



Structural Report Planning Application **186 Creighton Avenue**

SD Structures Project Reference

SDS1456

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Rev P0



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1.0 Introduction

SD Structures have been contacted by XUL architects, on behalf of the property owners, to provide structural engineering design services for the project on 186 Creighton Ave, London N2 9BJ, located on the council of Haringey, London. The existing structure built on site consists of a 3-storey building of traditional masonry construction with timber floors, occupying an area of approximately 150m².

The proposed works consist of the demolition of the existing building and the construction of a new 3-storey structure with a similar plan area and the addition of a single storey rear extension. The new build will incorporate a layout which allows for a more efficient usage of the space, with better communication between different compartments and more comfortable living, an improvement in the thermal and acoustic performances which will result in a much more efficient use of energy and the construction of a sustainable structure.

This report is a support document to the planning application providing information on the structural engineering considerations, the preliminary design, and a summary of the sustainability approach.

2.0 Structural Considerations

This section presents the structural engineering considerations and the preliminary design undertaken to choose the construction type for the project.

The geometry of the new building is considered suitable for several type of construction with masonry, structural insulated panels (SIP's) and timber cassettes being the ones initially considered. This is because there is a regular distribution of walls throughout the plan, most of them walls are continuous in height and the spans are generous. There is the need to introduce some steel elements within the design however that integration is possible regardless of the construction type adopted.

The three types of construction were compared in terms of structural characteristics, constructability and time, environmental considerations, and cost.

Despite being a well know construction typology, widely mastered by contractors, with good strength characteristics, significant thermal mass and cheaper cost of construction, masonry cavity construction was ultimately not chosen as the preferred type due to its long construction time, its carbon footprint being higher when compared with the other options and its significant weight resulting in bigger foundations i.e. more concrete.

SIP's and timber cassettes are two very similar types of constructions as both involve prefabricated panels that are assembled on site. Both are light weight which results in smaller foundation volume, due to its prefabrication nature the overall construction program is likely to be shorter than masonry cavity construction, both allow for an integration within the PassivHaus concept if chosen, as both are environmentally friendly from their ability to create well-insulate, airtight buildings, M&E work can be accounted for by the manufacturer and its *lift and bolt* erection method means wet trades are all but removed and both use low embodied carbon structural materials (timber). Timber cassette was chosen as the preferred construction typology due its lower embodied carbon, wood fibre insulation instead of PU insulation, its better performance against overheating and because the supplier includes the frames, windows, and external doors as part of their package.

Timber cassettes are precision engineered offsite components, used in place of traditional walling and roofs. They are finished to the desired standard, shipped to site and erected using a crane and crew. It's an incredibly simple method that offers an extremely high-quality finish. By using cassettes, the clients benefit from a building that can rapidly seal external facing walls, giving them protection from the elements and improving health and safety.

"Cassettes" is often the term used to describe wall, floor and roof panels factory assembled. Figure 1 shows the general elements that create a timber cassette panel. These panels can either be open panels, comprising studs, rails, sheathing on one face and a breather membrane (Figure 2) or closed panels comprising studs, rails and insulation with sheathings and/or linings on the faces of the panel; a vapour barrier is provided on the warm side of the insulation and a breather membrane on the outer face of the panel. Closed panels may also include fitted windows and internal service zone battens (Figure 3).

Floor cassettes are fully assembled groups of joists, rimboards or rimjoists with structural subdeck fitted to enable lifting as a completed assembly. Treatments to the timbers are often coloured for differentiation. Floor cassettes may also include fitted insulation and lining materials (Figure 4).

The foundations of the project are proposed to be materialised with concrete strips and pads. Given that in some locations the proposed new walls are on the same alignment as the existing a site investigation has been undertaken to establish the existing soil conditions and the possibility of reusing some of the foundations.

APPENDIX A show the preliminary structural design undertaken to highlights the projects key structural elements, areas where the structural might be simplified and provide a base for the preliminary costing estimate.

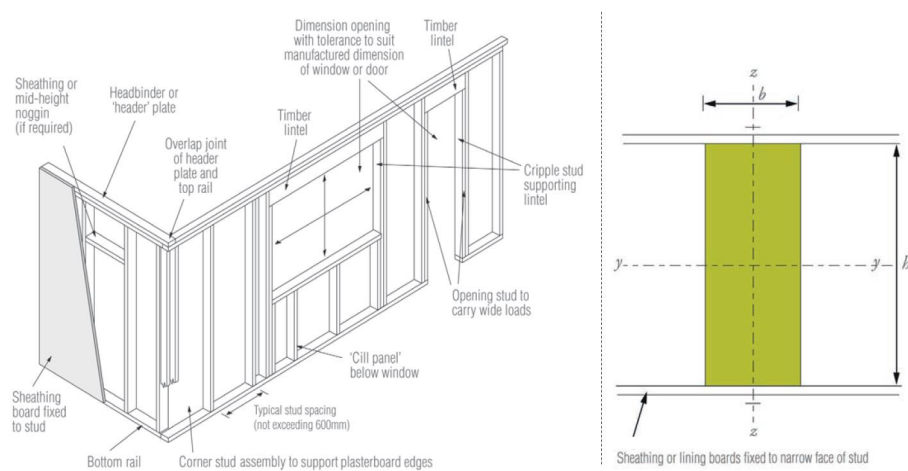


Figure 1 - Elements of a Cassette Panel



Figure 2 - Open Panel



Figure 3 - Closed Panel



Figure 4 - Floor Panel being lowered

3.0 Sustainability

This section discusses the opportunities within the current scope of the project to enable the client to produce a more sustainable project. The construction methodology and materials used are examined, but this chapter does not discuss options for the servicing strategy or the end use of the building.

To further minimise the embodied energy of a building a sustainable structural design will be key. This can be achieved in the following ways:

- Efficient design, to minimise material use.
- Simple design, e.g. Minimising complex transfer structures, when possible, which will minimize the materials used hence the embodied energy in the structure.
- Future proofing the design to enable flexibility of use.

These three approaches are commonly taken for granted, as they often mirror other project objectives, e.g. project cost and or program, but they should not be overlooked when evaluating the sustainability of the structural design

Within the scope of the project the main structural materials used are timber; for walls, floors and roof panel; concrete, for new foundations, slabs and retaining walls; and steel, for long span beams and high point loads.

The timber used typically contains around 50% carbon (in comparison with its net weight). This helps determine an estimate for a building's carbon footprint and gives our clients the added satisfaction in knowing their project is benefiting the environment. However, it is important that the timber used is obtained from sustainable sources.

Sustainable timber refers to timber that has been harvested responsibly from well managed forests that are continuously replenished and ensure that there is no damage to the surrounding environment, or to native flora and fauna. In the UK the main ways to demonstrate timber is sustainable is by obtaining certification from either the FSC® (Forest Stewardship Council®) or PEFC® (Programme for the Endorsement of Forest Certification). Timber from well managed sources, such as FSC® certified forests, is a natural, renewable solution for global environmental problems such as climate change, ecosystem destruction and landscape deterioration caused by increasing human consumption. Besides forming a natural ecological habitat, forests are an important carbon sink by filtering CO₂ out of the air and absorbing into the biomass of the tree.

Concrete is typically the construction material with the higher rate of embodied carbon, however with the advance in technology and awareness the re-use of material, several considerations can be included in the project with the goal of reducing that rate. Often referred to as *Green Concrete*, green concrete is a concrete that contains recycled or secondary products. There is no industry standard for "Green Concrete" and the required percentage of secondary products within the mix in order for it to be described as green. However, BREEAM award a credit for the use of 25% recycled or secondary aggregate.

Concrete can meet most engineering design requirement and is a material that can be recycled. Recycled concrete can play a key part of the both the construction and demolition of the proposed building by using / being used as recycled aggregate. Products from other industries can be also incorporated in the concrete, such as secondary aggregates, i.e pozzolanic constituents or concrete additives such as fly ash and GGBS. Because there no industry standard for Green Concrete the percentage of used of recycled products within the structure is sometimes used as a benchmark for a development aiming to be perceived as market leaders. As such this percentage could be measured and monitored through the construction process.

It should be noted the following risks in achieved a green concrete mix:

- Cost

The cost of secondary aggregated can vary by up to 15% dependant on demand.

- Program

The use of secondary aggregated and additive can slow down the curing process, if this is not managed properly this could delay the overall program.

- Creep

Recycled concrete as aggregate will typically have higher absorption and lower specific gravity than natural aggregate and will produce concrete with slightly higher drying shrinkage and creep. These differences become greater with increasing amounts of recycled fine aggregates.

The increase in creep will need to be factored into the structural design as the amount of creep directly influences the deflection of concrete elements. If green concrete is specified on the project material testing maybe required in order to verify the material properties. As such it may not be possible to update the design until the green concrete mix is finalised and corresponding tests have been carried out.

As part of the tender, the contractors should include a percentage of recycled or secondary products as part of their tender return. Early appointment of a concrete contractor is recommended so that different concrete mixes can be trailed.

Adapting Design and Construction

By adapting the construction process, the embodied energy in the structural design could be reduced. SDS would recommend that the contractor be asked to propose a list of potential saving in embodied energy by modifying the construction process. i.e extending curing times, especially of foundations, by reducing the cement content.

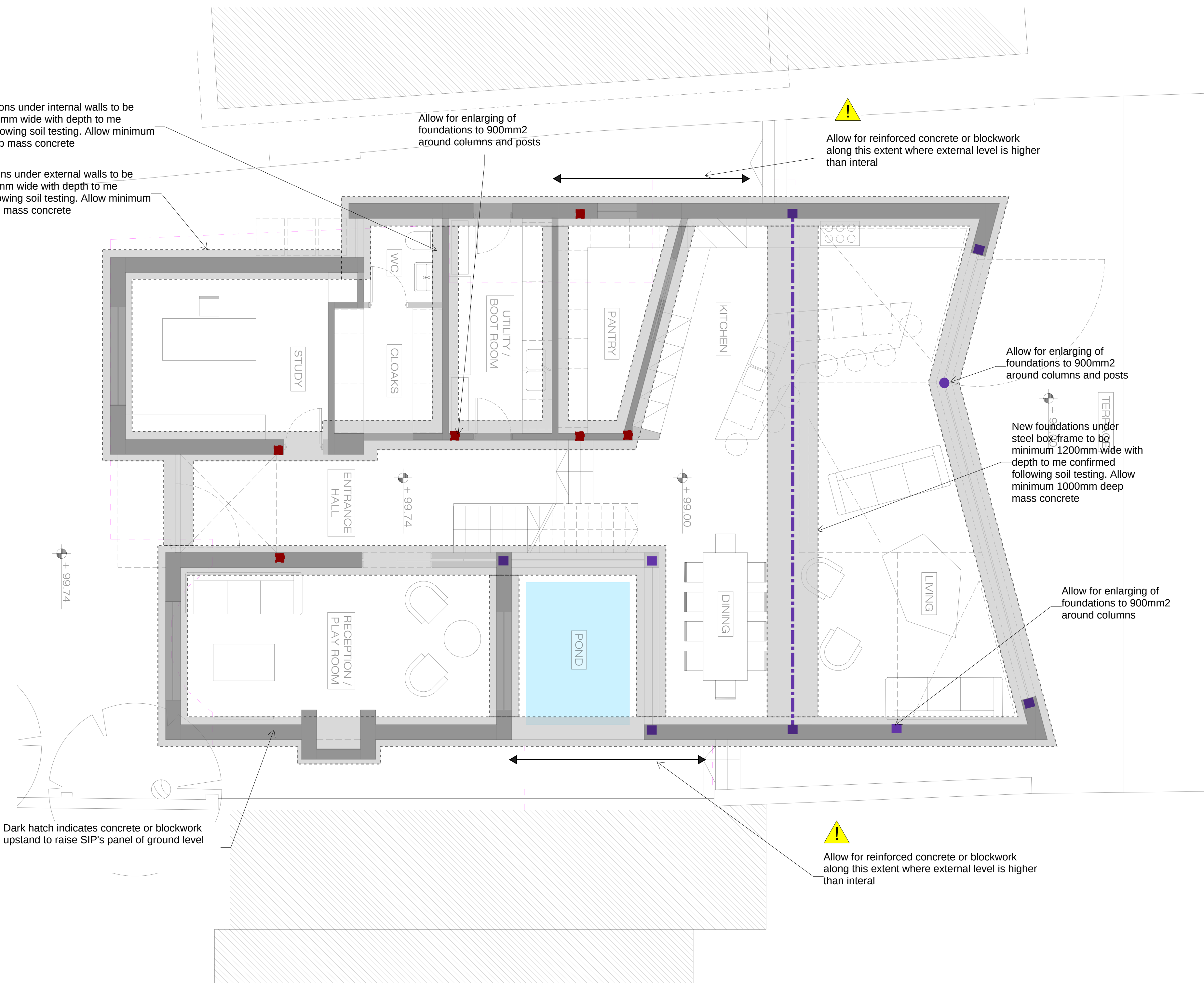
Alternatively, these items could be developed by the design team and added into SDS specification but there may be cost and program implications of this approach and it may limit the number of contractors able to tender the project. As such SDS' best practice guidance is that the contractor should propose a list of possible sustainability measures for the project team to comment on.

CEMFREE

Advice can be sought out from a concrete mix design company who provides a low cement mix concrete by introducing an alkaline binder. The cemfree mix is 84% lower in embodied CO2 per m3 than standard concrete mixes. At the time of writing, CEMFREE is still not the industry standard and there is an undergoing verification process for the use of reinforcement with such mix, and until this is obtained SDS would not recommend using this product for any reinforced structured element.

However, CEMFREE could still be used on non-structural elements, such as concrete blinding and mass filled elements. SDS' best practice guidance is that the use of CEMFREE is discussed as part of the tender process but not listed as a key requirement.

APPENDIX A



Foundation Plan
1:50

- Notes:
- These drawings are not to be used for setting out purposes. Refer to the latest Architects information and site measure as required.
 - Contact SD Structures in the event of any discrepancies between findings on site and these drawings.
 - Drawing is to be read in conjunction with the SD Structures Engineer's Specification and General Notes.
 - 3D views are indicative only and any conflicting 2D information should take precedence. If in doubt contact SD Structures prior to starting work

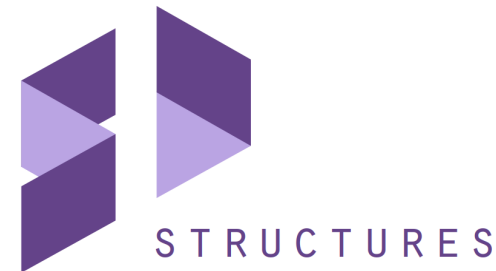
KEY					
	Existing	Concrete	Steel	Timber	Masonry
Beams	Ex beam				
Column / pier					
Wall					
Column / wall below					
Slab/floor	Ex				

KEY CONT'D	
	Foundation below
ps	Padstone
	Lintel above
DJ / TJ	Double / triple joist
⌂	Crank point
⌂	Lateral restraint strap

Hazards noted thus

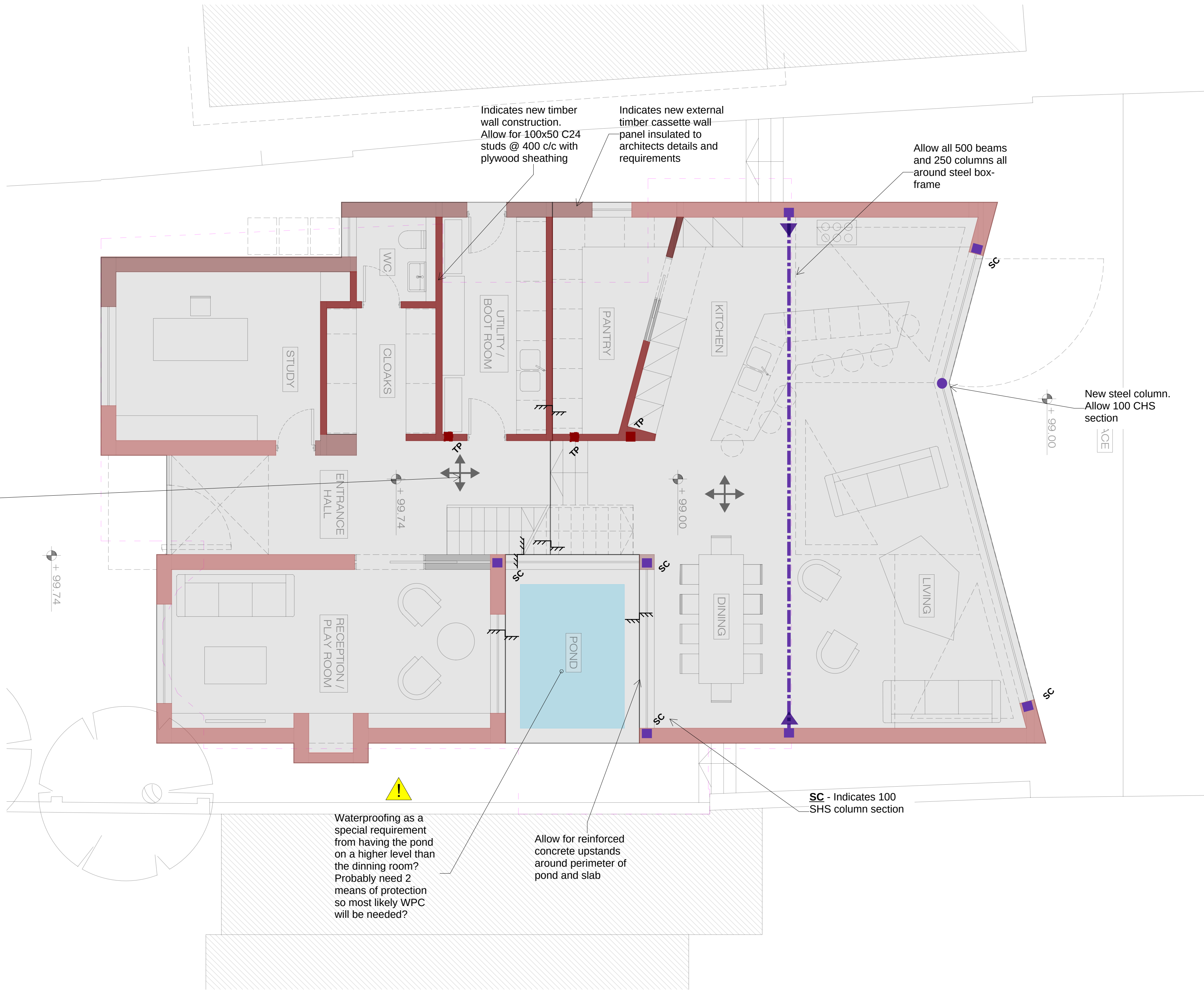
NOTE:

SIP's panel need to be raised from the ground level by approx. 150mm therefore allow for an upstand in concrete or blockwork under each panel.



S1 Suitable for Coordination	
186 Creighton Avenue SDS1456	Eng: RC Drawn: RC
Foundation Plan Timber Cassette Option	
Proj Orig Lev Rol No Status Rev	1456 - SDS-FN-S-1001 S1 P01

P01	Issued for Coordination	02/08/2022	RC	RC	Scale: As indicated @A1
Rev	Amendment	Date	Drawn	Eng	



Ground Floor Plan
1:50

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Wall					
Column / wall below					
Slab/floor	Ex				

KEY CONT'D	
	Foundation below
ps	Padstone
DJ / TJ	Double / triple joist
⌵	Crank point
⌵	Lateral restraint strap

Hazards noted thus

P01	Issued for Coordination	DATE	RC	RC	Scale: As indicated @A1	Proj	Orig	Lev	Rev	No	Status	Rev
Rev	Amendment	Date	Drawn	Eng		1456	-	SDS-GF-S-2000			S1	P01

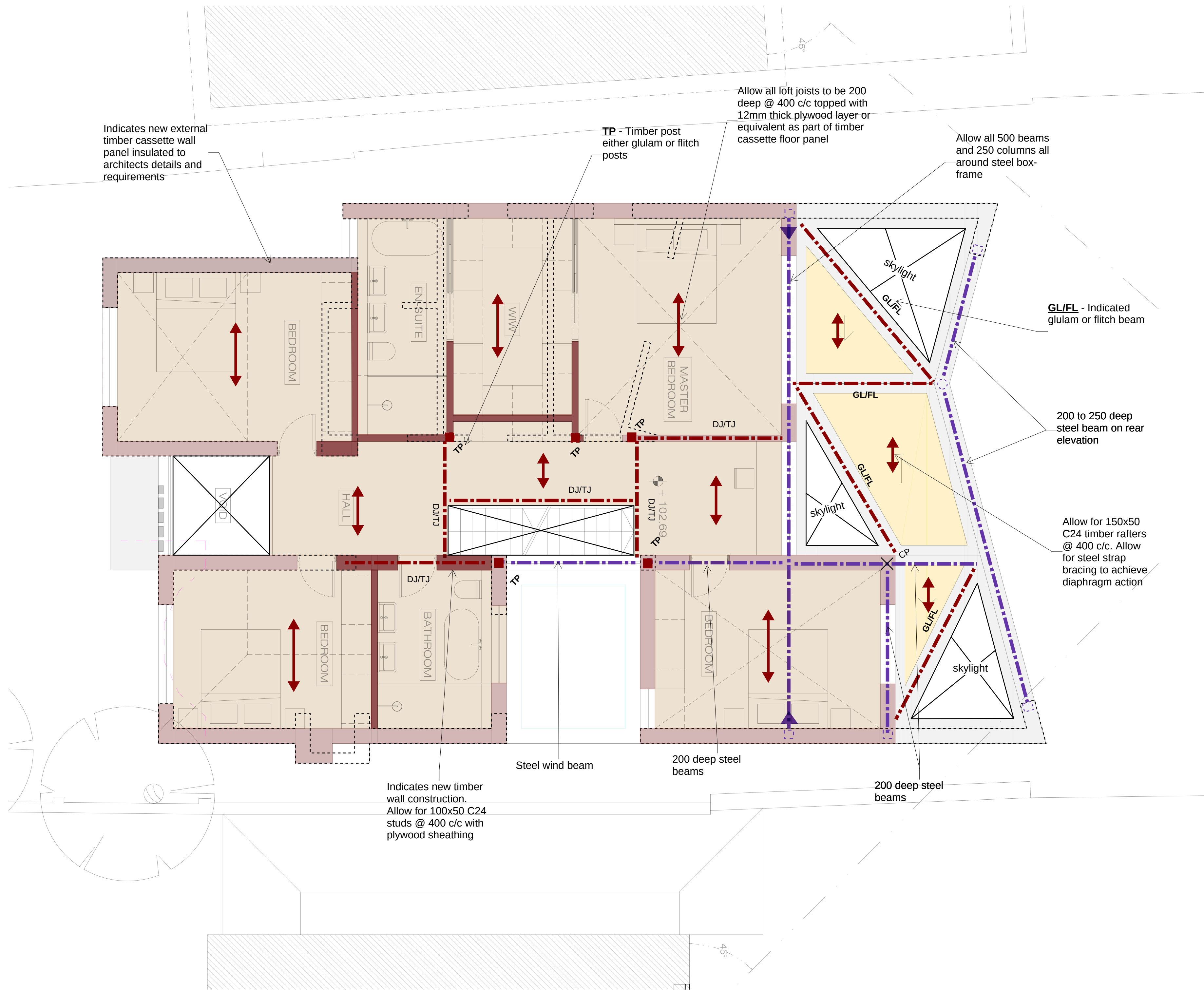
S1 Suitable for Coordination

186 Creighton Avenue
SDS1456

Eng: RC
Drawn: RC

Ground Floor Plan





First Floor Plan
1:50

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Wall					
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KEY CONT'D	
	Foundation below
ps	Padstone
	Lintel above
DJ / TJ	Double / triple joist
CP	Crank point
	Lateral restraint strap

Hazards noted thus

P01	Issued for Coordination	DATE	RC	RC	Scale: As indicated @A1	Proj	Orig	Lev	Rev	No	Status	Rev
Rev	Amendment	Date	Drawn	Eng		1456	-	SDS-01-S-2001			S1	P01

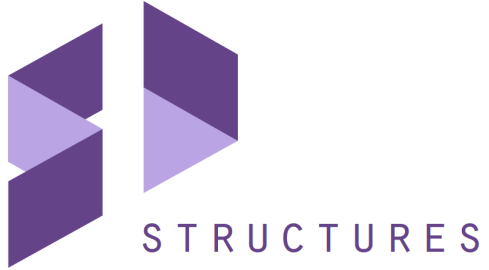
S1

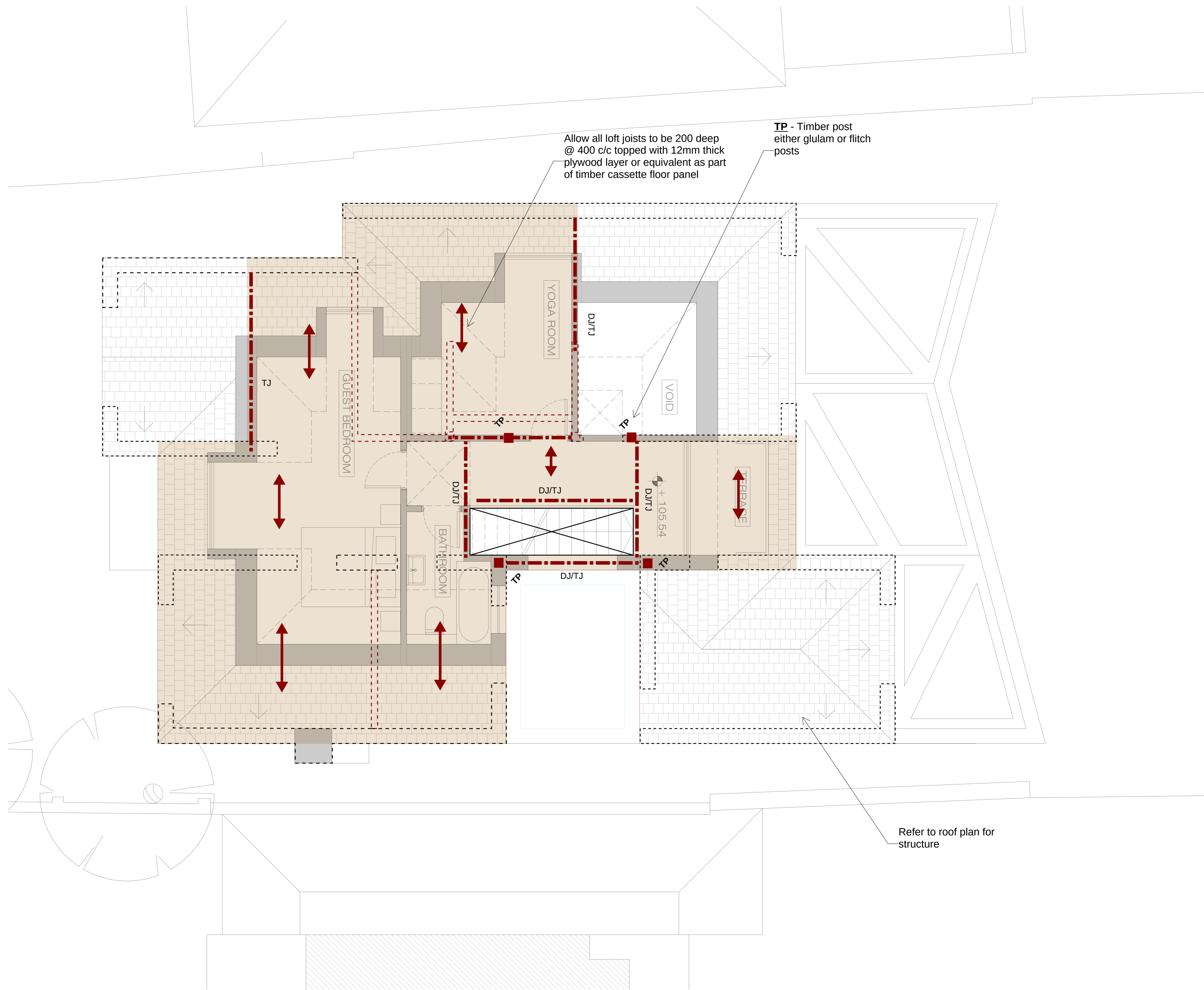
Suitable for Coordination

186 Creighton Avenue
SDS1456

Eng: **RC**
Drawn: **RC**

First Floor Plan





Second Floor Plan
1:50

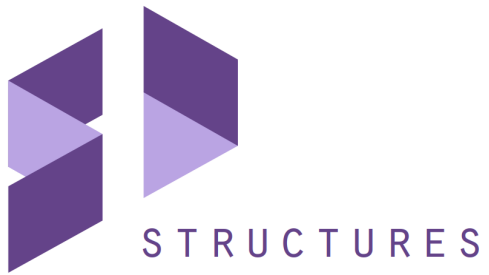
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Wall					
Column / wall below					
Slab/floor	Ex				

KEY CONT'D	
	Foundation below
ps	Padstone
	Lintel above
DJ / TJ	Double / triple joist
CP	Crank point
LR	Lateral restraint strap

Hazards noted thus

P01	Issued for Coordination	DATE	RC	RC	Scale: As indicated @A1	Proj	Orig	Lev	Rel	No	Status	Rev
Rev	Amendment	Date	Drawn	Eng		1456	-	SDS-02-S-2002			S1	P01

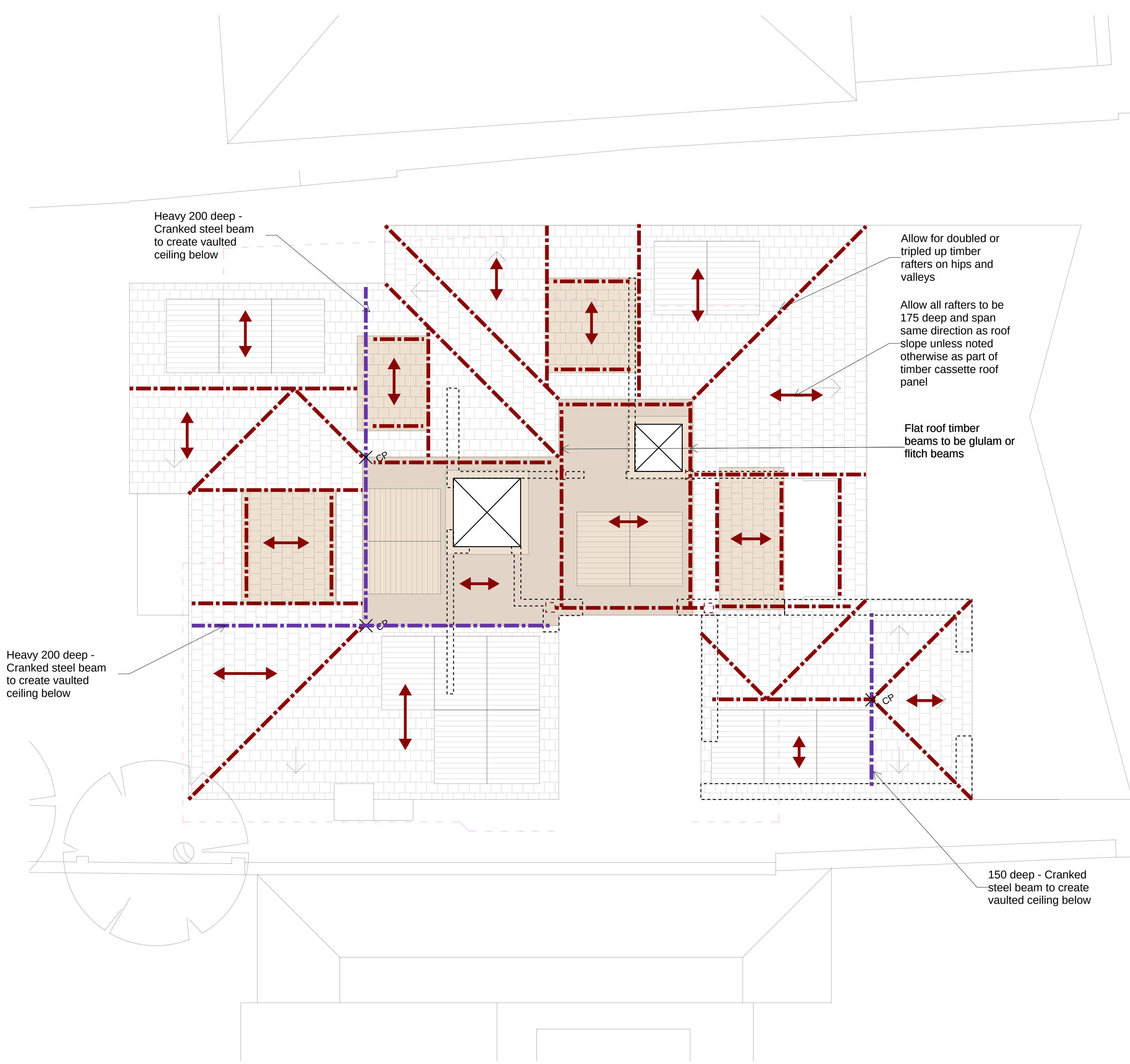


S1 Suitable for Coordination

186 Creighton Avenue
SDS1456

Eng: RC
Drawn: RC

Second Floor Plan



Roof Plan
1:50

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KEY CONT'D	
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	Lateral restraint strap

Hazards noted thus

P01	Issued for Coordination	DATE	RC	RC	Scale: As indicated @A1	Proj	Orig	Lev	Rei	No	Status	Rev
Rev	Amendment	Date	Drawn	Eng		1456	-	SDS-RP-S-2003			S1	P01

S1

Suitable for Coordination

186 Creighton Avenue
SDS1456

Eng: RC
Drawn: RC

Roof Plan