppliers, Cabinet makers (kitchens etc.)

Architectural Drawings
= plans, sections, elevations and details

Site plans

Scale = usually 1:500

Can have specific services ones



RHD = Relative Height Dimensions

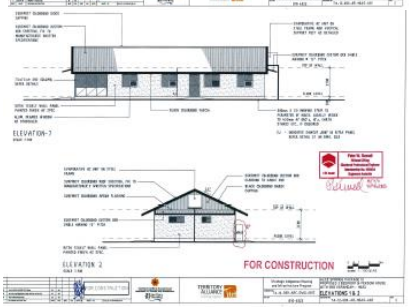
= one level is 0 and all other levels are measured relative to that

Floor Plans

- rooms, how big they are. internal (actual building) and external (landscaping) ones
- finishes (carpets, cupboards, floor finishes etc.)
- scale is usually 1:50 or 1:100
- reflected ceiling plan = shows panels, tiles, specific measurements

Elevations

- floor to ceiling heights
- kinds of ceilings
- windows and doors
- materials, paint etc.

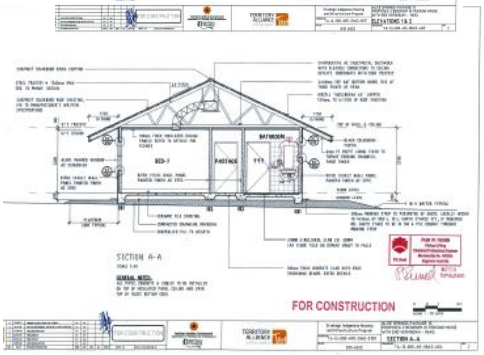


Sections

- slab, trusses
- ceiling heights and other measurements
- windows, bathrooms

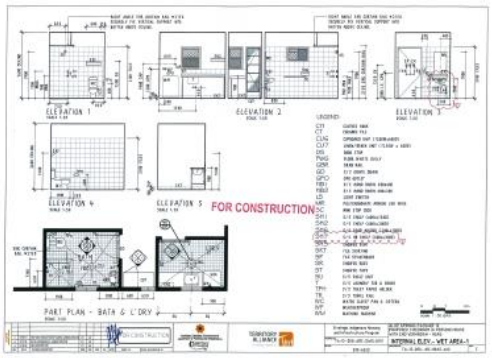
= internal elevation

- air conditioning



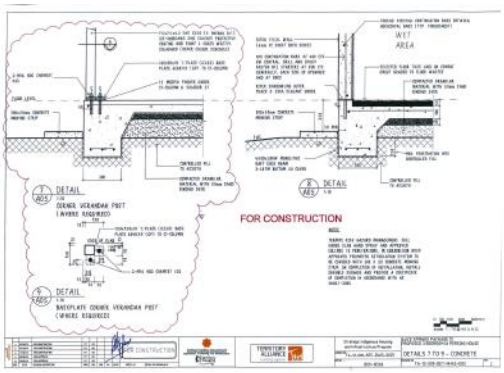
Internal Elevations

- shows tiles, windows etc.
- light switches
- all specified with height
- specific fittings and notes for builder



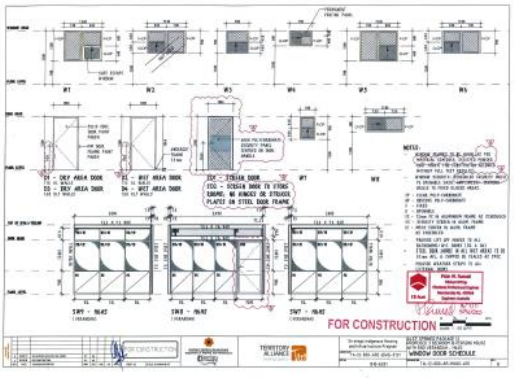
Details Drawings e.g. Concrete

- bolts, reinforcing bars
- type of concrete
- scale = usually 1:10



Window & Door schedule

- Gives builders specifics of types, sizes, how much glass etc



Engineering Drawings

- Each kind of trade has a drawing of where their work comes into the house
  = plumbers, electricians, carpenters etc

Other drawings

- E.g. ventilation = shows where fans are, insulation, heaters, glass etc.

SCALE

- The ratio between the size of something real and that of a representation of it.
- Each type of drawing will have its own typical scale or scales
- 1:10,000 Locality plan
- 1:500; 1:200 Site Plan
- 1:100; 1:50 Floor Plans, Elevations and Sections
- 1:5; 1:10; 1:20 Details

DIMENSIONS

Types

- Actual
- Sequence (all independent)
- Running

Plan Dimensions

- Internal
- Overall (external)

Tolerances

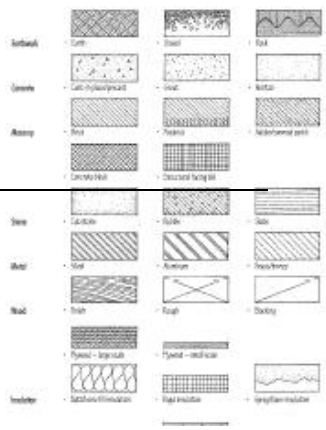
- Standards for how off something can be
- Skirting boards are useful for uneven floors for example

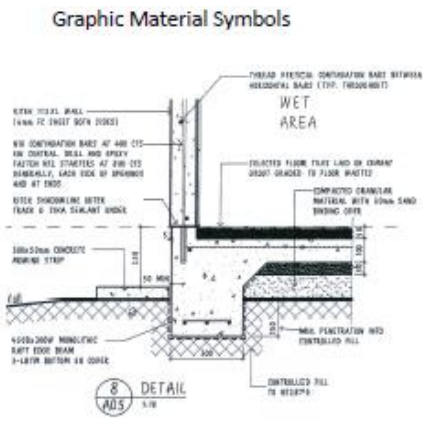
OTHER INFO

- Building address
- Date of last change to plans
- Architect and builder contact details
- Scale
- Drawing and sheet number

GRAPHIC MATERIAL SYMBOLS

- Industry specific ways of drawing, what material is what





Week 2 Lecture 1: How Buildings Work

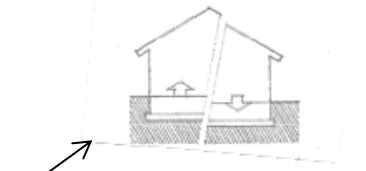
Structure

Substructure – underlying structure forming the foundations, footings etc.

Superstructure – vertical extension of the building, columns, beams, loadbearing walls that support floor and roof structures

Stability and Equilibrium

- Structural system designed to *transfer all loads and forces from buildings to the ground*.
- The *ground must be able to support all loads* and forces.
- Settlement or Heave: When *soil is not firm enough* to support the loads
  - Building loads need to be distributed. Consider what happens when you walk on loose sand or snow – your feet sink as they compact the loose material.
  - To avoid or minimise the "sinking" we need to spread the body weight over a greater area.
  - Building loads are similarly distributed.



When W (weight of building) and R (resistance of soil are not equal

Enclosure

Enclosure system is the envelope of the building, roof, external walls, floors, windows, doors

Types of Construction: (International Building Code)

- Type I A, B – most fire resistant e.g. reinforced concrete, high rise, multi storey buildings
- Type II A, B and III A,B – medium fire resistant e.g. Mixed construction, steel and masonry factories or warehouses
- Type V A,B – least fire resistant e.g. Lightweight timber construction, most apartments (A) and detached houses(B)

Building enclosure elements fall *three material/construction categories*:

- Monolithic/Bulk e.g. concrete.
- Unitised/modular masonry e.g. brickwork
- Supporting frame with cladding e.g. Timber or steel frame with brick veneer or lightweight cladding
- CAN BE A COMBINATION OF ALL THREE

Structural Performance

The elements must have the ability to absorb wind (or earthquake) loads and transfer them to the ground.

Movement of elements

- Enclosure element materials will move to varying degrees due to changes in moisture levels and temperature.
- Good building design should aim to *reduce the effect of this movement* or allow to *accommodate* the movement

Comfort

- A building can be compared to a person. When people get hot or cold they require warmth or cooling.
- Both of these functions require energy. Heating uses more energy per year than cooling (in Melbourne).
- We must *minimise the energy* used in our buildings.

Health

- is a major focus of building regulations
- **LIGHT**: Daylight-provided by windows. Balance between light and impact on energy requirement.
  - Views-may conflict with desirability for large glass areas e.g. Westerly orientation.
  - This conflict can be addressed a number of ways e.g. shading devices

- **VENTILATION**: Fresh air is a requirement for the well-being of occupants of a building.
  - The Building Code of Australia (BCA) has an objective to "….safeguard occupants from illness or loss of amenity due to lack of fresh air". = Covered by clause 3.8.5.2of BCA

- **THERMAL PERFROMANCE**: Expectation of house is to be warm in winter and cool in summer.
  - Objective: provide thermal comfort without resorting to high fuel bills as a result of high energy use.
  - *Elements of good thermal control*
    - Correct orientation and sizing of windows.
    - Seasonal control of sun through shading.
    - Thermal insulation to control heat loss or heat gain. (in walls, ceilings and floors)
    - Use of heavy material to store heat.
    - Well-designed ventilation and control of draughts.
  - Orientation is the term used to describe the direction a building is facing relative to North.
    - Path of winter and summer sun is critical consideration.
    - Generally *two zones* to house-*sleeping and living*. Living areas generally heated more.
    - Solar efficient homes tend to have living areas facing north (warmed by winter sun).
  - Seasonal control of the sun through *shading*. Angle of the sun's rays are steeper in summer
  - *Thermal mass* is used to even out swings in internal temperature.
    - Houses of fully lightweight materials heat up quickly during day cool down quicker at night.
    - Full masonry takes much longer to heat up but once hot, cool down slower.
    - Trend to lightweight construction with some heat storing elements.

      = compensate by using INSULATION
    - concrete slabs on the ground in combination with the ground = very large heat sink
  - Ventilation is the deliberate replacement of inside air with outside air.
  - Reasons for ventilation:
    - Replace stale air containing too much carbon dioxide and odours.
    - Cool the occupants.
    - Cool the building itself during summer.
    - Can be achieved by appropriate door and window locations
    - Cooling can be achieved by:
      - The stack effect-hot air rises and passes through an opening at the top.
      - Wind Pressure-allow wind to enter building from one side and pass out on the other.
      - Mechanical-fans can be used to suck out warm air thus allowing cool air to be drawn from outside.
  - Draughts: An integral aspect of good thermal design is the elimination of unwanted air leakage or unwanted air intrusion, especially around windows and external doors.

- **SAFE MOVEMENT**
  - we need to provide safe access into and within a building.
  - Doors-widths to be fit for purpose including movement of furniture and appliances.
  - Stairs-must be at a safe gradient and barrier provided for falls above 1 metre.
  - Ramps-alternative to stairs, slip resistant surface with gradient not to cause distress to user (1:8).
  - Swimming Pools-fenced off and child resistant gates, doors and windows.

Acoustics

- Exclusion and/or reduction in noise needs To be considered from external and internal sources.
- Various ways to suppress external noise (mass, barriers).
- Internally, use of soft surfaces (hard surfaces bounce noise).

Durability

- *Water* is the major factor influencing the durability of materials, and the lifespan of a building.
- Good detailing to exclude water from our buildings and the transfer of damp from one material to another is essential.
- Equally important is selection of the appropriate material for a given purpose.
- Use of weepholes to prevent water getting in the house
- Material to protect water getting in e.g. *biowood* = plastic looks like wood

Aesthetics

- Some architects frown upon the products produced by volume house builders. In some cases justifiably so.
- Many builders pay little thought to detailing that would enhance the appearance of a house at no additional cost.
- Consider such items as matching and aligning windows, doors, articulation joints and downpipes.

Cost

- Passive thermal design does not cost more.
- The temptation to view the additional up front expenditure as cost rather than an investment should be resisted if possible
- Reduced running costs can be significantly reduced over the life of a house.
- It's the client not the builder who bears the cost for poor design

Services

- Water & Sewage
- Electricity & gas
- Telephone, internet etc.

How the industry works:

- Domestic (small scale) VS Commercial (larger, more expensive scale) construction
- Separation of developers (concerned with **land)** and builders (**build something on land)**
  - In Australia
- Types: **Greenfield** (land focused, no buildings there previously) , **Brownfield** (old industrial land) or **infill** (knock down older house and build more houses in same space)
- **Builders** = manage process, not actually build. Usually small firms (5 or 6 people)
- **Subcontractors** = do actual building: internal and external