COMMON BUILDING DEFECTS
THROUGH THE AGES
(AN INTRODUCTION)

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**Introduction**

Trident Building Consultancy has 4 core service lines, Project Management, Building surveying, Cost Consultancy and Rights of Light.

We have extensive experience of investigating defects in all types of property, throughout the UK and across mainland Europe.

Many buildings display defects typical of their era, locality and use. A (non-exhaustive) list of some of the more common examples is given below. Note that all building defects need to be assessed in the light of the owner’s aspirations for the building, particularly its remaining economic life. In short, they need to be viewed in context.

**COMMON DEFECTS – PERIOD BUILDINGS**

1. **Leaning Chimney Stacks**

   Leaning chimneystacks are generally due to driving rain saturating only one side of the stack. Salts, present in the brickwork and/or the mortar pointing, both naturally or via the combustion process, leech out and crystallise in the mortar joints, causing uneven expansion and a resultant bowing of the stack.

2. **Partially Removed Chimney Breasts**

   It was common for chimneybreasts to be removed for some of their extent in the 1940’s to the 1970’s in accordance with the fashion of the times. In many cases the remaining structure is inadequately supported leading to the possibility of sudden collapse in the future, either of the ceiling beneath where the chimney may bear upon it, or of the remainder of the stack where supported solely by metal angles or the like.

3. **Replacement Finishes**

   When an original timber roof structure is re-covered it can be subjected to substantially higher loads by the new roof finish. This is particularly the case where concrete tiles replace thin Welsh slates.

   Overloaded timbers will lead to sagging of the roof, and inadequate tying of the foot of rafters will lead to the outward splaying of the front and rear walls.

4. **New Roof Finishes, Incorporating Roofing Felt**

   It is common practice when renewing roof finishes to provide roofing felt.

   The felt, while acting as an additional barrier against moisture ingress, can cause condensation within the roof void, leading to decay of the roof timbers. Accordingly, adequate ventilation into the roof void must be incorporated if this is not to occur. This is commonly achieved by the addition of plastic proprietary products.

5. **“Snapped Header” Brickwork**

   Many Georgian builders wished to give the appearance of a quality building at minimal cost.

   In some cases, they achieved this by the use of a thin skin of expensive good quality bricks on the exterior of the wall, which was connected to a thicker wall of cheaper, lower quality, irregularly shaped brick with thicker mortar joints, to form the overall wall construction.

   In order to maintain the illusion of a quality wall, the bricks, known as headers, which ordinarily would have extended across the full width of the wall in a fashionable bond such as Flemish
(to connect the two together) would have been “snapped” in half. This had the advantage of creating two facing bricks from an expensive header brick thus saving money.

However, the difficulties of connecting the two walls lead to a resulting tendency to skimp on connecting headers. Where they exist, over time, differential loads, movement and the difficulty of matching up the joints on the inner and outer wall, all contribute to the connecting bricks breaking and the outer leaf bulging away from the inner.

6. **Timbers within External Walls**

Timber lintels were extensively used in Georgian, Regency and Victorian properties, together with timber bonding, wall and spreading plates. In addition, floor joists were commonly built in to solid walls.

As a result, it is imperative that the external walls and rainwater goods are maintained in good condition if such timbers are not to rot and ultimately fail.

7. **Load Bearing Internal Partitions**

Georgian (in particular), Regency and Victorian properties commonly feature the use of load bearing timber trussed partitions separating the front and rear rooms. Any alterations, such as the insertion of new door openings or the complete removal of the partitions themselves, should consider their load bearing nature.

8. **Gutters and rainwater goods**

Georgian properties can feature internal open trough gutters taking the discharge from the external front parapet gutter through the roof space to the rear elevation downpipe. If the roof profile is “M” shaped, this route can feature multiple troughs and gutters, all of which need to be free flowing and watertight if water is not to penetrate internally, leading to rot occurring.

Such troughs are vulnerable to being blocked whilst both gutters and troughs, being lead lined are vulnerable to failure where the lead is at the end of its life or underlying movement is occurring. Old lead is difficult to patch and modern replacement materials may not accommodate the steps in the gutters (to maintain flow) and may not be compatible with the underlying wood of the gutter boards.

9. **Terracotta or Faience Cladding**

Terracotta (moulded clay blocks) was widely used in the building industry in the period 1840 – 1910 and Faience (as large thin slabs) was fashionable in the inter-war period.

Terracotta blocks were usually fixed to a brick backing, or an iron or steel frame, by means of iron or steel fixings. Faience slabs were usually fixed by bedding into a screed of concrete.

When original used, terracotta and faience were viewed as being highly waterproof, but this is not the case as water is able to enter behind the glaze particularly at the sides, bases and tops of the units. As a result, not only will salts crystallise and disrupt the surface of the glaze or frost cause damage, but the underlying metal fixings and structure will rust, expand and fail, loosening the blocks or slabs.

Only an extremely close inspection will usually reveal the condition of terracotta or faience and event then it may not reveal extensive corrosion of internal fixings.

10. **Embedded Metal Structure**

Iron or steel load bearing frames and lintel sections were commonly enclosed within the external walls of Victorian, Edwardian and inter-war buildings.
If water penetrates through the walls, perhaps due to defective mortar pointing or poor weathering, the metal will rust, and expand, moving stone sections outwards or cause them to split. Brick external walls will crack or have loose bricks. Such splitting, particularly in the case of projecting and lintel sections, could leave sections of stone or bricks in a dangerous condition and liable to fall away from the face of the building.

The rate of corrosion is accelerated by a porous mortar/brick filling, likely to exist between stone and steel, which acts as a sponge to keep the steel work in a constantly damp environment. In some cases, the movement and cracking are likely to be aggravated by the expansion forces generated during the freezing of entrapped water.

Clinker concrete, commonly cast around lintels and frame sections in late Victorian, Edwardian and Inter-war properties will leach acidic solutions which will further increase the rate of corrosion of encased metal.

**MODERN OFFICE BUILDINGS**

1. **Marble, Slate, Cast Stone Panels**

   Many Edwardian to early 1970’s buildings feature marble, slate or cast stone panels. It was common for some, or all of these panels to be fixed with mortar dabs, which fail in time allowing the panels to fall away.

   In addition, iron or steel fixings were frequently used which fail due to their rusting following water penetration.

2. **Mosaic Tiles/Brick Slips to Concrete Surfaces**

   It was fashionable in the late 1950’s, until the early 1980’s to cover exposed walling, panels and concrete frames with mosaic, small tiles or brick slips (cut bricks).

   Unfortunately, insufficient allowance was usually made for thermal movement and contraction while their adhesion to the underlying surface was not always adequately specified and achieved on site. As a result, such finishes can fall away from the building without warning.


   Many 1950’s and 1960’s buildings have pre-cast concrete cladding or early forms of curtain walling which, at the time of their erection, was considered innovatory.

   Their weather-tightness depends upon the use of baffles and mastics, the limitations of which were not fully appreciated at the time nor the need for regular maintenance. As a result, water penetration through similar cladding/curtain walling can occur.

4. **Expansion Joints**

   In Post War properties until the late 1970’s, Architects generally failed to take into account the need to allow for movement of the various elements making up the building fabric. Accordingly, the number and location of expansion joints provided may well be insufficient when judged under modern day standards. As a result, thermal expansion and contraction of the various elements may cause cracking, failure of fixings and, ultimately, affect the structural stability of the building.

5. **Recessed/Raked Mortar Pointing**

   Recessed mortar pointing was especially popular during the mid-1960’s until the mid-1980’s.
The use of such pointing requires a careful match between its porosity and the type of brick chosen to accompany it. Bricks of low absorbency increase the flow of rainwater to the joints and thus, potentially, the quantity of water reaching the cavity between the two leaves of the external wall. Conversely highly absorbent brickwork will become even more so if utilised in the company of dense mortar pointing.

Unless carefully specified and supervised, the use of recessed pointing in external walls can frequently lead to excessive water ingress into the cavity. This combined with poor detailing of ties or the cavity being filled with certain forms of full fill cavity insulation will lead to damp penetrating to the interior of the property.

Recessed pointing not only reduces the overall barrier presented to rainwater ingress through the mortar joint but also exposes the arises (edges) and a small proportion of the top surface, of the bricks, areas which are more absorbent than their faces, and thus vulnerable to damage arising from frost.

In short, recessed pointing should only be used in conditions of sheltered exposure, with frost resistant bricks and not where full fill cavity insulation has been installed.

6. Inadequate Concrete Cover

The structural adequacy and longevity of reinforced concrete depends upon its permeability, any additives used and the depth of cover provided to the integral steel reinforcement bars. From its first use (circa 1897) until the late 1960's this was not taken into account with the result that older reinforced concrete tends to have inadequate cover when judged by modern day standards. Failure of the concrete results from rusting and expansion of the reinforcement bars causing the concrete cover to crack and fall away.

7. Flush Copings and Window Cills

Modern architectural fashions of the 20th Century in many cases lead to the omission of elements which threw water away from the underlying construction.

It is good building practice to ensure that coping stones and window cills project away from the face of the underlying wall. If this is not achieved, the wall beneath is exposed to a much more severe rainwater flow than would otherwise be the case, with a consequential increased likelihood of deterioration of the wall and its components, in turn leading to water penetration internally.

8. Incorrect bricks and cavity detailing

Bricks are best thought of as sponges of varying degrees of porosity. Not all bricks are equal, with many only suitable for use in sheltered or moderate conditions. An appreciation of how exposed the subject property is and which elements of the property in turn are exposed or sheltered will dictate the choice of brick.

In modern cavity construction the correct use of cavity trays (and their correct installation) is crucial to throwing the inevitable water penetration through the exterior leaf of bricks and mortar away to the exterior thus helping keep the inner leaf dry. Where the wall construction features a cavity, then the chance of water penetration is markedly increased where there is poor detailing or workmanship of the building elements within the cavity (such as missing or inadequate cavity trays or mortar covered cavity wall ties).
INDUSTRIAL BUILDINGS

1. Plastic-coated Steel

   Many buildings feature the use of plastic-coated steel cladding.

   Instances of failure of the plastic coating, allowing the steel substrate to corrode and thus rendering the sheeting incapable of carrying the design loads, are found in cladding manufactured pre-1992.

   Such cladding was commonly cut to suit on site, leading to the underlying steel becoming exposed and vulnerable to corrosion, particularly in a marine or corrosive environment.

2. Shallow Industrial Roof Pitches

   During the 1970’s onwards, shallow roof pitches became popular but because of their reliance upon good design and workmanship, failures have occurred.

3. Shallow Gutters

   Many industrial buildings from the 1970’s onwards feature the use of gutters, which have a minimal fall. These rely on a progressive build-up of rainwater run-off from the roof to keep them clear and working. As a result, it is vital that they are cleaned regularly in order to work as intended and are properly constructed in the first instance.

4. Hidden Rainwater Downpipes

   It is common for downpipes to industrial premises to be hidden within the wall construction with no allowance made for any access, which may be required to them in the event of their becoming blocked.

5. Hidden Structural Steelwork

   In many cases, the steelwork forming the structure of the premises is enclosed within the external walls.

   As a result, the durability of the steelwork is dependent upon it being separated from the outer leaf of the wall construction together with correct detailing of cavity trays and the like achieved to prevent any moisture being transmitted across the cavity to the steelwork.

NB. Detailed specialist advice should be taken before taking or refraining from any action as a result of any comment made in this publication or the accompanying talk, which is intended as a brief introduction to the subject of building defects only.