



Allan Corfield
STRUCTURES

Structural considerations

David Gallagher, AC Structures





**Structural Considerations
by David Gallagher**



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BACKGROUND TO ACS

- ❖ **ACS were established in 2021 as a Sister Company to AC Architects to provide a full design service for custom build clients**
- ❖ **ACS specialise in Modern Methods of Construction (MMC) and provide specialist design services to Timber Frame, SIPs and ICF manufacturers and Suppliers**
- ❖ **ACS utilise BIM software to aid co-ordination and integration with Architectural drawings**
- ❖ **ACS are able to offer a full project design service from site evaluation through to construction inspections to suit Client requirements**
- ❖ **ACS also offer specialist design services for steel connections, steel stairs, balustrades and feature glazing.**
- ❖ **ACS are SER Certifiers (Scotland)**



PROJECT STAGES

ROLE OF STRUCTURAL ENGINEER

1. Initial Design



1. Preliminary Desk Top Evaluation of Site, Specification and Review of Site Investigation Scope and Findings

2. Planning Application



2. Early Review with Architect and Client to Determine Preferred Method of Construction and Structural Design Principles

3. Building Regulations or Warrant



3. Structural Design and Drawings for Building Warrant/Regs. Specification of Specialist Contractor Design Elements

4. Production Drawings



4. Design and/or Review of Third-Party Elements

5. On Site



5. Structural Support and Additional Visits Can be Provided on Request

6. CDM



6. To Identify Any Site Specific Hazards That Would Not Reasonably Be Anticipated by a Competent Contractor Under CDM 2015

TRADITIONAL
STRUCTURAL
ENGINEERING SCOPE

ACS INCREASED STRUCTURAL ENGINEERING SCOPE



IMPORTANT CONSIDERATIONS WHEN SELECTING YOUR STRUCTURAL ENGINEER

- ❖ **Is the scope of service comparable between your tender returns?**
- ❖ **Does the level of input offered by the Structural Engineer meet your and the site's requirements?**
- ❖ **On-site support is also highly recommended. Has this been included or cost per visit identified.**
- ❖ **Is your preferred Structural Engineer experienced in the methods of construction you are considering?**
- ❖ **Does your preferred Structural Engineer have proven experience working with your Architect and specialist manufacturer?**
- ❖ **Does your Structural Engineer have awareness of cold bridge detailing requirements**
- ❖ **Value for money. Beware of false economy. Any difference in fee can be quickly dwarfed by over conservative design and/or slow information release.**



THE ADVANTAGE OF EARLY STRUCTURAL ENGINEER DESIGN REVIEW

- ❖ **Different perspective**
- ❖ **Structural Zones identified**
- ❖ **Transfer Structure and Column Locations**
- ❖ **Early identification of value engineering opportunities**

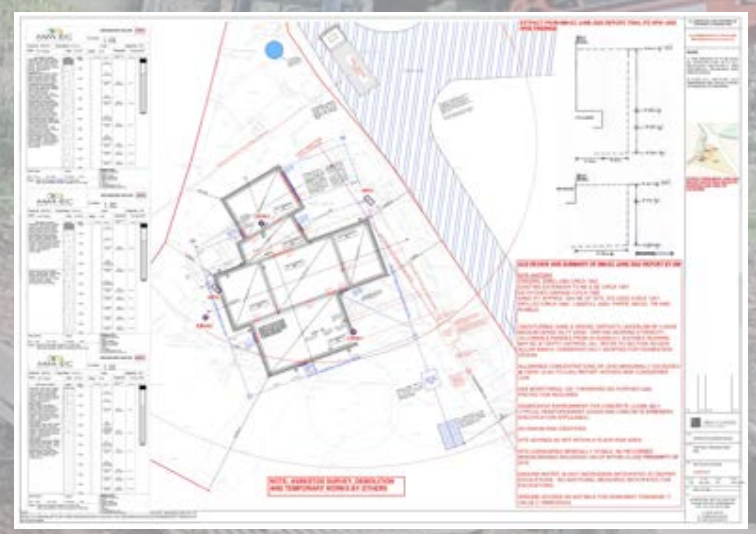
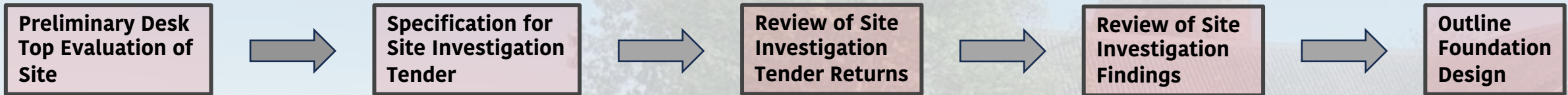


BENEFITS OF THE PROJECT ENGINEER BEING APPOINTED AS SPECIALIST ENGINEER BY YOUR ICF/SIPS/TIMBER FRAME CONTRACTOR

- ❖ **Allows the superstructure engineer to be involved in your project from an earlier stage.**
- ❖ **Design assumptions made prior to appointment of your specialist manufacturer are more likely to reflect the final design requirements.**
- ❖ **Helps inform preliminary costing and anticipated line loading for foundation design.**
- ❖ **Preferred detailing and specifications can begin to be incorporated into the early design prior to formal appointment.**
- ❖ **Critical structural design considerations such as the stability strategy can be identified and coordinated.**
- ❖ **Having one engineer responsible for your project (under two separate appointments) streamlines the design process.**



STAGE 1: INITIAL DESIGN



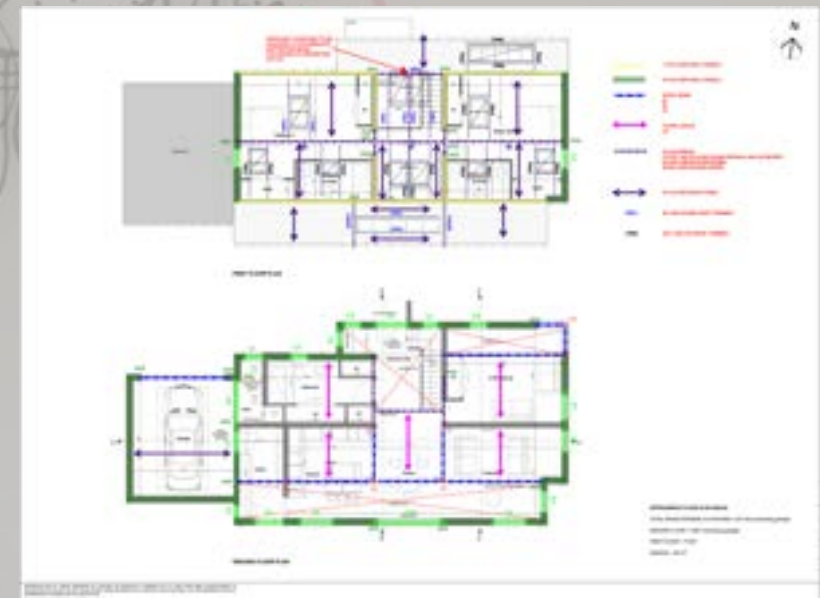
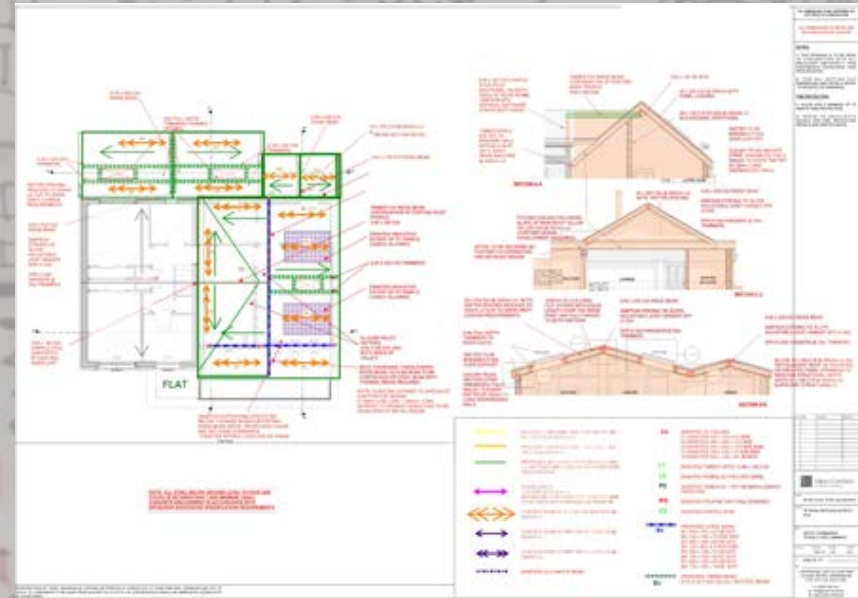
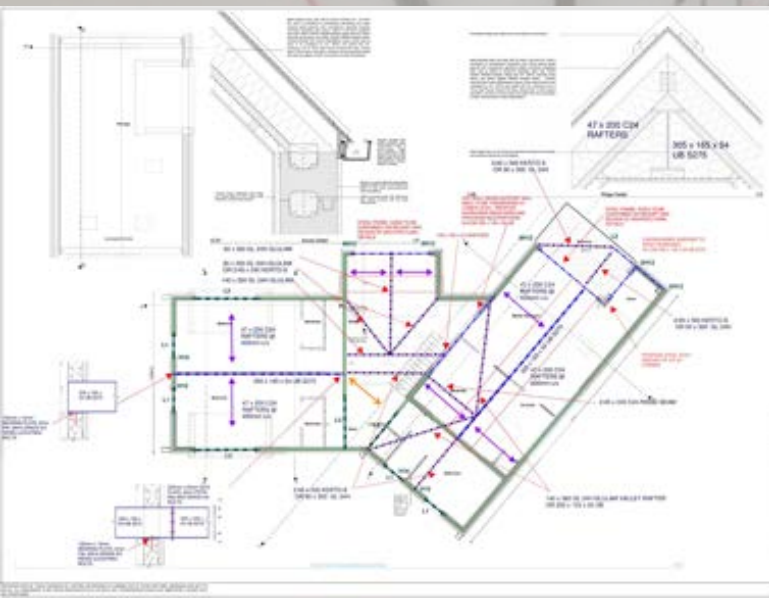


THE IMPORTANCE OF A SITE INVESTIGATION

- ❖ **The biggest unknown for any project is the ground conditions**
- ❖ **The scope of the site investigation needs to be appropriate for the scale of the project and the anticipated ground conditions and foundation requirements**
- ❖ **The site investigation is split into 2 phases. Phase I is a desktop evaluation of the site. This phase investigates the history of the site, potential risks and establishes the recommended scope of the Phase II - intrusive investigation.**
- ❖ **The scope of stage 2 can vary but typically includes Boreholes, trial pits, lab testing, percolation test, gas and water monitoring.**
- ❖ **If piling is anticipated the depth and number of boreholes required are likely to be more to ensure sufficient information is obtained for the specialist piling design**



STAGE 2: EARLY DESIGN REVIEW





VALUE ENGINEERING FROM THE BEGINNING

- ❖ **WORK WITH YOUR SITE CONSTRAINTS**
- ❖ Try to limit volume of excavation by working with site levels
- ❖ Avoid retaining walls where possible
- ❖ Site access to be considered

- ❖ **TRANSFERRING GRAVITY LOADING FROM ROOF TO FOUNDATIONS**
- ❖ Aligning walls between floors to limit transfer structure

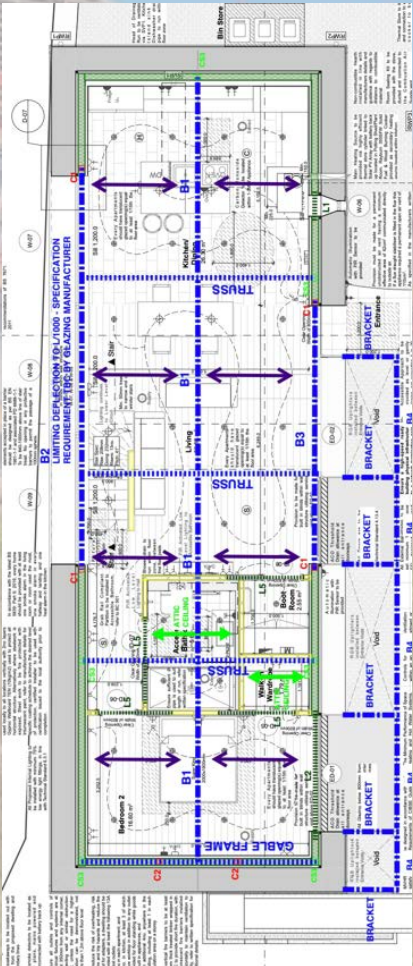
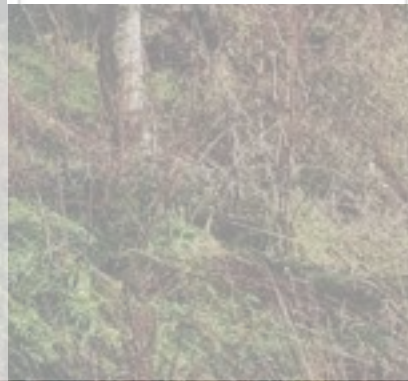
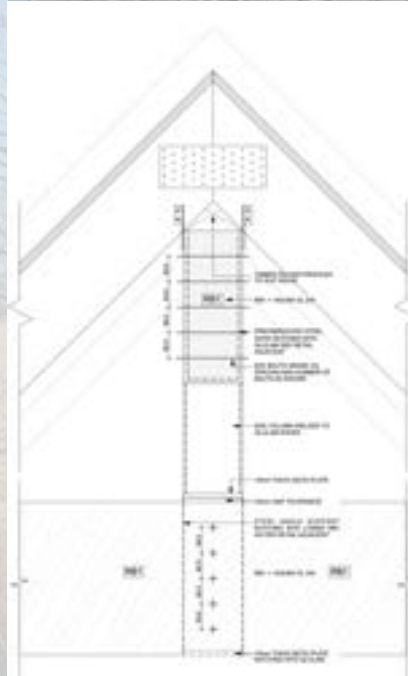
- ❖ **CONSIDER THE STABILITY OF THE STRUCTURE**
- ❖ Tall narrow structures and those with limited internal walls (and/or walls that do not align between floors) are more complicated and therefore more costly to stabilize

- ❖ **AVOID LARGE STRUCTURAL SPANS ABOVE CRITICAL ELEMENTS**
- ❖ Transfer beams above glazed bifold doors need to be designed to strict performance specification increasing the structural depth and/or weight = increased cost

- ❖ **MAXIMISE AVAILABLE STRUCTURAL ZONE**
- ❖ The deeper the zone available, the more efficient the structure becomes (minimum 310mm for airtight structures requiring MVHR)

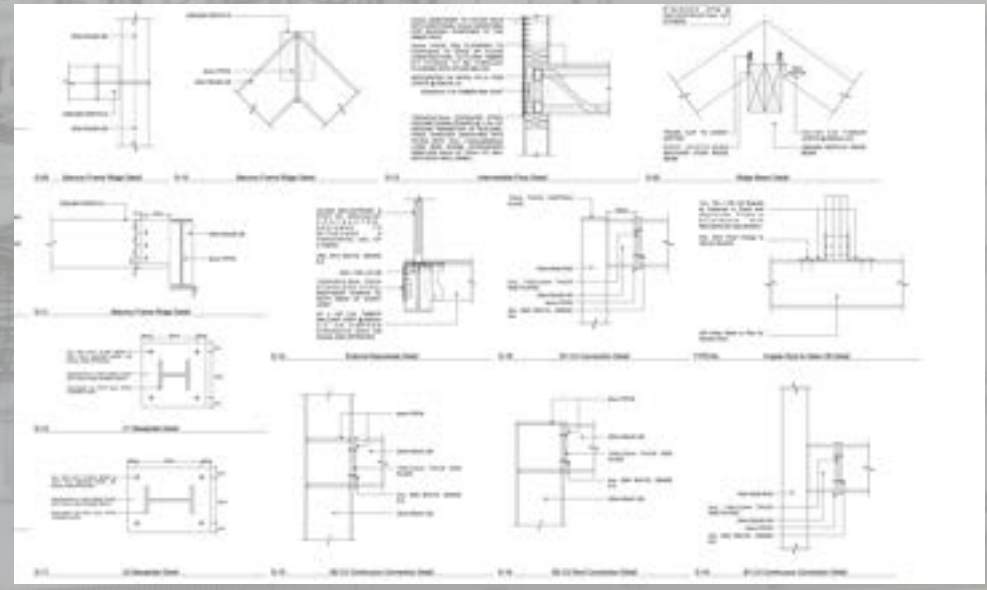
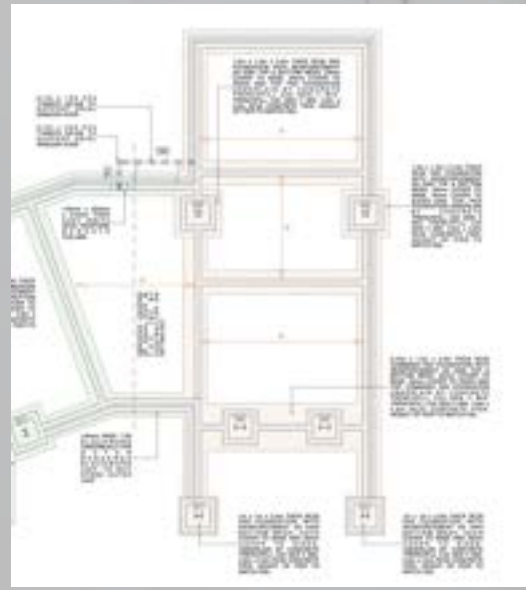
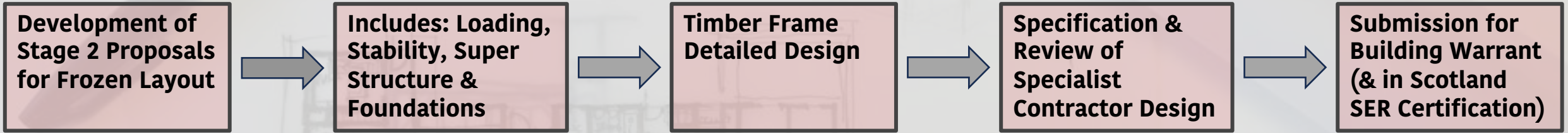
- ❖ **SIMPLIFY THE ROOF STRUCTURE WHERE POSSIBLE**
- ❖ Vaulted ceilings with varying ridge heights introduce difficult detailing if there is an opening plan floor layout below

- ❖ **SIMPLIFY DETAILING AND AVOID THE REQUIREMENT TO DETAIL AGAINST COLD BRIDGING**



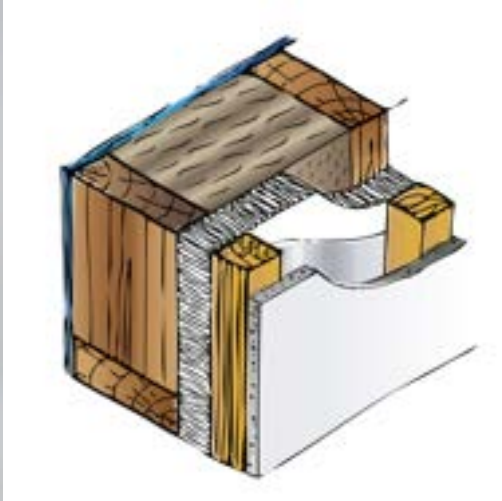


STAGE 3: STUCTURAL DESIGN AND DRAWINGS FOR WARRANT BUILDING REGULATIONS



COMPARING METHODS OF CONSTRUCTION

TIMBER FRAME CONSTRUCTION



SIPS CONSTRUCTION



ICF CONSTRUCTION



PROS

- ❖ Speed of construction – Reduced site time – quicker to wind and watertight
- ❖ Greater cost certainty
- ❖ Prefabricated panels reduces site wastage
- ❖ Sustainable – Sourced from well maintained sustainable forests
- ❖ Lightweight frame helps buildability and reduces foundation costs
- ❖ Low embodied carbon compared to other construction options

PROS

- ❖ Speed of construction – 5-7 days typical
- ❖ High performance pre-insulated sip panel structure
- ❖ Prefabricated panels reduces site wastage
- ❖ Lightweight frame helps buildability and reduces foundation costs
- ❖ Low embodied carbon compared to other construction options
- ❖ High levels of air tightness 2-4 acph

PROS

- ❖ Excellent air tightness
- ❖ Great for projects where retaining walls are required
- ❖ High insulation and acoustic performance
- ❖ Can be constructed in a wide range of weather conditions
- ❖ Integrated with raft foundations (where ground conditions permit)

SER CERTIFICATION CONSIDERATIONS

- ❖ **SPECIALIST CONTRACTOR DESIGN ITEMS – INCLUDED IN SCHEDULE 1/FORM Q**
- ❖ Feature glazing (>2m² or acting as barrier (with 800mm of finished floor level)
- ❖ Piling Design (if required)
- ❖ Balustrades
- ❖ Timber truss design
- ❖ **SUPPORTING CALCULATIONS REQUIRED PRIOR TO FABRICATION**

- ❖ **SPECIALIST CONTRACTOR DESIGN ITEMS – EXCLUDED FROM SCHEDULE 1/FORM Q**
- ❖ Steel stairs or bespoke timber stairs beyond the scope of BS 585-1
- ❖ If not available at warrant submission a staged warrant/SER may be required