Form

Design Note DN-S-001

Project	24 Heath Drive
Subject	Roof Structural Solution
Job no	162637
Date	17th March 2021

Revision	Description	Issued by	Date	Approved (signature)
01	INITIAL ISSUE	BR	26/03/2021	AI

Introduction

This design note has been produced to describe the design development to the roof proposals at 24 Heath Drive.

The principle of structural solution remains the same as that in the consented drawings, with triangulated steel frames being utilised to support the existing listed roof structure, but it has evolved during the detailed design stage of the project to take into account site discoveries since the original planning application.

Design Development

The structural design for the roof at the time of the planning application showed the intent for the roof support. This consisted of a number of triangulated steel frames to support the existing timber roof structure where existing elements were to be removed to realise the consented Architectural proposals. Figure 1 below shows the structural intent submitted for planning.

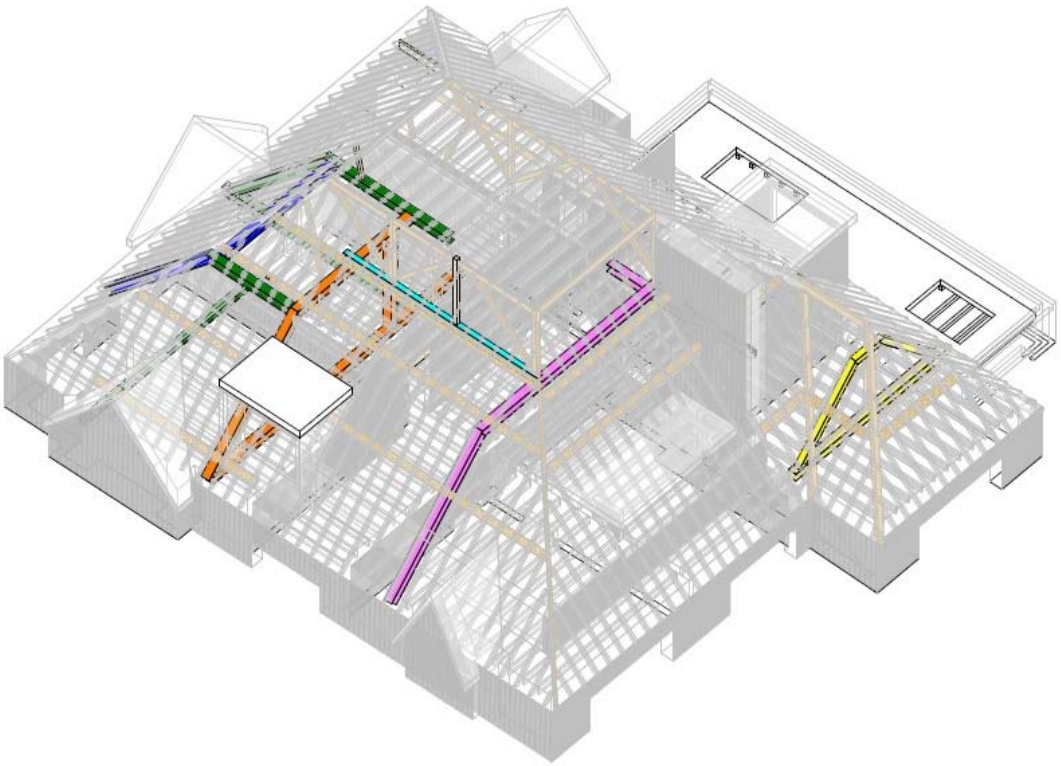


Figure 1 - Roof Structure: Connected Planning Scheme

Following on from this further site inspections have been carried out to assess the impact on the existing building fabric of the proposed scheme, and it was ascertained that a better solution was viable for the roof which utilised more suitable loadbearing elements down the building and required less removal of the existing building fabric. The below sections of this design note document these developments and the reasons for the proposed revisions:

Maintaining the Existing Joists in the Rear Section of the Roof

The consented planning application included a new steel frame to open up the rear section of the roof and house a new plant room. The new planning application now proposes that this will be a new bedroom, but the structural solution for this zone remains the same in terms of steel work required, i.e. a new triangular frame to support the existing roof structure where struts are being removed (see figure 2).

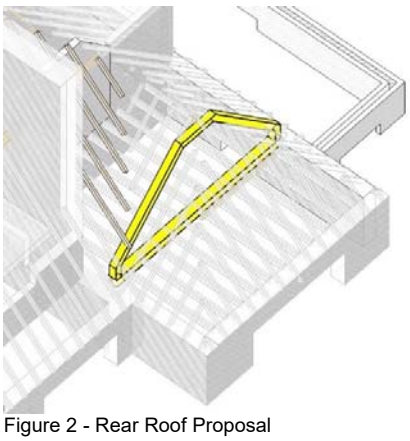
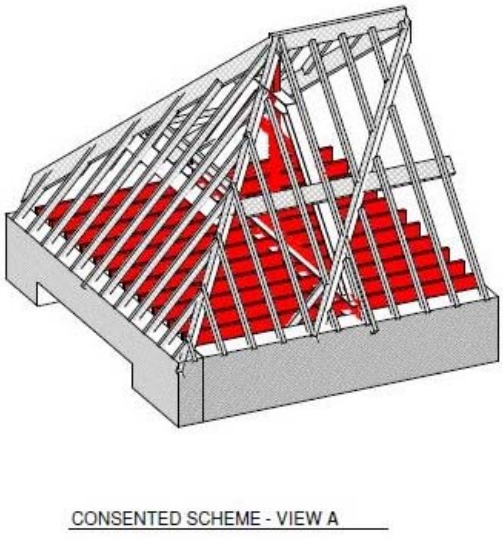
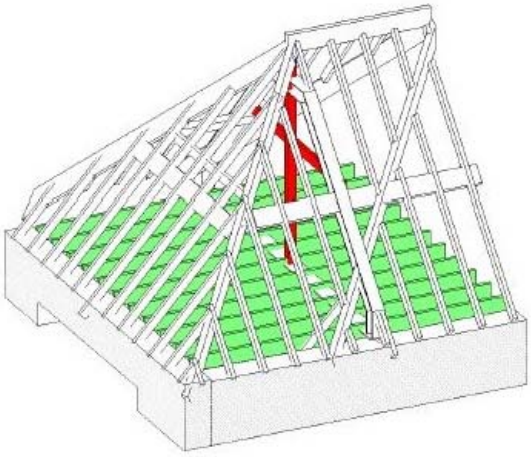


Figure 2 - Rear Roof Proposal

The only proposed revision is that previously, in the consented scheme, it was proposed to remove the existing timber joists supporting the 2nd floor ceiling and replace with new. This has been revised to maintain the existing joists in order to limit the removal of original building fabric and better protect the ceiling below. See figure 3 below showing the existing joists that can now be maintained.



CONSENTED SCHEME - VIEW A



CURRENT PROPOSED - 2021 - VIEW A

Figure 3 - Rear Roof Comparison

Assessment of Load Paths and Removal of Beams from 2nd Floor Ceiling Zone

This development is twofold. Firstly, upon further inspection of the existing structure, it was considered necessary to change the loadpaths supporting the proposed roof structure to areas where the existing structure below is more robust. Please see figure 4 below. The red walls were required to take load from the frames above in the consented scheme but were considered to be insufficient upon further inspection on site. The proposal was therefore revised to take all loads down the green walls, which are solid 215mm thick masonry walls and are much more suitable for supporting the structure above.

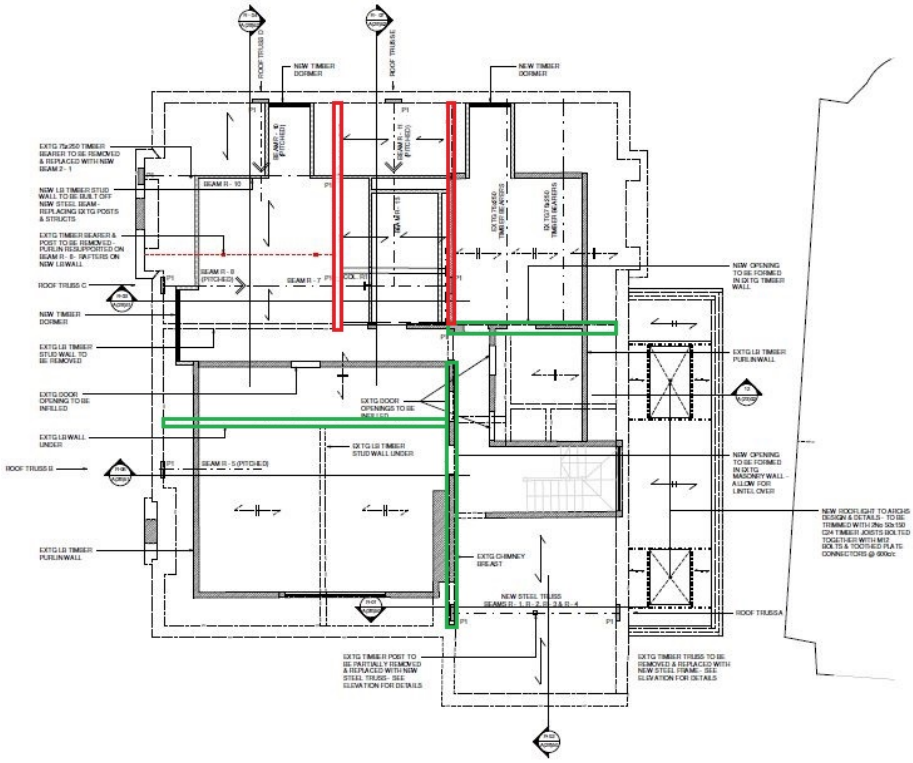


Figure 4 - 2nd Floor Load Bearing Walls Below

The second aspect to this was that the consented scheme required installing new steel beams within the zone of the 2nd floor joists, which support the 1st floor ceilings below. It was therefore proposed to replace these joists, as can be seen in figure 5, which is an extract from consented drawing A(28)52 P3.

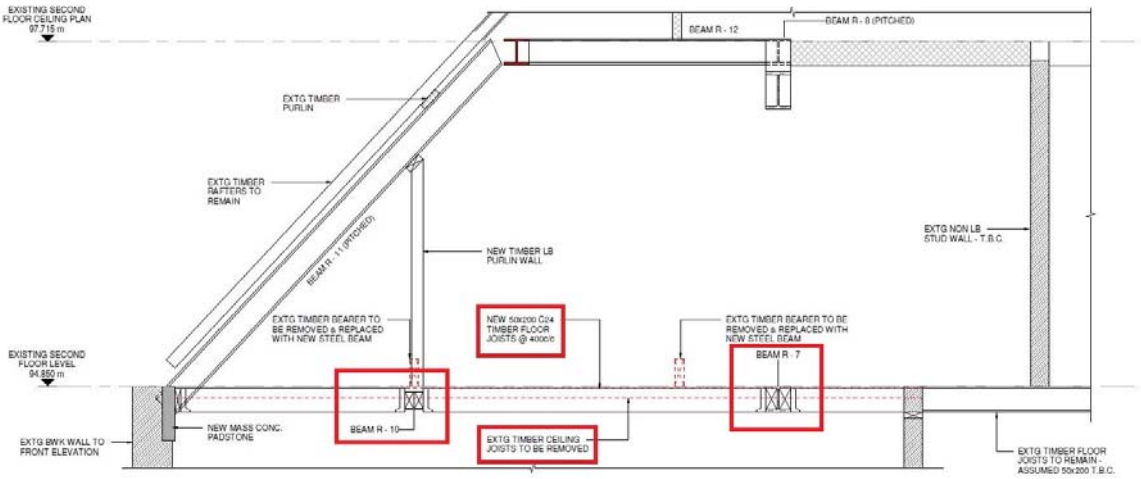


Figure 5 - 2nd Floor ceiling joist replacement

Upon further review, it was felt that more could be done to maintain the existing joists in this zone and offer further protection to the ceiling below, which is historically not in good condition. Therefore additional steel beams are proposed to sit above the existing 2nd floor joists in the zone behind the dwarf wall around the perimeter. These can be seen in purple in figure 6 below.

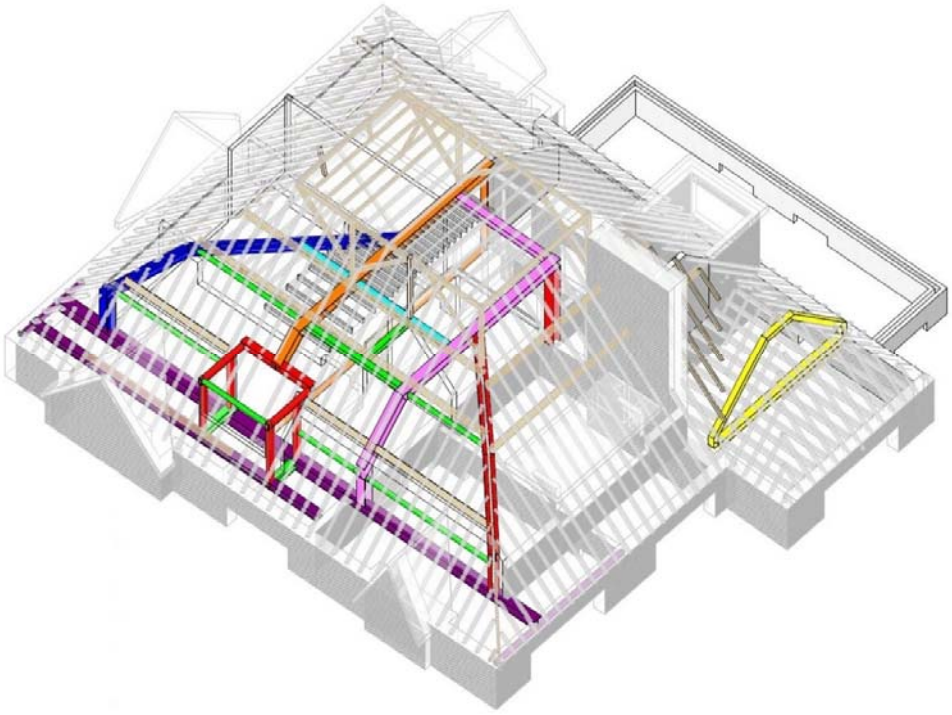


Figure 6 - Proposed Roof Structure

The inclusion of these purple beams allows the removal of the blue beams highlighted in figure 7 below and ensures that no steelwork needs to be installed within the zone of the 2nd floor joists. This reduces the amount of existing building fabric to be removed, protects the 1st floor ceilings as the installation is less intrusive and takes the roof load to the robust green walls shown in figure 4. The joists shown in green in figure 7 show the existing fabric that can now be retained due to the inclusion of the purple beams.

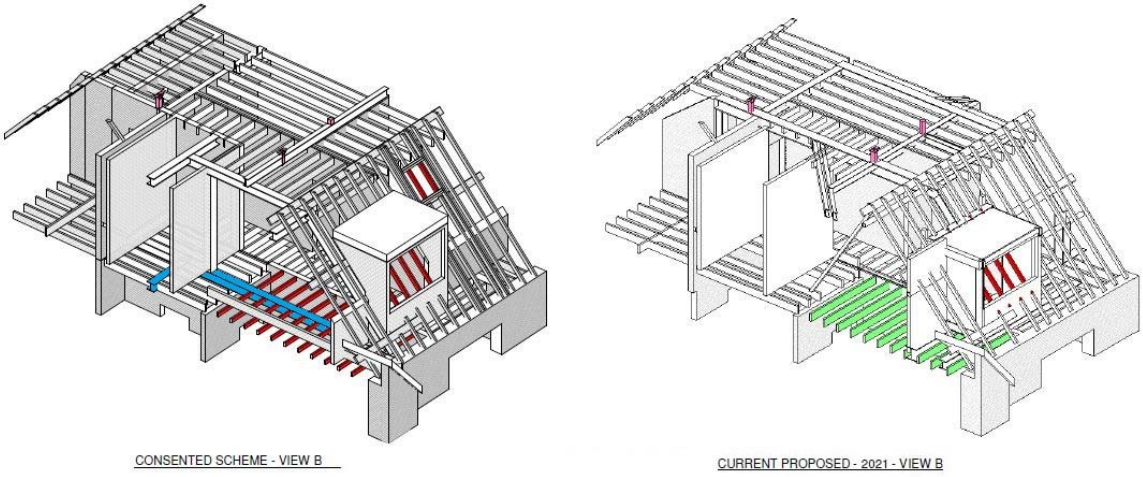


Figure 7 - 2nd Floor Joist Comparison

Summary of Design Changes

Following further site inspections and an increased understanding of the existing building, the design intent for the roof support remains in line with the original intent but has evolved as described above. The original intent in the consented drawings was to utilise steel beams to support the longer spans. This is still considered necessary to facilitate the proposed layouts as timber structure would lead to excessive deflections. Please see figure 8 below for a summary of the changes.

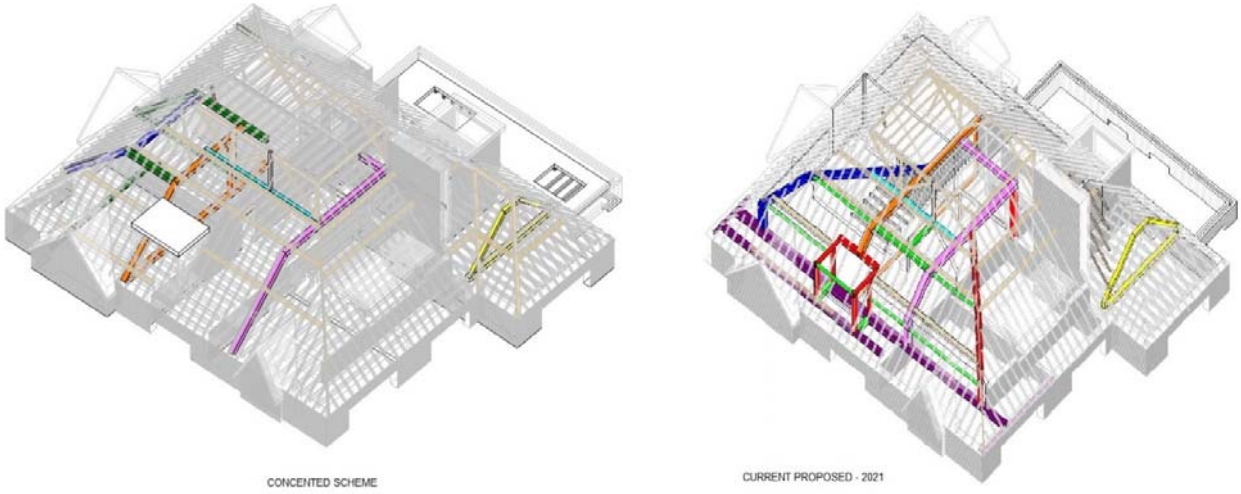


Figure 8 - Consent and Proposed Images

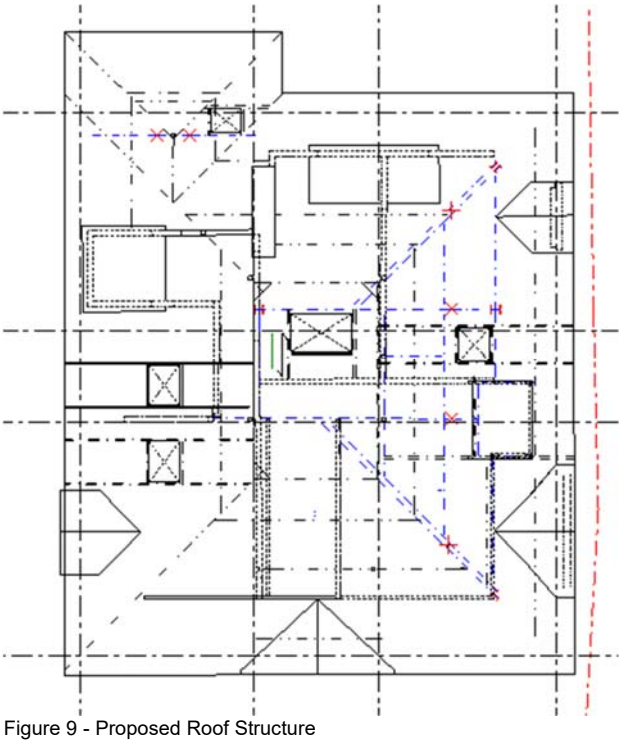


Figure 9 - Proposed Roof Structure

- Yellow frame remains as original intent.
- Pink frames remain as the original intent, but with a new post to the rear to take load onto solid masonry wall at 2nd floor level.
- Orange frame remains as original intent but re-positioned to sit on the line of solid masonry wall below (see figure 4). New dormer is framed to support the frame. This removes the need to remove 2nd floor joists and disturb the ceiling below.
- Green and blue frames move to the hip locations to provide better support and remove the need for new steels in the 2nd floor joist zones. Please note that these steels sit either side of the existing hip beam so the original timber remains in place.
- New purple 2nd floor beams introduced to avoid the need to remove 2nd floor joists and disturb the ceiling below (see figure 7). They also take the roof load to the solid masonry walls below.
- Tie beams between frames added based on detailed design analysis to reduce lateral movements due to wind and therefore protect the remaining timber roof structure.

It is worth noting that these changes were proposed prior to the option of the plant moving into to roof structure and additional bedroom being created. The revised structural proposals for the roof offer a more robust support which will extend the life of the remaining timbers, require less removal of existing building fabric and reduce disturbance to the existing ceilings at 1st floor level.

It is therefore considered that the most suitable proposal for both the consented Architectural layouts and the revised Architectural layouts is the currently proposed structural solution.