6. Feasibility of building deconstruction

The feasibility of building deconstruction refers to the assessment of the conditions under which the disassembly of buildings to maximise material salvage for reuse and recycling purposes is likely to be successful. The feasibility of deconstruction can be determined using two main criteria viz. the physical potential and economic potential of a given area. The assessment of an area for deconstruction potential depends on the availability of baseline information about the prevailing conditions in that area. Useful sources of information include public housing authorities, building authorities, statistical services, finance and revenue services, health departments and existing secondary material businesses.

In addition to being used as a preferred option to mass demolition for building removal, deconstruction can be used to address other national and local problems. These include the following:

- Deconstruction can be incorporated into strategies to minimise waste from the construction industry
- Deconstruction can be used in urban renewal plans to rehabilitate dilapidated buildings, abandoned buildings and unhealthy buildings
- Deconstruction can be used as a community economic regeneration tool to create employment and business development opportunities using local resources and circulating the money within the community

It is thus important that deconstruction feasibility be assessed with due consideration of all these aspects.

There are a variety of factors that influence the feasibility of building deconstruction. These factors present both the opportunities and the barriers to deconstruction. Many of the factors will vary in different areas, but some commonalities can be drawn on a broad scale. Some examples of the factors that influence the feasibility of building deconstruction include the availability of buildings to be deconstructed, the physical condition of the buildings, local construction activity and practice, the local economy, secondary markets, prevailing policy, labour issues, environmental concerns, tipping fees, time constraints, government support, prevailing codes and specifications, and public perceptions of secondary materials.

This section will attempt to describe the role of some of these factors by looking at some broad issues viz. physical factors, economic factors, policy and regulations and secondary markets.

6.1 Physical factors

Building stock

Building deconstruction, like demolition, depends on the availability of buildings that will form the feedstock for the industry. However, for deconstruction it is not only the amount of available buildings that is the concern, but also the amount of deconstructable buildings. Building types vary locally, regionally and nationally. In addition buildings also vary by function i.e. residential, commercial or industrial. Buildings can be dismantled using structural and/or non-structural deconstruction. A decision between the two types will usually be determined by the physical conditions of a building and the cost-benefit analysis of each option.
The text box below gives examples of the kind of building stock that could present an opportunity for the use of deconstruction.

### Building stock examples

1. In the US, an estimated 200,000 public housing units have been slated for demolition as a result of HOPE VI, a program of the US Department of Housing and Urban Development (HUD). This program was initiated to provide funding to local authorities for the demolition and construction or rehabilitation of public housing units across the US [12].

2. The US Department of Defence has ruled that hundreds of military bases across the country be closed or realigned and converted to civilian use [12].

3. Many local authorities in the UK are facing increasing numbers of undesirable dwellings, which are proving to be very difficult or impossible to let. Some local authorities are incorporating demolition into their overall strategy for tackling this problem [13].

### Building condition

The physical conditions of a building that influence its feasibility to be deconstructed include:

- Building type
- Building status
- Building location
- Neighbourhood context
- Building physical condition
- Building materials
- Property access

Table 8 gives a summary of the issues that relate to each of the building conditions for residential buildings.

**Table 8: Summary of issues relating to building conditions for residential buildings, source [17]**

<table>
<thead>
<tr>
<th>Building condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building type</td>
<td>High rise multi-family, Low rise multi-family, attached (row) housing, semi-detached, single dwellings</td>
</tr>
<tr>
<td>Building status</td>
<td>Condemned, abandoned, for sale, under renovation</td>
</tr>
<tr>
<td>Building location</td>
<td>High density residential area, residential suburb, inner city</td>
</tr>
<tr>
<td>Neighbourhood context</td>
<td>High or low income area, high or low crime rate, old or new neighbourhood, derelict neighbourhood</td>
</tr>
<tr>
<td>Building physical condition</td>
<td>Structurally unsafe, fire damaged, gutted, overgrown, water damaged, weathered, vandalised</td>
</tr>
</tbody>
</table>
Building materials | Timber, concrete, steel, aluminium, brick, gypsum etc.
Property access | Site access, mobility

These physical conditions can be used to assess and rate building deconstruction potential according to an agreeable rating scale. For instance, the NAHB Research Centre used a rating scale as presented in Table 9 to assess the deconstruction potential of buildings in DC, USA.

Table 9: NAHB Research Centre rating scale, source [17]

<table>
<thead>
<tr>
<th>Rating</th>
<th>Meaning</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No deconstruction potential</td>
<td>Buildings in good condition, suitable for renovation.</td>
</tr>
<tr>
<td>AA</td>
<td>Some potential</td>
<td>Buildings have been fire damaged and gutted, deconstruction may not be cost effective. Maybe demolition is a better option.</td>
</tr>
<tr>
<td>AAA</td>
<td>High potential</td>
<td>Buildings with high value materials, suitable for deconstruction.</td>
</tr>
</tbody>
</table>

Generally, concrete and steel structures (e.g. high rise buildings) are not suitable for structural building deconstruction\(^6\). However, after mechanical demolition the concrete and scrap steel can be recovered for recycling. Brick buildings can be structurally deconstructed\(^7\). The decision to deconstruct will be determined by the cost of material salvage compared to its resale value. Timber structures are by far the most attractive buildings for structural deconstruction because of the quality and immediate reusability of the salvaged materials.

Non-structural deconstruction can be conducted in all of the types of buildings presented above. Typical items that can be salvaged include cabinetry, water heaters, boilers, windows, doors, sanitary ware, appliances etc.

**Note:** Different countries use different building methods and materials. For instance timber construction is used extensively in the US while South Africa mainly uses brick and concrete. This will have significant impact on the feasibility and type of deconstruction as well as the secondary materials markets.

6.2 Economic factors

The economic potential of building deconstruction depends mainly on the relationship between the availability of buildings with salvageable materials and the market demand for salvaged materials [17]. Some of the factors that influence this relationship include the local economy and construction activity in the area, the salvaged materials infrastructure, government programs and incentives.

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6 Unless mechanical processes will be used for deconstruction and local policy allows the reuse of recovered beams and slabs after testing, as was the case in Maassluis, Netherlands [18].
7 One example is the Riverdale case study [7].
Local economy and construction activity

A strong (growing) economy and a growing population stimulate activity in the real estate market [19]. This increases the demand for land for both business and residential purposes. The land earmarked for development may be occupied or unoccupied. In the case of occupied land, obsolete buildings may have to be removed to make space for new ones. This presents an opportunity for the use of building deconstruction.

Salvaged materials infrastructure

The supply and demand of salvaged building materials can determine the success or failure of building deconstruction. The salvage and collection of secondary building materials is only half the effort, the other half is being able to distribute the materials to end markets. The latter requires investment into used building material businesses and material storage facilities in order to ensure distributions points for material supplies. Also, the end markets rely on the consumer demand for secondary materials, which in turn depends on the perception of secondary materials.

Government programs

Government initiatives play a significant role in the promotion of building deconstruction. For instance:

- The Canadian government has implemented what is known as the Adaptive Reuse Conversions (ARCs), which is basically the refurbishing of old buildings [20].
- The District of Columbia in the US has implemented the Homestead Housing Preservation Program aimed at redeveloping existing buildings in the area [19].
- A number of cities in the US have implemented programs that link deconstruction training with other job training initiatives. This initiative has been successful in developing the skills of the unemployed, the youth and ex-offenders in construction trades while supplying the construction industry with low-cost labour [21].

All of these initiatives have the potential to stimulate deconstruction activity.

Incentives

Building deconstruction can be promoted by the introduction of incentives. This is a proactive approach of ensuring environmentally responsible construction practice while benefiting those involved. Some examples of incentives that have been introduced to stimulate deconstruction include:

- The technical and financial support of secondary material businesses that distribute and/or manufacture products from salvaged C&D waste.
- The provision of tax deductions for salvaged material and other tax relief measures.
- The provision of affordable prices and loans for the acquisition and redevelopment of abandoned or old houses [19].

6.3 Policy and regulations

Building deconstruction requires a lot of support from government if it is expected to succeed. One such support is the development of policy that promotes deconstruction activity. Policy support can take one of two forms:
Direct support for deconstruction

Local authorities can formulate policies aimed specifically at the promotion of deconstruction and material salvage. For instance the city of Portland, Oregon in the US undertook a program to aggressively support deconstruction, salvage, reuse and recycling. Driven by C&D waste statistics, Portland set targets for waste diversion from landfill sites, demanded recycling programs from construction projects, increased landfill tipping fees and enforced regulations.

Indirect opportunities for deconstruction

Government can develop various policies, in different sectors, that are driven by the common goal of achieving sustainability. Such policies can where appropriate, present a window of opportunity for the use of building deconstruction. For instance:
Local economic development policy – deconstruction can play a significant role in the creation of employment, training of labour in construction trades, SMME development and in creating a new economic stream, i.e. secondary markets.
Redevelopment/Preservation policy – deconstruction can find application in the restoration and renovation of historic and abandoned buildings.
Environmental policy – deconstruction can be a preferred technique for environmentally responsible building removal (reduced pollution and energy conservation).

Sometimes all that may be required are minor changes to existing policies and regulations in order to stimulate deconstruction activity e.g. salvage time constraints relating to the period between the granting of a demolition permit and the commencement of new construction and specifications that require virgin material use only.

6.4 Secondary materials markets

As indicated earlier, the success of building deconstruction depends on the supply and demand of salvaged building materials. Not only do we need to make sure that there is a supply of secondary materials, we also need to locate end markets and ensure rapid distribution.

Salvaged material supply

Secondary markets require a constant supply of consistent material. This is possible if deconstruction is taking place in an area where a significant amount of building stock has been identified for demolition. In many cases, building deconstruction encounters problems related to storage space for salvaged materials. Support should thus focus on the provision of storage space in areas where deconstruction is being promoted. In underdeveloped markets deconstruction projects may occur in areas that are far from secondary markets, which has high transport cost implications.

Salvaged material distribution

In order to successfully collect and distribute salvaged materials efforts should be focused on developing sustainable secondary market infrastructure [19]. Investment should be injected into the establishment of secondary material businesses such as used building material stores, recycling companies that convert salvaged waste into secondary materials and product manufacturers that use secondary feedstock.