



Zebrafish Facility Planning

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7th Annual International
Zebrafish Husbandry Course

Getting Started

Best to start by understanding what is needed to fulfill the needs of the immediate and future expectations of the facility.

First identify the nature and scale of the work you hope to support

Often driven by the institute, change in research focus, appointment of a new PI or a refurbishment of an existing premises



Getting Started

Where to start?

Feasibility Study –

- Great option designed to assess whether or not the institution is both in need of the additional resource, and is prepared to undertake the cost and effort required to do it correctly.
- Allows for experts (consultants) and vendors to weigh in and provide real-world expectations as to cost and timeline.
- Removes much of the burden from the already over-worked facility managers, and researchers.
- Often only a 2-3% of overall cost of project

Don't Underestimate the Task!

Large Team Effort! Stakeholders, Estate Services, External Contractor(s), Vendor(s), Finance/Accounts team, Legal team, Facility/BSU Manager

Politics - the more stakeholders the more politics. Don't avoid it - due recognition and time should be devoted to ensuring all parties are on board, are addressed early on and on a continuous basis

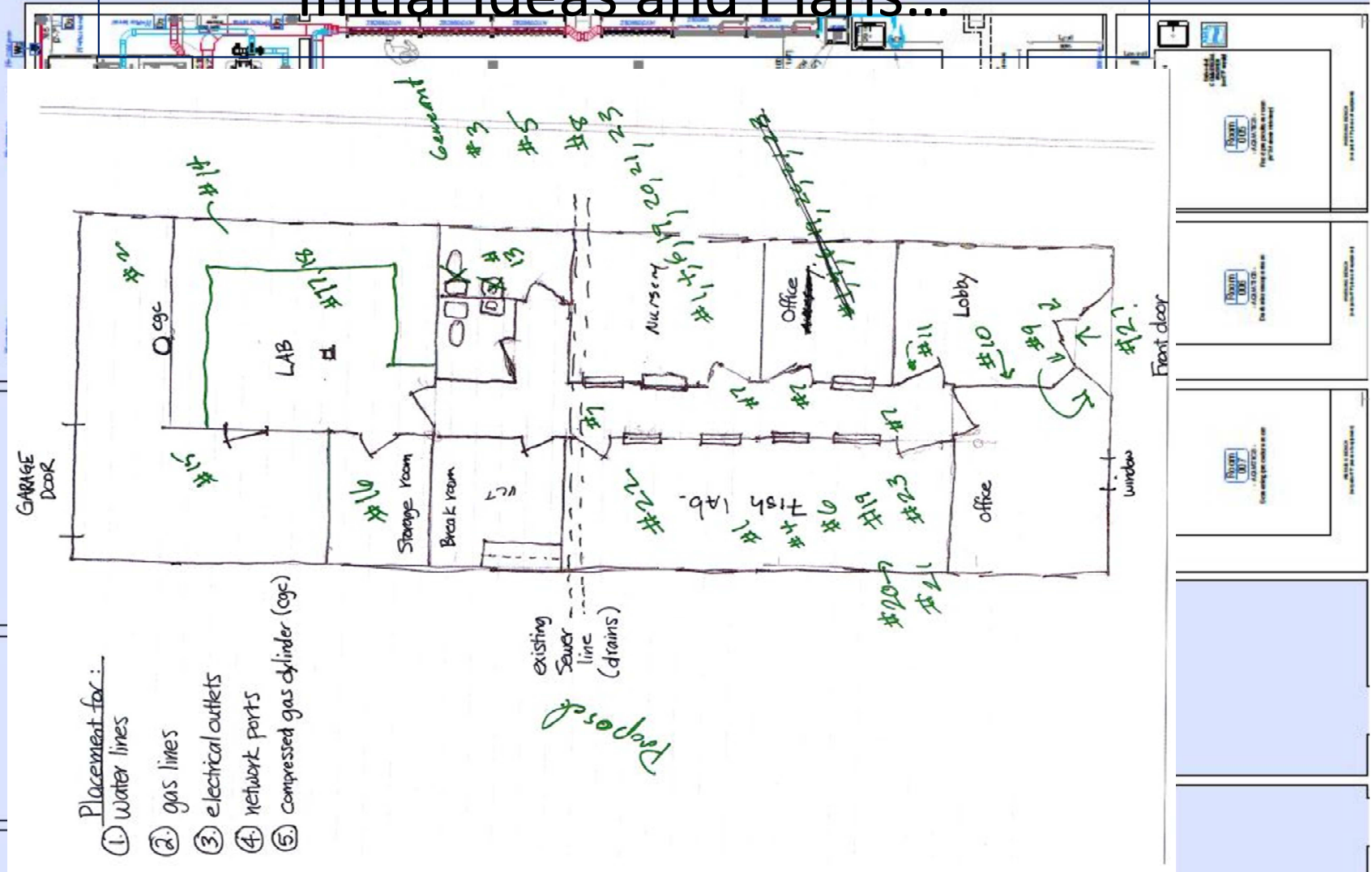
Critical - Ensure your institute 'buys out' sufficient time for the facility manager to attend all meetings. DO NOT just add to existing responsibilities otherwise detail will be missed

Engage - with users as much as possible during the process and before sign off

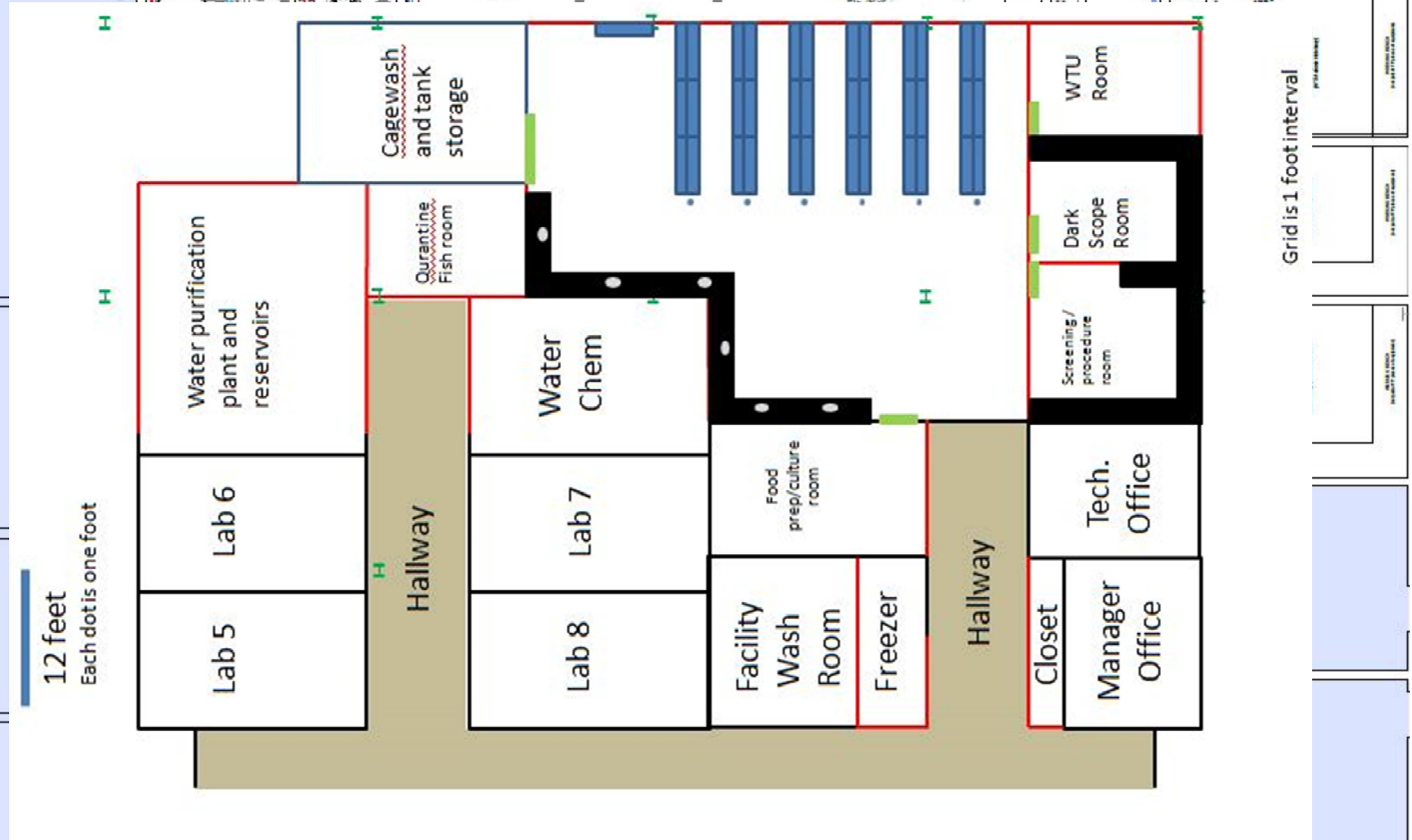
This begins to define the:

- Various animal rooms
 - Main colony room
 - Quarantine room
 - Flow-through
 - Toxicology
- Ancillary rooms
 - Behavioural science rooms
 - Microscopy/procedure rooms
 - Fluorescent
 - Dissecting stereo microscopes
 - Micro-injection
- Food preparation
 - Live food production
- Water purification
 - Mechanical
 - Life support systems
- Cagewash
- Storage
 - Tanks (plan for 5% more than full capacity)
 - and consumables
 - Chemicals
- Tools and service items

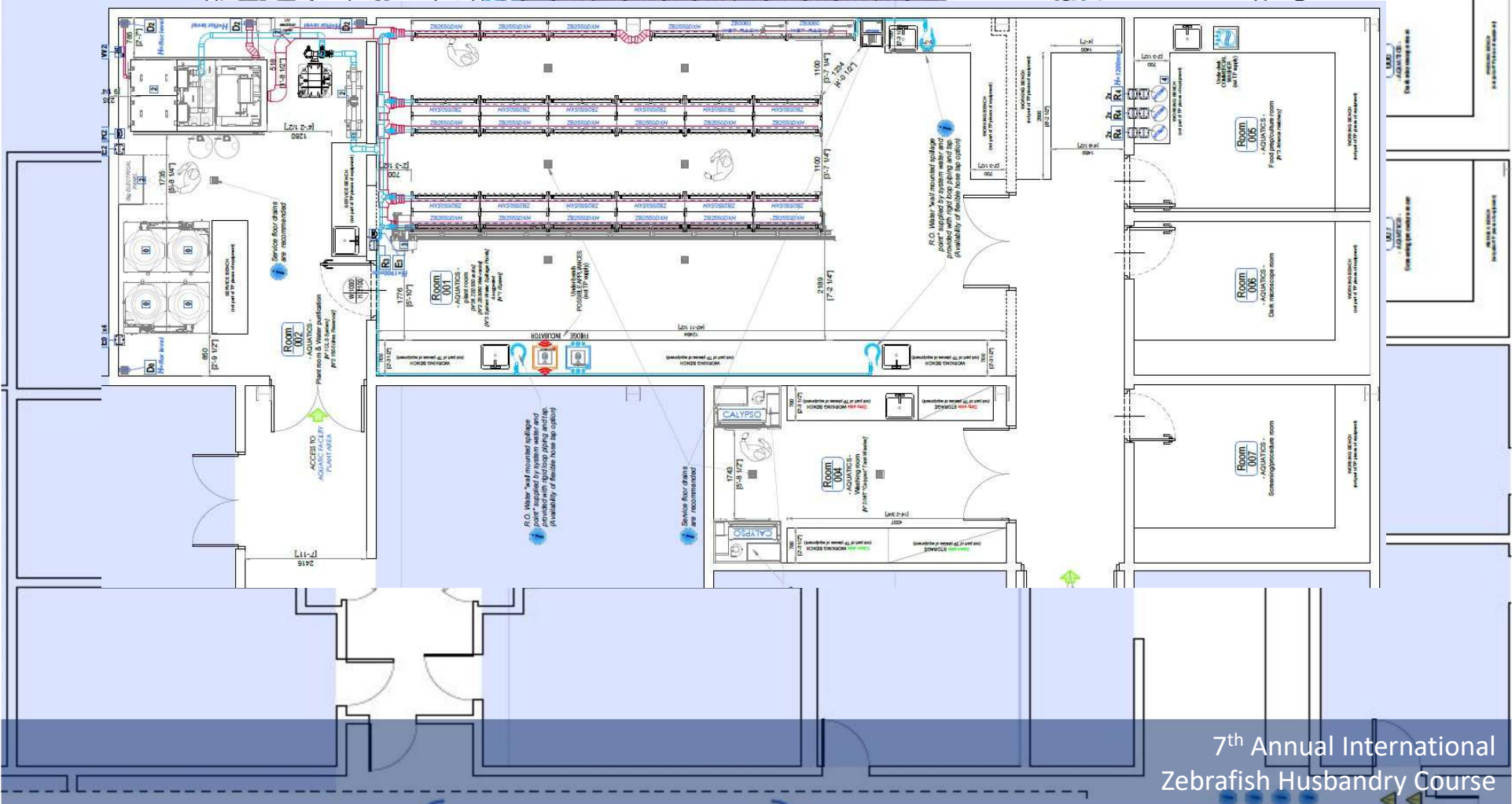
Initial Ideas and Plans...



Initial Ideas and Plans...



The Reality may be quite different!





The Physical Facilities: The ideal!

Whether a New Build or Refurbishment facilities should be

- Constructed to provide an environment which takes into account the physiological and ethological needs of the species being kept
- Designed and managed to prevent access by un-authorised persons and the ingress or escape of animals
- Have an active maintenance programme to prevent and remedy any defect in buildings or equipment
- Be sited with consideration to the activities in the adjacent buildings from an animal welfare perspective. Facilities forming part of a larger complex should be designed to be self contained

Site Selection

- By defining the types and number of rooms/spaces you need, you begin to define:
 - Site selection
 - Suitable locations
- Site Refinement – if a site is already provided, you can begin to narrow down what you can actually support in the given location

- Establish all the physical characteristics and requirements for each and every room/space

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Establish the Staffing Requirements of the Facility early!

How many people will it take to make this thing go?

- Manager – private office with room for meeting with 1-2 people
- Animal Care Staff
 - 1 person per 8-racks
 - Need
 - break room
 - toilet
 - Shared office resource
- Cage Washer
 - Based on capacity and cage-wash policies
- Technical Staff
 - IT
 - Plant Manager
 - Research

Assembling the Project Team

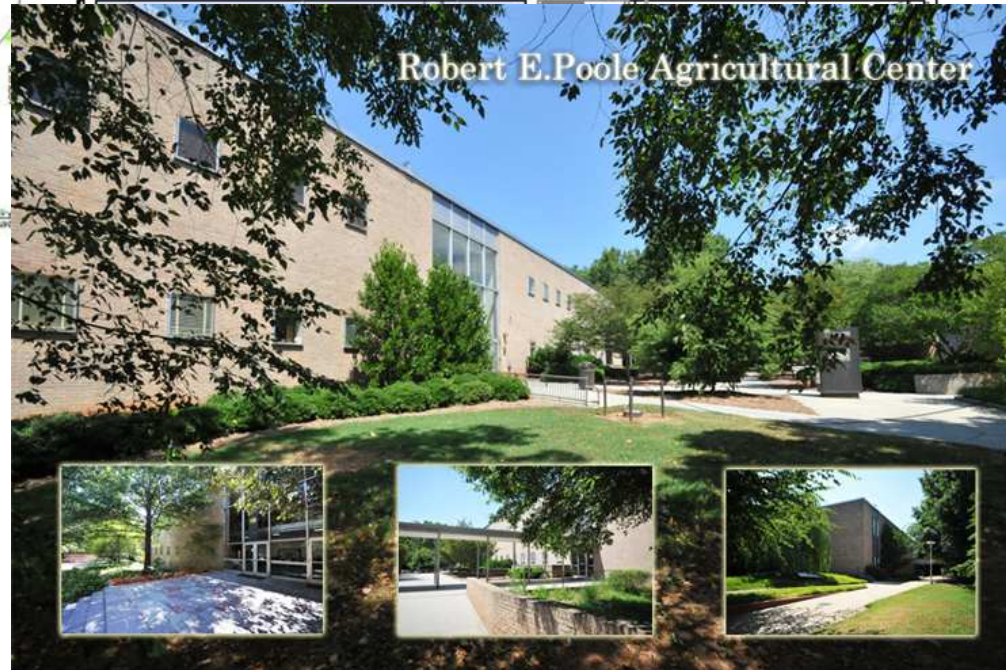
Who are the players in the process of building an aquatics laboratory?

- Primary users
 - Pls
 - Facilities manager BSU manager/ UOA manager?
 - Lab manager
- Institutional design team
 - Architect
 - Engineers
 - Structural
 - seismic
 - electrical
- General Contractor
 - Sub contractors
 - Electricians
 - Plumbers
 - Fitters
 - Tinnners
- Capitol Equipment Vendors
 - Animal housing
 - Cagewash
 - Water treatment
- Infrastructure Vendors
 - Water treatment
 - Lighting
 - Power
 - Compressed air
 - IT
 - BMS (can be internal and usually monitors AHUs, lighting), SCADA system for Life-support systems
 - HVAC

Assembling the Project Team

Who are the players in the process of building an aquatics laboratory?

- Do not forget in your team you need someone with knowledge of... every aspect of these processes
- Public procurement regulations for the institute – this can have a big impact on the programme - **critical path item** so involve procurement and legal teams early on!
- Interdependencies - planning approval, building control, fire officer, commissioning of environmental systems, specialist support facilities



Establish a project working group:

- Made of at least one member from each contributing group
- Minutes to be recorded and published weekly (example: Project Assistant, Estate Services) →
- Regular meetings with mandatory attendance
- Project Contact list is critical

Maintaining Control of the Project:

- Appointed Project Manager
 - Carries the responsibilities for communications, consulting reporting, advising, procuring and signing off in addition to assuming responsibility for the budget, programme and quality of the completed project



Maintaining Control of the Project:

8 stages

<p>The RIBA Plan of Work 2013 organises the process of briefing, designing, constructing, maintaining, operating and using building projects into a number of key stages. The content of stages may vary or overlap to suit specific project requirements. The RIBA Plan of Work 2013 should be used solely as guidance for the preparation of detailed professional services contracts and building contracts.</p> <p>www.ribaplanofwork.com</p>								
Stages	0	1	2	3	4	5	6	7
Tasks	Strategic Definition	Preparation and Brief	Concept Design	Developed Design	Technical Design	Construction	Handover and Close Out	In Use
Core Objectives	Identify client's Business Case and Strategic Brief and other core project requirements.	Develop Project Objectives, including Quality Objectives and Project Outcomes, Sustainability Aspirations, Project Budget, other parameters or constraints and develop Initial Project Brief. Undertake Feasibility Studies and review of Site Information.	Prepare Concept Design, including outline proposals for structural design, building services systems, outline specifications and preliminary Cost Information along with relevant Project Strategies in accordance with Design Programme. Agree alterations to brief and issue Final Project Brief.	Prepare Developed Design, including coordinated and updated proposals for structural design, building services systems, outline specifications, Cost Information and Project Strategies in accordance with Design Programme.	Prepare Technical Design in accordance with Design Responsibility Matrix and Project Strategies to include all architectural, structural and building services information, specialist subcontractor design and specifications, in accordance with Design Programme.	Offsite manufacturing and onsite Construction in accordance with Construction Programme and resolution of Design Queries from site as they arise.	Handover of building and conclusion of Building Contract.	Undertake In Use services in accordance with Schedule of Services.
Procurement *Variable task bar	Initial considerations for assembling the project team.	Prepare Project Roles Table and Contractual Tree and continue assembling the project team.	The procurement strategy does not fundamentally alter the progression of the design or the level of detail prepared at a given stage. However, Information Exchanges will vary depending on the selected procurement route and Building Contract. A bespoke RIBA Plan of Work 2013 will set out the specific tendering and procurement activities that will occur at each stage in relation to the chosen procurement route.			Administration of Building Contract, including regular site inspections and review of progress.	Conclude administration of Building Contract.	
Programme *Variable task bar	Establish Project Programme.	Review Project Programme.	Review Project Programme.	The procurement route may dictate the Project Programme and may result in certain stages overlapping or being undertaken concurrently. A bespoke RIBA Plan of Work 2013 will clarify the stage overlaps. The Project Programme will set out the specific stage dates and detailed programme durations.				
(Town) Planning *Variable task bar	Pre-application discussions.	Pre-application discussions.	Planning applications are typically made using the Stage 3 output. A bespoke RIBA Plan of Work 2013 will identify when the planning application is to be made.					
Suggested Key Support Tasks	Review Feedback from previous projects.	Prepare Handover Strategy and Risk Assessments. Agree Schedule of Services, Design Responsibility Matrix and Information Exchanges and prepare Project Execution Plan including Technology and Communication Strategies and consideration of Common Standards to be used.	Prepare Sustainability Strategy, Maintenance and Operational Strategy and review Handover Strategy and Risk Assessments. Undertake third party consultations as required and any Research and Development aspects. Review and update Project Execution Plan. Consider Construction Strategy, including offsite fabrication, and develop Health and Safety Strategy.	Review and update Sustainability, Maintenance and Operational and Handover Strategies and Risk Assessments. Undertake third party consultations as required and any other third party submissions requiring consent. Review and update Project Execution Plan, including Change Control Procedures. Review and update Construction and Health and Safety Strategies.	Review and update Sustainability, Maintenance and Operational and Handover Strategies and Risk Assessments. Prepare and submit Building Regulations submission and any other third party submissions requiring consent. Review and update Project Execution Plan. Review Construction Strategy, including sequencing, and update Health and Safety Strategy.	Review and update Sustainability Strategy and implement Handover Strategy, including agreement of information required for commissioning, training, handover, asset management, future monitoring and maintenance and ongoing compilation of 'As-constructed' Information. Update Construction and Health and Safety Strategies.	Carry out activities listed in Handover Strategy including Feedback for use during the future life of the building or on future projects. Updating of Project Information as required.	Conclude activities listed in Handover Strategy including Post-occupancy Evaluation, review of Project Performance, Project Outcomes and Research and Development aspects. Updating of Project Information, as required, in response to ongoing client Feedback until the end of the building's life.
Sustainability Checkpoints	Sustainability Checkpoint – 0	Sustainability Checkpoint – 1	Sustainability Checkpoint – 2	Sustainability Checkpoint – 3	Sustainability Checkpoint – 4	Sustainability Checkpoint – 5	Sustainability Checkpoint – 6	Sustainability Checkpoint – 7
Information Exchanges (at stage completion)	Strategic Brief.	Initial Project Brief.	Concept Design including outline structural and building services design, associated Project Strategies, preliminary Cost Information and Final Project Brief.	Developed Design, including the coordinated architectural, structural and building services design and updated Cost Information.	Completed Technical Design of the project.	'As-constructed' Information.	Updated 'As-constructed' Information.	'As-constructed' Information updated in response to ongoing client Feedback and maintenance or operational developments.
UK Government Information Exchanges	Not required.	Required.	Required.	Required.	Not required.	Not required.	Required.	Required.

8 task bars

Designing the Facility

Layout

- Understanding the Flow of work and traffic
 - Best provided by PI and Facilities and Lab Manager
 - Influenced by legislation and bio-security
- Understanding the realities of space requirements
 - Work with Capital Equipment Vendors
 - Animal housing
 - Cagewash
 - Water treatment
 - Lighting
 - Power
 - Compressed air
 - IT

Layout

Work Flow and Traffic Consideration

- Flow of work and traffic
 - True clean and dirty areas rarely applicable inside main facility
 - Easy access to fish holding areas from both food prep and cage wash of high importance
 - Fish users create high traffic during spawning and mating cage setup times
 - Ensure restricted access areas (e.g. food-prep) are not situated to be short-cuts to other parts of the facility

Layout

Fish Rack Layout

- Comb orientation preferable to perimeter positioning
- Less is more
 - Favour more work surface, aisle space, ground and ceiling clearance to more tank space
- Avoid pinch-points in high traffic areas where congestion can be created
- Ensure adequate (quiet) space for spawning tanks

Layout

Life Support Systems

- Isolate in purpose built rooms whenever possible
 - Eliminate excess noise
 - Avoid possible contamination
 - Smoke/fire from mechanical failures
 - Ease of access for maintenance



Layout

Isolate food production

- Food Prep Area

- Frozen
 - Long-term
 - Short-term (in use)
- Dry/prepared
 - Rotifers
 - artemia
- Live Feed Culture



Layout – Physical space for Plant



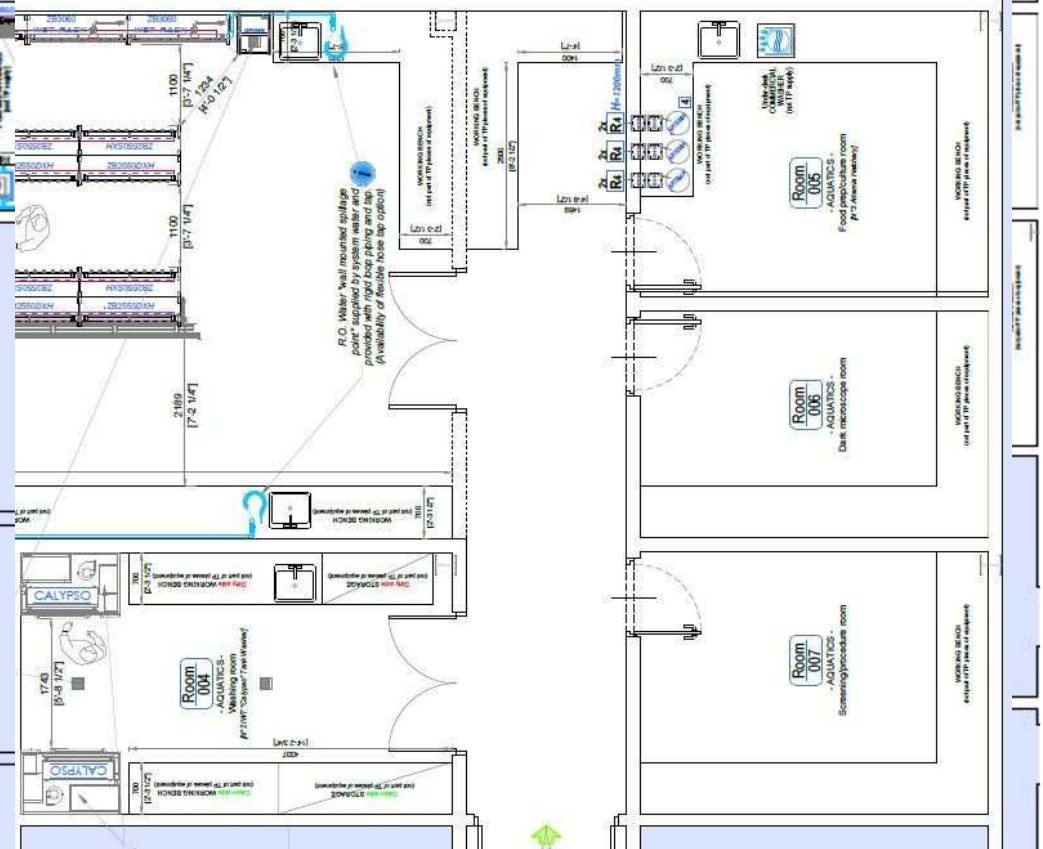
- **Mechanical Space**
 - **Water Purification Plant**
 - Pre-treatment
 - Purification
 - Storage reservoirs

- **HVAC (air handlers)**
- **Electrical Panels**

Layout

Ancillary Spaces and Procedure Rooms

- Microscope rooms
 - Fluorescent microscopy requires darkness and isolation from others
- Microinjection areas
 - Preferable to be near spawning areas



Designing the Facility

Infrastructure Requirements

- Power

- vendor input

- Fish Life Support

- Cage wash

- Lighting

- Water purification

- Specialized research equipment

- Emergency Power

- Water purification

- Fish life support

- BMS (can be internal and usually monitors AHUs, lighting), SCADA system for Life-support systems

Designing the Facility

Infrastructure Requirements

– HVAC

- Location of fresh air intake is critical
- Properly designed capabilities should be ensured at earliest possible time
- Access to equipment needing regular maintenance is critical



Designing the Facility

Infrastructure Requirements

– Plumbing and supply water

- Adequate volume and flow dictated by needs of the life support and cage wash equipment
- Drains should be selected sized to allow for flooding events



Designing the Facility

Infrastructure Requirements

– IT

- Adequate Wi-Fi and ethernet ports to accommodate all equipment and users



Designing the Facility

Special Considerations

- Security:
 - Animal facilities should be protected by appropriate security and building measures. Advice should be sought from the institute's own security services and other levels of expertise including local police
 - Swipe controlled door access, CCTV at exits and entrances leading to the facility, fire alarms, intruder alarms, lone worker alarms, alarm reporting procedure, response training



Designing the Facility

Special Considerations

– Noise

- Most equipment has published ratings for ambient noise it creates
- Proper location can minimize potential for ill effects
- Use of Isolators and proper anchoring will minimize ill effects

– Vibration

- Not necessarily the same as noise
- Quiet equipment can create vibrations that affect behavior and general well-being of animals



Appointing the Facility

Floors, Walls and Ceilings

- Floors
 - Epoxy filled quartz aggregate
 - Coved base creates a seal
- Walls
 - Water-based epoxy
 - Permits future repairs without the dangers of VOC
- All washable!



Appointing the Facility

Casework, Hardware, Doors

- Casework
 - Must be impermeable, such as phenolic resin
 - Tops should be epoxy or similar
- Hardware
 - 316-stainless steel
 - plastic
- Ceilings
 - Open is best
 - Water resistant tiles for suspended ceilings
 - Hard ceilings need ample access panels and epoxy paint



Appointing the Facility

Casework, Hardware, Doors

- Doors, kick plates, push panels, edging strips, etc.
- Pipes, Wiring, Cabling, Conduit, etc.
 - advisable to install services in such a way that they are either buried within the fabric of the building, boxed in or clear of the wall surface for easy cleaning



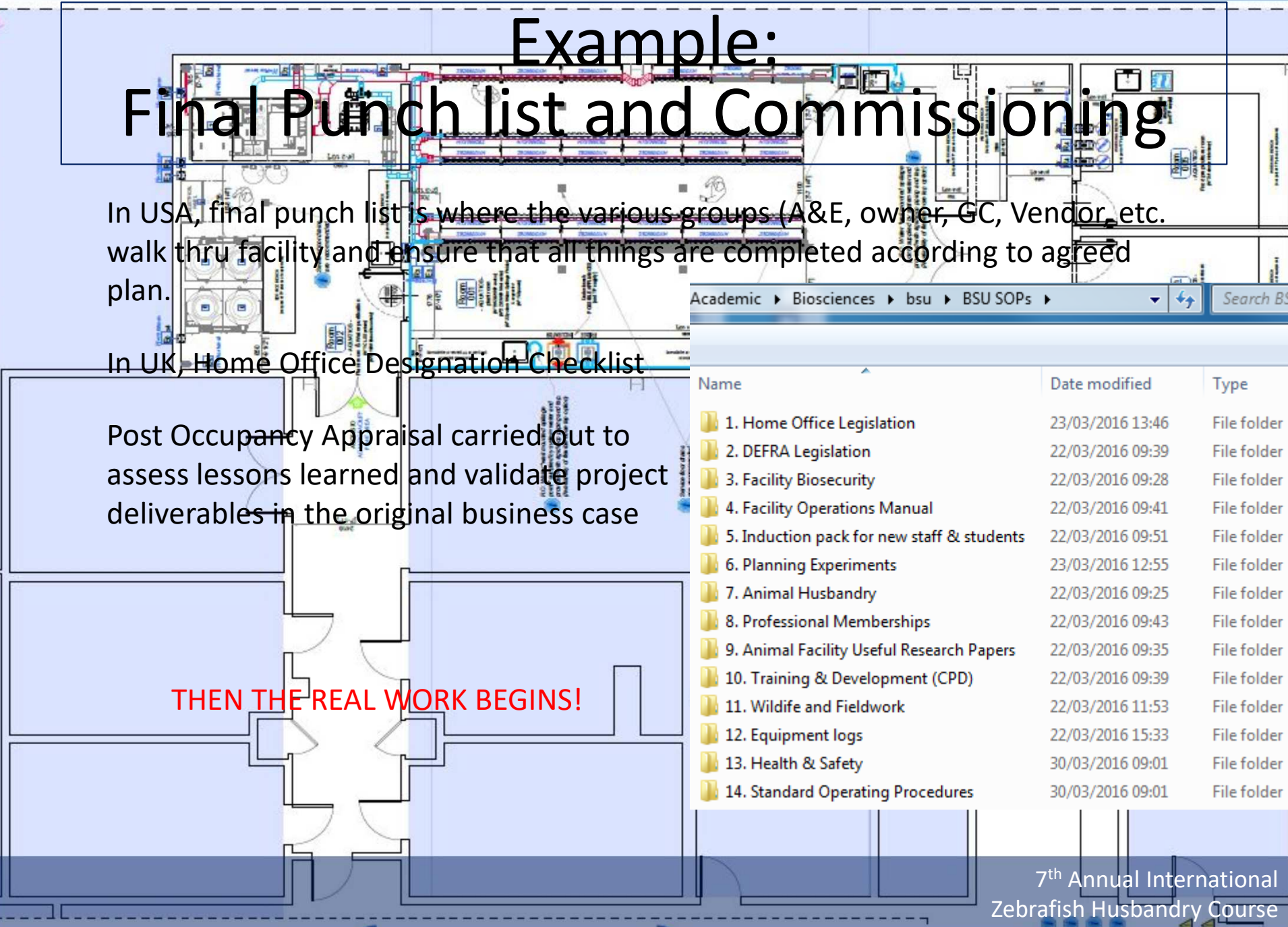
Example: Final Punch list and Commissioning

In USA, final punch list is where the various groups (A&E, owner, GC, Vendor, etc. walk thru facility and ensure that all things are completed according to agreed plan.

In UK, Home Office Designation Checklist

Post Occupancy Appraisal carried out to assess lessons learned and validate project deliverables in the original business case

THEN THE REAL WORK BEGINS!



Academic > Biosciences > bsu > BSU SOPs > Search BS

Name	Date modified	Type
1. Home Office Legislation	23/03/2016 13:46	File folder
2. DEFRA Legislation	22/03/2016 09:39	File folder
3. Facility Biosecurity	22/03/2016 09:28	File folder
4. Facility Operations Manual	22/03/2016 09:41	File folder
5. Induction pack for new staff & students	22/03/2016 09:51	File folder
6. Planning Experiments	23/03/2016 12:55	File folder
7. Animal Husbandry	22/03/2016 09:25	File folder
8. Professional Memberships	22/03/2016 09:43	File folder
9. Animal Facility Useful Research Papers	22/03/2016 09:35	File folder
10. Training & Development (CPD)	22/03/2016 09:39	File folder
11. Wildlife and Fieldwork	22/03/2016 11:53	File folder
12. Equipment logs	22/03/2016 15:33	File folder
13. Health & Safety	30/03/2016 09:01	File folder
14. Standard Operating Procedures	30/03/2016 09:01	File folder



Thank You

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