ABSTRACT. Processes of intensification lead to some unforeseen consequences. One such unplanned consequence is the rearrangement of existing buildings in new or revised spatial patterns. In pursuit of higher densities, large lot suburban development inherited from previous generations – the quarter-acre section – is “intensified” by cross-leasing rear gardens. The site frequently has greater commercial value than the existing buildings. Where the existing house is below the value expected by the market a house mover can be contracted to saw the building into sections, and truck it away to another, lower value site. In larger developments several houses may be shifted off a site to clear space for higher density new housing.

Houses subjected to this rearrangement are known as “re-locatables”. They are displayed in “relocatables yards”, from which they can be purchased for re-use elsewhere. The practice is known in other countries where timber frame construction is a standard house-building method, but is thought to be a more popular habit in New Zealand, where up to 10% of the annual housing supply is affected by moving buildings. There are casualties in this process including historical reliability of the urban landscape; but there is also an argument in favour, since analysis shows that the practice of re-cycling has merit as a sustainable building supply methodology. This paper explores the increasingly temporary nature of the built environment in New Zealand’s cities: the temporary reality of suburbia as a phenomenon of, on one hand, a socio-cultural disinterest in permanence of place, and on the other, a building culture of light-weight construction that can readily relocate its products.

Keywords: relocating houses, temporary habitats.

INTRODUCTION

This paper explores an aspect of the built urban and suburban environments in New Zealand: the temporary reality of suburbia as a reflection of, on one hand, a building culture of light-weight construction that can readily relocate its artefacts, and on the other an apparent socio-cultural disinterest in notions of permanence.

Moving buildings from place to place has been an accepted custom in the New Zealand housing culture from the earliest period of European settlement. Houses that have been “re-located” are not apparently stigmatized by market prejudices, despite their exclusion from most new sub-divisions. Rather than penalise relocated houses, normative market perceptions extend a generally uncritical approval, particularly for the rimu heartwood framing which is no longer obtainable, the recovery of old hardwood flooring and fireplaces, original doors and windows and more surprisingly is even tolerant of out-dated room layouts. The primary structure and spatial organisation of the house is retained: only components of the building that need attention in the short term or those that would have to be renewed with or without relocation are affected.
Recycling whole buildings is a process that achieves low waste of resources, minimal waste to landfill, minimal resource depletion, and has, in the common course of the process, the potential social benefit of high levels of personal participation. Alternatively, demolition and limited component recycling, with additional costs of handling and further loss by attrition - including damage to materials, and unusable off-cuts - acts against economic material recovery, and reinforces the argument for relocating the entire building. The re-locating of houses might be considered an ultimate form of recycling, and thus have implications for the general narrative of sustainability.

This study divides into two parts, to separate environmental issues from those that bear on the wider discourses of social history, architecture, urban planning, and the principles of conservation. It is suggested that the process of relocation is worthy of examination, (a) to investigate relocations as an element of sustainable housing supply, and (b) to consider the principle of relocation in the context of the prevailing policies aimed at more compact urban form by which it is intended that population densities will be increased.

Housing economics and technical parameters predominate in the first of these two areas, and in the second, cultural and social issues take precedence. Technical-environmental aspects of relocations are considered first, to confirm the validity of the practice as an aspect of sustainability.

**METHODOLOGY AND LITERATURE**

The main source of data for this study are the industry's own resources, set in the context of official statistics and a small collection of literature, including reporting in the general media. The methodology relies on materials gathered through approaches to house removal and haulage firms in the Auckland region. This has involved a series of interviews to gain a profile of the house-moving industry, to explore its systems, and a general survey to quantify the scale of its activities.

Building consents issued by city councils (or Territorial Authorities) are the primary source of data for housing supply. Relocated houses are required to obtain removal consents under New Zealand Building Code (NZBC) regulations, with approvals filed with documents attached to the building record. A survey of council records in Waitakere City provided some indications of the extent of building relocation; these files do not make distinctions between new buildings and relocations, but planning consents for relocations under the Resource Management Act are identifiable through application details. Consent is necessary in advance of the re-positioning of the building and applications are occasionally rejected on grounds of biodiversity contamination.

A reliable indication of industry activity is provided by permits issued to the haulage industry. The Heavy Haulage Association (HHA) publishes best practice advisory guides for the industry, and guides for prospective private buyers of relocatables (ACC, 2005). The small body of independent literature in the subject associates relocations with waste management and administrative procedures rather than the principles of sustainable material recycling. Storey (2002) has investigated construction and demolition (C&D) waste in New Zealand, confirming an industry-wide neglect of material recovery and points to difficulties of quantifying C&D waste due to the many private landfill arrangements. Other literature from the Building Research Association of New Zealand focuses on the details of formal process and advisory notes (MacLaughlan, 2002).

**DEFINITIONS AND CONSTRUCTION PROCEDURES**

House removal companies carry out four different operations all of which introduce questions of sustainability and also relate to New Zealand’s traditions of urban form and social habit. One operation involves the relocating houses from urban to rural sites. In a second, using the same work-force and equipment, houses are lifted to create additional lower-ground floor space (Figure 2).
Lifting a single storey house usually provides an integrated garage, freeing other space on site for rear section development. This contributes to infilling, and thus to consolidation policies. The extra floor space gained by house-lifting may be used for workshops, storage and garaging, and small additional units of semi-independent accommodation - "granny-flats", "rumpus" rooms, "man dens", and the other spaces that are necessary to house pool tables, larger toys, and many of the other consumer products of contemporary suburban living. The up-lifting strategy increases density measured by floor area ratio (FAR) but usually adds little to the neighbourhood population density (Turner and Su, 2006). A larger increase is obtained if new units of housing under a separate title are produced with a simultaneous cross-leased development. The effect on the visual landscape of the street caused by the sudden lifting of a two-storey house is often considerable; similarly, making an adjustment to a site layout by moving a house within a section is sometimes a disturbing and occasionally a disorienting transformation.

For the city the more significant industry activity is whole house removal and recycling to a different site. This constitutes a more rigorous test of sustainable practices than rural relocations or on-site lifting and repositioning. The industry's primary business involves transfer of a house to a sale yard, but houses are also re-located from one site to another in a single move, or are moved to a different position on the same section to make room for infill development. Large-lot suburban property is intensified by cross-leasing rear gardens for infill development (urban consolidation), a process in which spatial decisions are determined by a combination of planning regulations and market forces. Sites in desirable inner-city suburbs are often more valuable if existing buildings are removed.

A house mover is contracted to confirm that site conditions allow access for a mobile crane and the transporting vehicle. The building is disconnected from services and its foundation piles, sawn into sections and then carted away to be exhibited in a saleyard from which it can be bought for re-use on another site. In this process the house is moved twice, and the re-sale prices include and are varied by the ease or difficulty of re-siting. In larger developments several houses may be shifted off a site to clear space for new housing at higher density. A skilled sector of the building industry is occupied exclusively with moving houses.

Building removals necessitate licences issued by Transit New Zealand for the use of public roads by heavy equipment hauling escorted wide loads. The HHA records approximately 4,500 permits annually for all building types. A single permit may also be issued for a convoy of more than one vehicle and one building. These permits cover the relocation of all building types including school classroom blocks, and commercial and small industrial structures. In the absence of definitive records the HHA estimates that houses account for at least 90% of relocated buildings, and that more than 3,000 houses are relocated each year; Statistics New Zealand, however, indicates a lower figure of 2,600 using figures from council consents (SNZ 2006). Total annual housing production in New Zealand varies between 17,000 and 29,000 units. The contribution of relocatables to the production totals would thus appear to be between 9% and 15% of all housing provision.

The Auckland region has eight established removal firms operating at varying levels of productivity, some of whom report a declining market; Haines Ltd, for instance, were relocating 350 houses annually in the late 1990s, but now expect not more than 100 units in a year’s work (Wood, pers. comm., 2009). Others, including the largest company, Craig Walker Ltd, acknowledge that the market fluctuates, but do not anticipate a significant reduction in demand in the long term.

Thurston, (2008) confirms that the Housing New Zealand Corporation (HNZC), with 68,000 properties nationally, is a major participant in the relocation industry, frequently shifting houses to rationalise low density land holdings. The Corporation’s figures are included in statistics (above) for annual removals where these have been relocated to a different site. As an example, HNZC redeveloped its 20 year old Laurelia Place, Wiri sites in 2009, cutting up a total of 28 units including a 96m long 2 storey block; all the buildings were relocated in Northland. HNZC finds it economic to shift whole houses from state housing developments to stationary labour pools where repair and renovation works are carried out, after which the process is reversed, and the house re-instated either on its original site or another (Thurston, 2008). Training in building skills for this labour pool is an additional benefit.

RELOCATABLES AND SUSTAINABILITY

Acknowledging the common circumstances in which, through market forces rather than dilapidation, houses become candidates for relocation, the first part of this paper relates to an assessment of whole house relocations as a sustainable practice: is recycling quantifiably a sustainable method of housing supply?

The technology involved in the relocation process is unsophisticated. The principal tools used until the house is re-sited are chain saws, wrecking bars and sledge hammers. “Up-lifting” and relocating a house is only possible at all in the context of New Zealand’s light-weight timber-framed building tradition, in which most houses are attached to the ground by wire dogs and galvanized perforated straps onto short timber piles. Structural framing can tolerate a small degree of distortion in the course of the move, usually without causing irreparable damage to the more fragile components of the building - particularly glass and internal finishes - or the integrity of the building’s main structure.
Concurrent repairs often include replacement of iron roofing, guttering and roof flashings, and occasionally external claddings. This level of renovation applies mostly to pre-1940 houses. Re-fitting of service elements (bathrooms, kitchens, laundries, and re-wiring in older houses) would also normally be carried out, and in these instances, at least with older buildings it is common for the internal linings to be completely or partially replaced. These operations provide for electrical circuits, telephone and television connections and insulation to current standards to be installed.

Energy costs of removal and relocation vary widely in this industry. Distance of travel is a relatively small factor, and is estimated for this energy audit as an averaged consumption of fuel based on two 240Kw diesel engines running for 22 hours at 90% capacity, representing the energy used in a 50km transit and including the engine in operation while stationary for rams and hydraulic positioning manoeuvres. Other energy is consumed during site works by diggers, piling rigs, small electrical equipment, and temporary lighting since much of the relocation activity is conducted at night.

The majority of relocations are not semi-derelict early twentieth century villas such as that illustrated in Figure 1. These often prove difficult to relocate. Most are suburban “boxes” produced in the post-1945 building boom by companies such as Keith Hay Homes, and still in moderately good condition. Standards of repair work are designed to meet the durability requirements of the NZBC. For this study a re-fitting programme was measured to include the complete renovation of one bathroom, one kitchen and utility, 66% re-wiring, 100% relining of internal walls and ceilings, and 50% of windows and external doors replaced with single glazed aluminium frames. This up-grading and replacement schedule reflects the works typically carried out on a 30 to 50 year old relocated house (Walker, 2008, pers. comm.).

The current estimate of embodied energy in new houses is between 3,500 and 4,000 kWhrs per square metre. For an average re-locatable house of 100m$^2$ with five main spaces, between 250-300m$^2$ of new 10mm plasterboard is required, and approximately 220m$^2$ of insulation will be used to line external walls and roof spaces. A further 100m$^2$ of under-floor insulation is recommended but is not usually required for a building consent. Including on-site energy consumption, transportation, embodied energy in replacement materials and re-wiring, an insulated re-locatable of this size with new services and internal finishes can be supplied for an estimated total of embodied energy of 65-75,000 kWhrs, or between 650 and750 kWhrs per square metre. Calculations are based on tables of energy coefficients produced by the Victoria University of Wellington’s Centre for Building Performance Research. This estimate of the energy required for a renovated relocatable house therefore shows substantial savings over that typically invested in similarly-sized new houses.

Relocation processes commonly involve small building companies, self-employed tradesmen, and frequently the owners themselves, all of whom have a greater propensity to re-cycle materials, and are considered more likely to embrace a culture of waste minimization. This serves, simultaneously, to reduce costs and to meet social principles of sustainable building. In summarising this analysis it is suggested that technical dimensions of sustainability are satisfied by the low-tech process of shifting and relocating whole houses, with an estimated investment of new energy one-fifth of that required in standard new house-building.

**RELOCATABLES AND URBAN CONSOLIDATION**

The analysis above proposes that in technical areas the practice of relocation satisfies the objectives of sustainable development. The second issue considered in this study, of its value to urban consolidation, introduces a socio-cultural dimension. Intensification of the suburbs is not separate from other socio-economic developments, as more people aspire to more personal space, better housing standards, and continue the custom of up-grading as well as maintaining houses. But do “relocatables” in their rearrangement of the suburban environment destabilise other assumptions that relate to concepts of sustainable urban form? For example, what is the effect on notions of permanence of such a capricious approach to the artefacts themselves?

Expressions of permanence in the urban environment are affected by history, social custom, and change, all of which are elements of the discourses around Auckland’s future urban form. Conventionally, buildings and
institutions are the principal manifestations of the city. If sustainable urban form - the objective of intensification policies - is an achievable goal, in what way is it assisted or obstructed by the moving of buildings?

Housing customs develop from historical origins. In a pioneering culture the habit and practice of moving buildings, particularly houses, may be recognised as a component of a historic vernacular. The majority of nineteenth century settlers from Europe came from rural origins where they did not own land (Fairburn, 1989). Rural landowners in Britain preferred their tenants to be located in one place, but in New Zealand the great majority of new immigrants built and owned their houses and were free to decide their location (Dunstall, 1992). Permanence of place in the form associated with housing in Europe was undesirable for the new immigrants, who found practical advantages in a less permanent relationship to site.

Belich (1996) notes that much of New Zealand's early housing was produced in hard-won conditions, establishing a housing culture in which "mending and making do", ad hoc building, and temporary or short-term solutions were an accepted element of house-building. Making, adapting, repairing, and modifying houses attested to a characteristic pioneering resourcefulness, confirmed by the advice from Julius Vogel in 1875, that: "the handyman in the colonies should be able to turn his hand to almost anything" (Vogel, quoted in Salmond, 1986, p.71). Pre-fabrication was popular. The ability to dismantle and shift the house satisfied a determination to avoid waste, even when technological constraints made it a difficult operation. If a settlement failed commercially, or land was reclaimed by New Zealand's tangata whenua the buildings could be salvaged and the investment of energy and material resources could be transferred to another location.

Recognising the practical and social conditions of nineteenth century immigrant housing, it is argued that an unusual but highly sustainable approach to non-fixed settlement developed in the culture. Traditional ideas of place and assumptions of permanence would have been premature in the circumstances of early settlement. In an uncharted landscape a notion of place as a temporary phenomenon, and whole building recycling became, it is suggested, social facts of a sustainable housing vernacular, alongside material choices and active participation in the construction process.

In the twenty-first century builders and planners of New Zealand's cities are engaging with concepts of sustainable urbanism. These introduce new ideas of duties to future generations, and with them, notions of the city as a record of permanent inhabitation rather than temporary occupation. Cities are no longer transitional: in their physical environments they represent earlier generations with enriching layers of buildings and spaces. Habits of the vernacular - in this context the habit of denying or for pragmatic reasons overlooking traditional relationships between site and artefact - may disregard historical veracities communicated by the built environment; but these habits now conflict with contemporary theories of urbanism.

The house shown in Figure 5 was designed in the 1930s by Gray Young for a family in Wellington. Gray Young was one of New Zealand's leading architects in the first half of the twentieth century, responsible for various buildings at Otago University including Knox College, the construction of Wellington's railway station in 1930, and approximately 300 houses in a forty-year long career (Fowler, 2010). According to the advert, the house is available for relocation. Its removal to another place (which could be anywhere in New Zealand) will meet all the instrumental criteria of environmental sustainability outlined earlier in this paper. There remains, however, a
question as to whether its ability to ‘move’ us will be preserved, since its authenticity as a piece of building history will not be intact.

CONCLUSIONS

Referring to the Conference theme of research in theory and practice, it is suggested now that the practice of relocating buildings meets some of the objectives of sustainable development but conflicts with others. The certainties of a science-based approach to sustainability justify the practice of relocating buildings by reduced energy consumption, reduced resource depletion, and less waste of still useable material. Such convincing empirical evidence would appeal to Steven Shapin’s preference for the “decisiveness” of applied research (Shapin 2008). His vocation in science, protected in an intellectual environment that as Polanyi (1966) observes benefits from the “unparalleled lucidity of modern man”, further relies on acknowledgement of the human concepts of civility and truth; but his vocation’s first interest lies in the factual proofs of scientific experiment. Shapin argues that applied research is a means of communication that offers certainties including that of identity.

In considering the practice of relocating houses, it is important to acknowledge that the built environment also confirms identity, also offers certainties, and also communicates meaning in the community. The house relocation industry makes a culturally significant contribution to the process of urban compaction, but research studies, perhaps led by architecture, are now needed to define clearer meanings for such abstractions as “permanence”, “precedent”, and “place”. Adopting Shapin’s argument, confidence that is inspired by the certainties of science is only validated by the civilising influence of social knowledge.

REFERENCES


