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WINE ESTATES

Lab Design

Or How to Build the “Tardis”

Eric Wilkes

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Winery Requirements

- Takes up little or no space.
- Looks super clean and Spartan on the inside.
- Can store an infinite amount of stuff (old records, old wine show trophies and the odd instrument).
- Available for any other purpose.
- Has “you beaut” technology that gives super accurate results on any analysis that a winemaker or marketing agent can dream up.
- Is obscure and unnoticeable from the outside.
- Costs nothing to run.

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In short, the Tardis



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Making a Good Laboratory

- Needs to be-
 - Practical
 - Workable
 - Efficient
 - Liveable
- To achieve this you need to consider many factors.
- Preferably before construction.

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Considerations

- Why build a lab?
- What are the economic benefits?
- What level of testing is required?
- Is it more economic to outsource a proportion of the work?
- Will it need accreditation?

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Considerations

- What level of staffing is required now?
- And in the future?
- What equipment is needed?
- What future expansion may be needed?

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Design

- To architect or not to architect???
- It does cost more.
- They need a good brief and close working relationship to achieve a good outcome.
- They save a vast amount of effort.
- Generally a faster and more cohesive outcome.



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Design

- Iterative Process
- Don't be afraid to scrap your ideas and start again.
- Ask as many people as you can.
- If you don't go through at least 10 versions you are probably not doing a good job.
- Better to get it right than modify it later.

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Regulatory Issues

- Must meet federal, state and local government provisions.
- These tend to be the minimum, many labs need more.
- Main Standards
 - AS/NZS 2982.1:1997, Laboratory Design and Construction Part 1:General Requirements
 - AS 2243, Safety in Laboratories





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Physical Location of Laboratory

- Try to locate the laboratory (if you have the option) in such a way as to minimise the distance to the sample point.
- This saves a lot of time and effort.
- Time and effort equates to money.

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Size

- Usually limited by location and cost.
- Good rule is to double what you think!
- Whatever the amount of space provided you will fill it!



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Layout

- Island or peninsular benches?
- Open plan or instrument rooms and offices?
- No simple answer.
- Aim for maximum flow and accessibility.
- Remember to consider access for visitors and to offices and store rooms.
- Plan exits for safe egress.

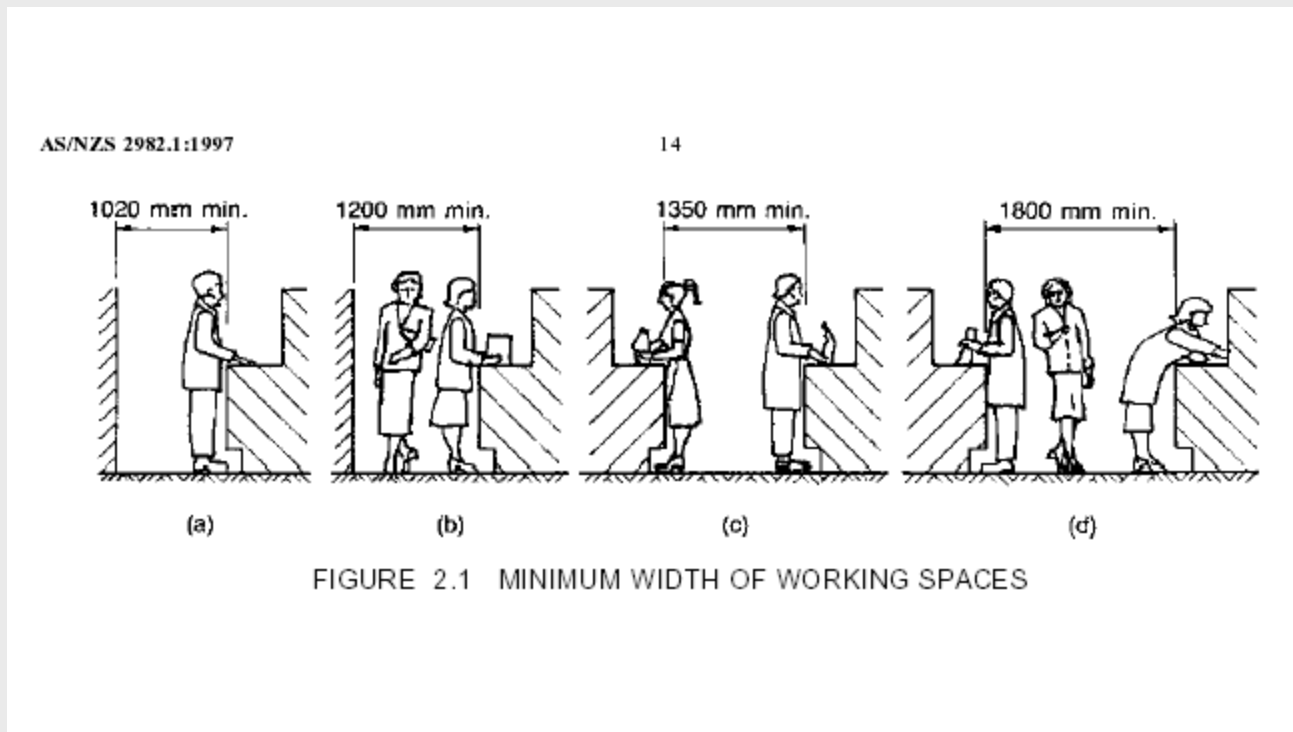




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Space

- Minimum Separation



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Landscape Your Lab

- Draw a plan on graph paper.
- Create to scale cut outs of instruments, equipment and wet test areas.
- Move them around to see how they fit.
- Don't forget fridges, freezers and filing cabinets.
- Remember most instruments need their own space again as prep areas.



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Workflow

- Look at where samples are coming from and where they go to!
- Important to minimise handling and travel.
- These translate into time and cost.
- Try to avoid bottlenecks.
- Remember to include waste disposal in the workflow plan.





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Throughways

- Avoid throughways through labs at all costs. Both internal and external.
- They are
 - dangerous
 - Inefficient
 - Wasteful of space.
- If you give people the ability to shortcut through a lab they will do it no matter what sign you put up.



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Safety Equipment

- Safety showers and eye wash stations!
- Must have them if you use any hazardous substance.
- Drench taps are not an acceptable alternative.
- The maximum travel distance to a safety shower is 10m.





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Safety Equipment

- Fire extinguishers
- Make sure they are readily available for any hypothetical fire.
- That is can be accessed no matter where the fires location is.
- Have fire blankets available.
- Don't necessarily settle for the regulated minimum.

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Safety Equipment

- Fume Cupboards, do you need them?
- Dependant on the testing done but usually yes.
- Can be filtered or vented to the outside (preferable).
- Must be sited so that drafts from doors or air conditioning do not effect their operation.
- Subject to AS 2243.8 and must be checked annually.
- Similar rules for laminar flow cabinets.

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Services

- Gas
- Water
- Electrical (AS 2430)
- Vacuum
- Data
- Cooling liquid
- All services must be able to be isolated.
- Gas cylinders and vacuum pumps should be outside.

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Airflow

- Air conditioning or natural ventilation?
- For modern laboratories temperature control (20+/- 2) is very important. Leads to better results.
- Temperature stability is also very important.
- From the standard, air conditioning shall...”prevent recirculated air from the laboratories mixing with air supplies from non-laboratory areas”
- Good idea to totally replace air in every hour.



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Staff Moral

- A good working environment produces much better results.
- Staff will manage and look after a good lab much better.
- They may even keep working there!

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A Good Working Environment

- Windows
- Separate write up areas.
- Decent desks and chairs.
- Clear lines of view.
- Low levels of back ground noise.
- Good lighting
- Separate eating areas (requirement of standard and food safety) and place for personal items (lockers?)

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Desk Space

- You do need it!!!!!!!!!!
- Labs provide information and it must be recorded!
- Need space for computers.
- Try to give each staff member a space to work from.
- Include book cases.

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Storage

- Chemical
- Flammable
- Equipment
- Data
- Also remember to allow room for refrigerators and freezers.

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Storage-Flammable

- Maximum of 50 litres in 50 square meter lab before you need a flammables cupboard. (AS 1940-1993)
- Good idea to have one anyway.
- Under bench units are good (maximum 30 litres)
- Corrosives must be stored separately
- Ethanol plus nitric acid is an easy way to demolish a lab.



Storage-Chemical

- Have separate acid and alkali cupboards.
- Store chemicals so that labels are easily seen (not in drawers).
- If using shelving have sliding glass doors or restraining bars (we do have earth quakes in this country!).
- Organise separate dry goods and wet goods areas (never store wet above dry).
- Shelves containing corrosives should be no more than 1 meter from the floor.
- At least double what you think you need.





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Storage-Equipment

- Don't forget equipment spares and consumables.
- Often the bulkiest items.
- Try to suit the style of storage to the kind of item (i.e. shallow drawers for pipettes).
- Maximise storage by using innovative system like compactors.
- Remember to consider Manual Handling Issues.





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Storage-Data

- Filing space, you will need it.
- The paperless office is a long way away.
- Think about the records that you need to keep and plan for the amounts of paper which will be stored, both ready to hand and archival.



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Sample Storage

- Wine laboratories store lots of wine (usually).
- Includes reference and holdback samples.
- Important to allow sufficient space.
- Incorporate racks into bench design or use compactor system.
- Remember to consider Manual Handling Issues.





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Work Benches

- Surfaces should be impervious and resistant to the chemicals in use (red wine stains!)
- Bench tops can be made of a vast range of material. Should avoid having joins in the middle.
- Sinks can be stainless steel or integral to the bench top.
- Services can be on the benches or mounted in bollards. (there are restrictions where electricity can be on wet benches).





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Work Benches

- Modular or built in cupboards?
- Modular cupboards give much greater flexibility over future usage.
- They do tend to be more expensive.
- They must be designed to facilitate cleaning.
- For all fittings and surfaces go and have a look and see what best suits the laboratory requirements (not what necessarily looks good).

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Drainage and Waste Disposal



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Drainage and Waste Disposal

- Most winery laboratory waste can go in with winery trade waste system.
- Exceptions are chromates and organics.
- Need to check local system and local regulations.
- Organics and some acids should be stored for professional disposal. Space needs to be allowed for this.
- Make sure spill provisions and a spill kit are provided.



Microbiological Waste

- Living cultures (yeast plates etc) must be disposed of by either by autoclaving then to landfill or incineration.
- Or by direct incineration in an approved incinerator.
- In labs doing micro allowances must be made for storage of this matter prior to disposal.



Solids disposal

- Provision needs to be made for disposal of all lab solid waste.
 - Sharps
 - Cardboard
 - Glass
- Just putting bins in the corridor tends to cause problems.





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Floor Surface

- The floor needs to be impervious and resistant to the chemicals in use.
- It needs to have no joints through which chemicals can enter and be treated in such a manner that it is slip resistant.
- Welded vinyl or painted concrete seem to be the most common options.
- Joints at walls and fittings must be such that they are easy to clean and will not allow chemical access to the underlying substrate.





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Ease of Cleaning

- The whole laboratory and its fittings should be designed with ease of cleaning mind.
- Taps and fittings on benches should be high enough to allow cleaning underneath.
- Avoid complex surfaces that are difficult to clean.
- Avoid nooks and crannies that are difficult to get to and hence clean.





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Security

- Laboratories are regularly broken into for access to chemicals and equipment for illicit uses.
- They also contain a large range of hazardous substances which should have restricted access.
- Idle curiosity leads to a depressing amount of damage.
- Labs should be designed such as to have good after hours security.



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OH&S

- Once you have a design that you are happy with, walk other people through it to look for OH&S issues.
 - Location of walkways in relation to hazardous equipment.
 - Manual handling issues.
 - Safety of visitors.
 - Ability to evacuate safely in an emergency.

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Goods Delivery

- Ensure that supplies can be delivered to the lab easily.
- Samples and consumables are often heavy or bulky (for example gas cylinders).
- Deliveries to the lab should be possible without having to go through problematic physical (stairs) or administrative (restricted areas) barriers.



Lighting

- AS16801
- Lighting in laboratories needs to be
 - Strong
 - Omnidirectional
 - Colour adjusted to neutral white.
- This should allow the elimination of shadows and the accurate perception of colour and colour changes.



The Building Stage

- You thought the planning was painful!!!!
- How much disruption
 - Water
 - Power
 - Access
 - Dust
 - testing





The most important thing!

- Look what other people have done.
- Ask them why they did it.
- Ask them what works
- And what doesn't.
- Don't reinvent the wheel.

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