SINTEF

**University of Twente**
*Enschede - The Netherlands*

BACHELOR THESIS CIVIL ENGINEERING UNIVERSITY OF TWENTE
IN CO-OPERATION WITH SINTEF NORWAY

# QUALITY IN HOUSING

AN EXPLORATIVE RESEARCH TO THE WAY NORWAY, THE NETHERLANDS AND THE UNITED
KINGDOM MEASURE AND DEFINE QUALITY IN HOUSING AND A DESCRIPTION OF HOW THEY TRY
TO IMPROVE HOUSING QUALITY BY THE USE OF NEW PROCUREMENT ROUTES.

12TH OF MARCH 2007 – 29TH OF JUNE 2007

APPENDIX REPORT

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11TH of JULY 2007

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## A THE VALUTA FOR PENGENE PROJECT

This description has been made by analyzing project documents and with help of Wibeke Knudsen.

The Valuta for pengene project is one of the running projects at the architecture and building technique department at SINTEF Byggforsk. The project consists of case studies on fifteen housing projects containing a total of 612 building units all around Norway. The projects are situated in Tromsø, Trondheim, Stjørdal (a small town near Trondheim), Bergen, Kristiansand and Oslo.

The projects differ in size (varying from 14 up to 79 living units per project), in the way they are organized and in the stakeholders. The projects are divided in two main groups, the first group are the row housing projects and the second group are the projects containing apartment buildings with several living units. The projects used as case studies are existing projects which are selected for the Valuta for pengene project based on their builders' interested in sharing their knowledge and experience. The Valuta for pengene project tries to define the relation between the procurement route and the value for money of housing projects.

### Research method in Valuta for pengene

There is a 'standard form' which is filled out for every project. The aspects in the form are the aspects which are studied in all of the case studies and they address issues like the participants, owners, but also information about the main construction of the buildings, environmental aspects, the surroundings of the buildings etc. The organization model is one of the studied aspects of the case studies. The parts from the standard form which are of significance to the organization model as meant in my research project are the actors and the used procurement route.

To analyze the built quality the check list developed in the 'Housing quality in a society perspective project' is used.

### Used organization models

There are different types of organization models used in the fifteen projects. The most commonly used type is the totalentreprise (the main contractor model)

All used organization models are:
- The main contractor model (Totalentreprise)
  - With two main contractors
  - With complete design at contract moment
- The negotiated main contractor model (Forhandlet totalentreprise)
  - With incentive agreement
  - Transparent procedure until the contract
- The owner led model (Byggherrestyrte sideentrepriser)
  - Construction done by owner organisation

### Hypotheses

There are some hypotheses mentioned in the presentation from 14/15 February in Oslo, they are divided by row housing and apartment buildings.

Row housing:
- Lowest cost per square meter and highest quality in regard to project costs are reached by using a owner led model in combination with self building
- The negotiated main contractor model in combination with incentive agreement gives almost as much quality in regard to the project costs
- Highest cost per square meter is reached by using the main contractor model with complete design in combination with incentive agreement

Apartment buildings:
- No evident relation between costs and unit building
- No real difference in quality of the Trøbakken and Strandkanten project but a big difference in cost
- Looks like here the owner led model gives also lower costs than the main contractor model
- The negotiated main contractor model with incentive agreement and partnering seems to give more value for money in the form of quality than other types.

## B DEFINITIONS

This chapter will describe the used terminology to support the understanding of the report and to avoid misunderstandings based on wrong interpretations.

**Procurement route**
The procurement route will be defined using the definition given by Goodchild (1999):
*'Procurement methods may be classified along two principal independent dimensions; first, according to the extent to which the contractor assumes responsibility for design work and second, according to whether the price of the contract is determined by means of negotiation or competitive tender or a mixture of the two.'*

So the procurement route consists of two main issues
- Design responsibilities (org model related)
- Method of tendering (who to give the contract, bidding, negotiation etc)

**Organization model**
Based on the definition of the procurement route the definition of the organization model will be related to the design responsibilities. The organization model is the model that describes the involved stakeholders, their relation to each other, their roles and the phase in which they are active in the building process.

**Method of tendering**
The method of tendering will be defined as the way in which the contract is offered to the contractor or for example the Design&Build team. Distinction will be made between public and non public tendering.

**Housing scheme**
A housing scheme is a development project with multiple residential buildings, these can be single houses, row housing or apartment buildings.

**Housing association**
A housing association is an independent nonprofit organization which provides low cost social housing. They are the main providers of rental homes.

## C HOUSING POLICIES

**The United Kingdom**

(Department of Communities and Local Governance, 2006)

Strategic housing policy objectives
'The Government's key housing policy goal is to ensure that everyone has the opportunity of living in a decent home, which they can afford, in a community where they want to live. To achieve this, the Government is seeking:
- To achieve a wide choice of high quality homes, both affordable and market housing, to address the requirements of the community.
- To widen opportunities for home ownership and ensure high quality housing for those who cannot afford market housing, in particular those who are vulnerable or in need.
- To improve affordability across the housing market, including by increasing the supply of housing.
- To create sustainable, inclusive, mixed communities in all areas, both urban and rural.'

Planning for housing policy objectives
The PPS is a planning policy which means that the key housing policy goal has to be turned in to outcomes of the planning.
'The specific outcomes that the planning system should deliver are
- High quality housing that is well-designed and built to a high standard.
- A mix of housing, both market and affordable, particularly in terms of tenure and price, to support a wide variety of households in all areas, both urban and rural.
- A sufficient quantity of housing taking into account need and demand and seeking to improve choice.
- Housing developments in suitable locations, which offer a good range of community facilities and with good access to jobs, key services and infrastructure.
- A flexible, responsive supply of land – managed in a way that makes efficient and effective use of land, including re-use of previously-developed land, where appropriate.'

Achieving high quality housing
12. Good design is fundamental to the development of high quality new housing, which contributes to the creation of sustainable, mixed communities.

13. Reflecting policy in PPS1, good design should contribute positively to making places better for people. Design which is inappropriate in its context, or which fails to take the opportunities available for improving the character and quality of an area and the way it functions, should not be accepted.

14. Local Planning Authorities should develop a shared vision with their local communities of the type(s) of residential environments they wish to see and develop design policies that set out the quality of development that will be expected for the local area, aimed at:
– Creating places, streets and spaces which meet the needs of people, are visually attractive, safe, accessible, functional, inclusive, have their own distinctive identity and maintain and improve local character.
– Promoting designs and layouts which make efficient and effective use of land, including encouraging innovative approaches to help deliver high quality outcomes.
See forthcoming *Code for Sustainable Homes*, Communities and Local Government.

15. Local Planning Authorities should encourage applicants to bring forward sustainable and environmentally friendly new housing developments, including affordable housing developments, and in doing so should reflect the approach set out in the forthcoming PPS on climate change, including on the Code for Sustainable Homes.14

16. Matters to consider when assessing design quality include the extent to which the proposed development:
– Is easily accessible and well-connected to public transport and community facilities and services, and is well laid out so that all the space is used efficiently, is safe, accessible and user-friendly.
– Provides, or enables good access to, community and green and open amenity and

recreational space (including play space) as well as private outdoor space such as residential gardens, patios and balconies.
– Is well integrated with, and complements, the neighbouring buildings and the local area more generally in terms of scale, density, layout and access.
– Facilitates the efficient use of resources, during construction and in use, and seeks to adapt to and reduce the impact of, and on, climate change.
– Takes a design-led approach to the provision of car-parking space, that is well-integrated with a high quality public realm and streets that are pedestrian, cycle and vehicle friendly.
– Creates, or enhances, a distinctive character that relates well to the surroundings and supports a sense of local pride and civic identity.
– Provides for the retention or re-establishment of the biodiversity within residential environments.

17. Particularly where family housing is proposed, it will be important to ensure that the needs of children are taken into account and that there is good provision of recreational areas, including private gardens, play areas and informal play space. These should be welldesigned, safe, secure and stimulating areas with safe pedestrian access.

18. To facilitate efficient delivery of high quality development, Local Planning Authorities should draw on relevant guidance and standards15 and promote the use of appropriate tools and techniques, such as Design Coding16 alongside urban design guidelines, detailed masterplans, village design statements, site briefs and community participation techniques.

19. Local Planning Authorities should monitor progress towards achieving high quality housing and consistently good design standards using the Annual Monitoring Report process.

## The Netherlands

Three basic principles:
1. Increase the citizens freedom of choice
2. Attention for social values. To protect collective values, the freedom of choice of the people will always be bounded by restrictions.
3. Hands-on government and controlled market forces. Government and market parties pull together in the implementation of housing policy. In order to protect the weaker groups on the housing market, the market forces at work will have to be controlled and where necessary, adjusted.

Five core policy tasks
1. Allowing people a greater say about the dwelling and residential environment
1. Creating more opportunities for people in vulnerable situations
2. Promoting custom tailored housing and care
3. Improving the residential quality of the cities
4. Complying with the desire for more green

Based on VROM (2001).

## Norway

The primary vision for the Government's housing policy is 'Adequate and secure housing for all'.
This will be achieved by means of the following overall goals and strategies:
• Stimulating to a well functioning housing market.
• Providing housing for groups that are disadvantaged on the housing market
• Increasing the number of environment-friendly and universally designed dwellings and residential areas
(Ministry of Local Government and Regional Development, 2004)

The main objectives of the NSHB are closely related to those of the government:
1. Promote a well functioning housing market.
2. Facilitate access to housing for all with emphasis on disadvantaged groups in the housing market.
3. Increase the number of environmentally friendly and universally designed dwellings and residential areas.
(Norwegian State Housing Bank, 2006)

## D ORGANIZATION MODELS

This appendix is written with help from Kirsten Arge project leader of the Valuta for Pengene project. It will describe the organization models which are mentioned in chapter 5 'Determining Quality' of the research report.

First the definition of an organization model will be given and the relation of the organization model to quality will be explained. All models will be described by the three most important stakeholders, interaction between them and their roles in four predefined phases of the building process. After this all models will be ranked on a scale of client led to contractor led to show where the design responsibility lies.

The theoretical description of all models will be given; this does not mean that the models are always used in this way. In many projects adjustments are made to the models.

Not included
I will not analyze the models on the following aspects
- Risk sharing
- Responsibilities
- Lead-time
- Cost
- Compensation format

### Definition organization model

The organization model is defined as:

*The model that describes the involved stakeholders, their relation to each other, their roles and the phase in which they are active in the building process.*

The order in which the architect and the contractor (or in combination in for example a Develop&Construct team) are contracted by the owner and the phase in which they start influencing the building process is distinct for the different organization models.

### Quality & the Organization model

As defined above the organization model describes which stakeholders are involved in which phase of the building process and what roles they play. The main question here is where the quality is determined; because of this the accent is put on the program and the design phase as these are the most important phases for determining the quality. Of course the construction phase and later maintenance and operation phases are of influence to the quality but the main influence on quality is expected to be made in the program and design phase.

### Stakeholders

I will describe the organization models with the following stakeholders
- The owner (also called developer or client)
- The architect
- The contractor (also called constructor or builder)

Stakeholders that will not be addressed in the models but only in the descriptions:
- The advisor (this can also be a role of the architect)
- The user (also called the (future) resident or buyer)
- Subcontractors
- Suppliers

### Phases

The building process will be defined here as the process from initiation till the construction phase. This includes four phases
1. Initiation
2. Programming
3. Design
4. Construction

This will be visualized as a timeline with four equal parts, in practice the length of each phase will differ per project. (based on Byggherren i fokus, 2003)

Initiation          Programming          Design          Construction

Fig 1 Four phases in the building process

The organization models all include a certain point in which the responsibility for the design shifts from the owner to the contractor (usually via the architect). The phase in which this shift occurs is usually the programming or design phase and shows who is or are influencing the design and with that the quality.

**The models**

He following models will be explained

- The traditional model (the building triangle)
- The Building Team approach
- Develop & construct
- Design & Build (also called Design & Construct)
- TurnKey
- The owner led model (Byggherrestyrte sideentreprise)
- The main contractor model (Totalentreprise )(with two related types)
    - Forhandlet totalenterprise
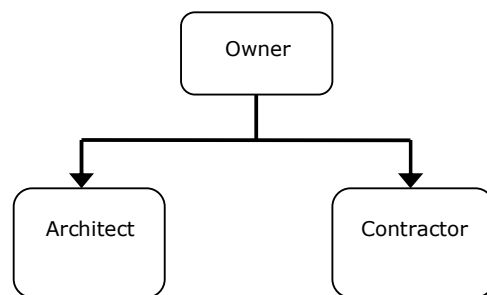    - Forhandlet totalentreprise med incitamentsavtal (Samspill model)

Fig 2 Traditional model / Byggherrestyrte sideentreprise

In the so called 'traditional model' in the UK and the Netherlands, similar to the Byggherrestyrte sideentreprise in Norway the owner is the one who is leading and managing the process. This can be done on own expertise (usual in the Norwegian model) or with help of an advisor. The owner contracts an architect for the design and after this is finished a contractor will be contracted to construct the designed object.
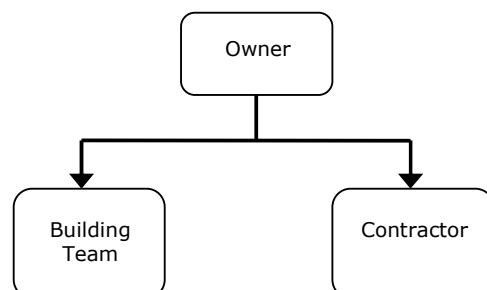
Fig 3 Building team

In the building team approach the owner puts together a building team (also here an advisor can step in when the owner has not enough knowledge himself). The building team usually contains an architect, a constructor and the owner. Together they make the design after which a contractor is contracted to construct the object. The contractor is not necessary the one who is part of the building team.
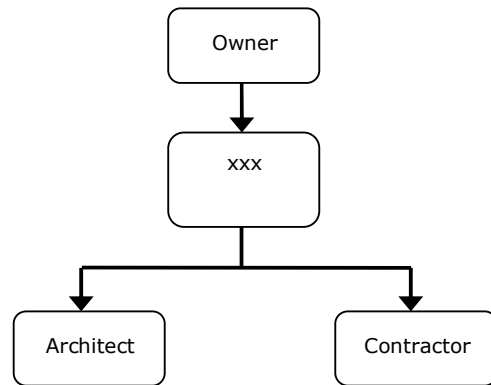


Fig 4 Totalentreprise, Develop&Construct, Design&Build and TurnKey

In place of the xxx you can put:
• Totalentreprenør
• Develop and construct team
• Design builder
• TurnKey operator

This model represents four different types of organization models. The basic idea is that the organization which is placed at the three crosses takes over the process from the owner and organizes the building process from that point. This can be (part of) the design and the entire construction phase. The process can be transferred on the point of a fully completed design but also with only a few requirements in which case the design is part of the contract.

**Roles in the different phases**

Only the relation between the actors is not sufficient to show the differences between the models. So in this paragraph will be shown when which stakeholder becomes active in the building process.

We assume here that the owner is the initiator and is involved from the first moment. In the pictures the points the architect and the contractor step in are shown.
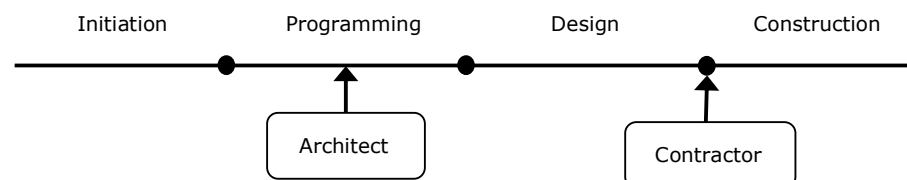


Fig 5 Traditional model / Byggherrestyrte sideentreprise

In the traditional model and the byggherrestyrte sidenetreprise the architect is assisting in the program and the design phase. When the design is entirely completed the contractor steps in. The point at which the architect is hired can differ based on expertise of the owner and his capability to set op requirements in the programming phase. The stakeholders are not involved at the same time. When the influence of the owner stops the architect steps in, when he is finished the contractor takes over. The phases in which the stakeholders execute their roles are strictly separated.

Initiation          Programming          Design          Construction
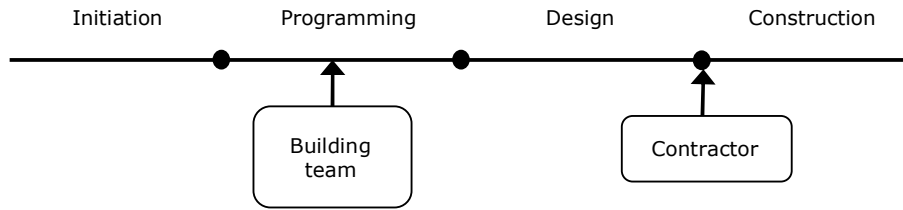
Building team

Contractor

Fig 6 Building team

In the building team approach the architect is now the building team, this means that besides the architect, the owner and a contractor are actively involved in the design. The contractor is still contracted after the design phase on this point the influence of the building team stops.

Initiation          Programming          Design          Construction
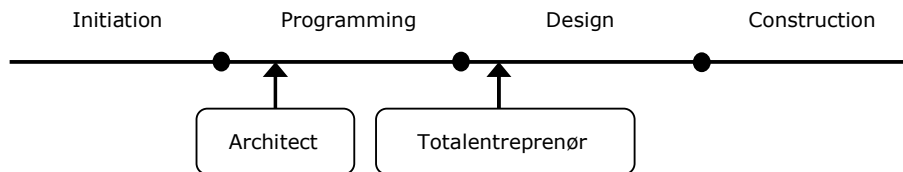
Architect

Totalentreprenør

Fig 7 Total enterprise

In the totalentreprise model we see also two contact points. The totalentreprenør (the main contractor) is usually hired in the early design phase. The owner takes responsibility for the programming and the design phase. The architect is usually being transferred to the main contractor at the contract moment so his influence continues. The point at which the main contractor is contracted can also be later in the design phase or earlier in the process.

When the Norwegian totalentreprise model is used there is a less strict line at the transfer. The owner can still have influence after the totalentreprenør has been contracted and taken over the design. This is not usual in the Dutch and English models in which after the contract phase the owner is usually not involved anymore and his influence ends after the brief.

Besides the standard totalentreprise model there are two other types. These are the forhandlet (negotiated) total enterprise and the forhandlet totalentreprise med incitamentsavtale (with incentives in the contract). The latter is also called the Samspill model in which the owner and the contracting organization are working together closer. These models will be addressed more explicit in chapter 6 'Improving Quality' of the research report.

Initiation          Programming          Design          Construction
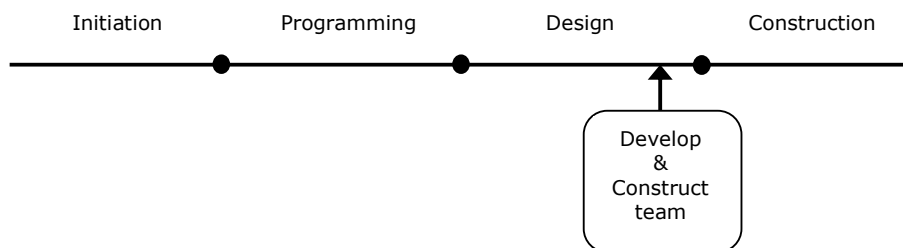
Develop & Construct team

Fig 8 Develop&Construct

In the Develop&Construct approach the Develop&Construct team is usually hired in the late design phase. This approach is sub led from the design & build approach but gives a owner far more influence and control in the design phase. The architect is not drawn in here but could be there before the Develop&Construct team is hired to assist the owner in the program and design phase.
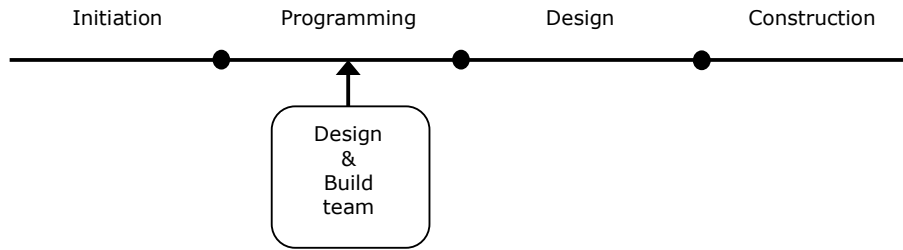
Fig 9 Design and build

In the Design&Build approach the owner has, as said above, less influence in the design phase which means that the Design&Build team is hired early in the process. They will make the design based on a certain level of specifications of the owner put up in the programming phase.
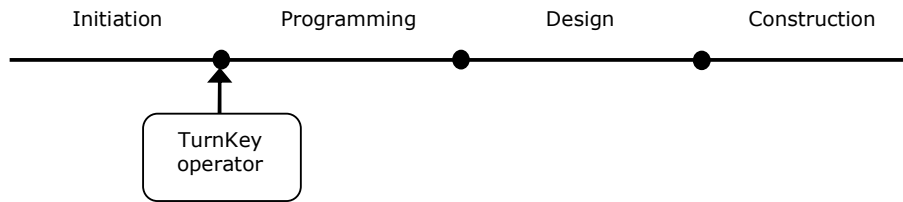


Fig 10 TurnKey

In the TurnKey model (which is rarely or not used in housing) the owner is only present in the initiation phase. The entire process will be executed by the TurnKey operator after which the fully completed building will be handed to the owner. The program and design phase are totally in hands of the TurnKey operator.

**Client led - contractor led**

The models are placed on a scale from client led to contractor led (Goodchild, 1999). Client led means that the client (=the owner) is taking the lead in the design phase. The more we move to the contractor led end the more influence the contractor gets in the design phase.

When all models are placed on a client – contractor led scale the picture will be as following:
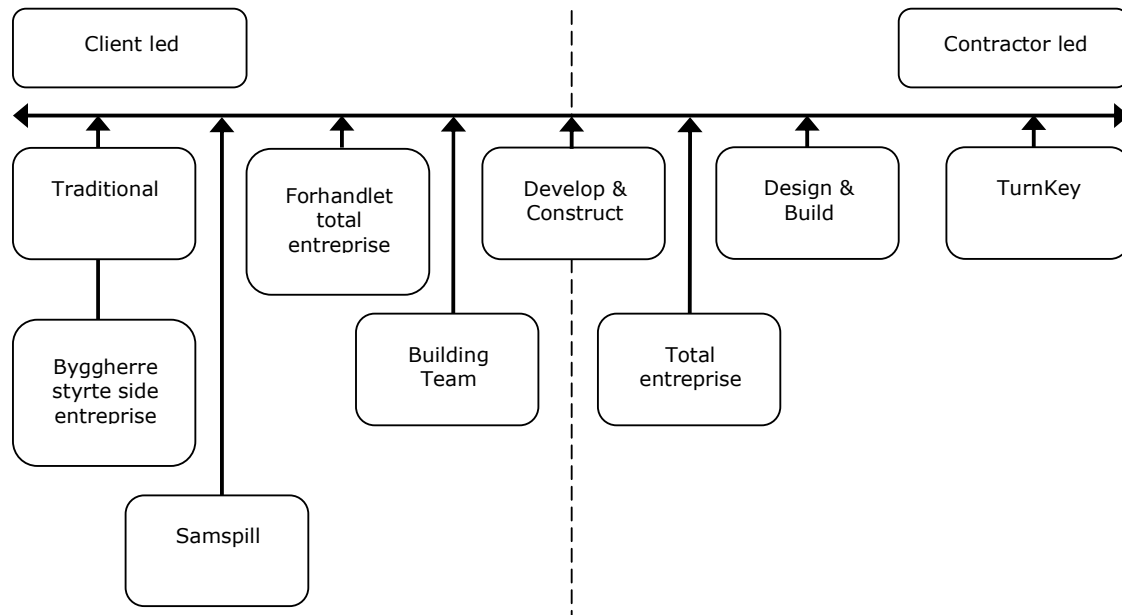
Fig 11 Client and contractor led

The Dutch models stay at the client led side of the model as the UK and also Norway have crossed the line. The UK did this 15 years ago and is nowadays familiar with working with more contractor-led approaches like the Develop&Construct and the Design&Build model. Also the total enterprise is not a new model. This approach is usually used by owners who didn't want the entire economic responsibility and did not have or did not wanted to have a large client organization. This Norwegian model is placed in between the Develop&Construct and the Design&Build approach. The totalentreprise hands over the project after a certain level of programming or designing which is usually not very detailed. We assume here more detailed than in a Design&Build approach but less detailed than a Develop&Construct approach. The newer forms of the totalentreprise are much more client led.

**References**

This appendix is based on:

- Benschop, T.P. (2007), Design Build and Housing, final thesis of the study Civil Engineering and Management at the University of Twente, unpublished
- Goodchild, B., Chamberlain, O., (1999) Building Procurement in Social Housing in Britain: A Review of the Main Issues, Housing Studies vol. 14.
- Byggherren i Fokus (2003), Metode for valg av anskaffelses- og kontraktstrategi, http://www.promsys.no/byggherren/pdf/beskrivelse.pdf
- Meeting with Kirsten Arge, project leader of the Valuta for Pengene project, June 4th 2007 and mail correspondence 25 June 2007
- Previous knowledge from the course B1 'Building Processes' at the University of Twente attended in 2002

## E MEASURING TOOLS

### Criteria & Explanation

The tools are al analyzed using the following aspects:
- Who developed the tool?
  Here the connection is being made between the organizations and the tools
- Based on which documents/policies?
  This shows if for example the policies of the government are implemented in the tool
- Institutionalized or not
  With this the status of the tool is partly stated
- Mandatory or voluntary
  Also related to the status, if mandatory then it is important who is prescribing
- What kind of dwellings can be examined with it
  This can be a difference between (social) rental and owned housing but also between the tool being suitable to evaluate single dwellings or entire schemes or apartment blocks. A third aspect is the state in which the scheme is, if it is a potential or an existing scheme.
- Who is measuring
  Which of the involved stakeholders is using the tool to measure, does the contractor or the designer of the scheme use the tool or are there several stakeholders involved.
- For who are the results
  For which stakeholder is the outcome valuable, is this the architect as a design indicator or does the user benefit by being able to see the quality
- What kind of outcome
  Quantitative, qualitative, visual
- Which criteria are used
  A short description of the themes to which the criteria are linked and if possible all the criteria.

Not all tools are described on all points.

### Building for Life

Character
1. Does the scheme feel like a place with a distinctive character?
2. Do buildings exhibit architectural quality?
3. Are streets defined by a coherent and well structured layout?
4. Do buildings and layout make it easy to find your way around?
5. Does the scheme exploit existing buildings, landscape or topography?

Roads, parking and pedestrianisation
6. Does the building layout take priority over the roads and car parking, so that highways do not dominate?
7. Are the streets pedestrian, cycle and vehicle friendly?
8. Is car parking well integrated so it supports the street scene?
9. Does the scheme integrate with existing roads, paths and surrounding development?
10. Are public spaces and pedestrian routes overlooked and do they feel safe?

Design and construction
11. Is the design specific to the scheme?
12. Is public space well designed and does it have suitable management arrangements in place?
13. Do buildings or spaces outperform statutory minima, such as Building Regulations?
14. Has the scheme made use of advances in construction or technology that enhance its performance, quality and attractiveness?
15. Do internal spaces and a layout allow for adaptation, conversion or extension?

Environment and community
16. Does the development have easy access to public transport?
17. Does the development have any features that reduce its environmental impact?
18. Is there a tenure mix that reflects the needs of the local community?
19. Is there a mix of accommodation that reflects the needs and aspirations of the local community?

20. Does the development provide (or is it close to) community facilities, such as a school, park, play areas, shops, pubs or cafes?

(CABE, 2005)

**The Housing Quality Indicators UK**

The entire tool consists of 30 pages and is therefor not added here. Through the following link the latest version of the HQI can be found:
http://www.housingcorp.gov.uk/upload/pdf/HQIFormv4_Apr_2007.pdf

The ten indicators are

1. Location
2. Site – Visual impact, layout and landscaping
3. Site – Open space
4. Site – Routes and movement
5. Unit – Size
6. Unit – Layout
7. Unit – Noise, light, services & adaptability
8. Unit – Accessibility within the unit
9. Unit – Sustainability
10. External Environment - Building for Life

**The Design Quality Indicators UK**

http://www.dqi.org.uk/dqi/default.htm

**Quality Scan NL**

| Marktsegmenten / Kwaliteit | 1 betaalbaar wonen voor ouderen | 2 betaalbaar wonen voor gezinnen | 3 betaalbaar wonen voor kleine huishoudens | 4 wonen met extra dienstverlening voor ouderen | 5 wonen in een intensief beheerde woonomgeving (voor alle doelgroepen) | 6 ruim wonen (voor alle doelgroepen) | 7 Wonen met extra luxe en comfort voor ouderen | 8 Wonen met extra luxe en comfort | 9 wonen met extra luxe en comfort met toekomstwaarde (voor alle doelgroepen) |
|---|---|---|---|---|---|---|---|---|---|
| 1. Sociale veiligheid gebouw en directe omgeving | | | | | | | | | |
| 2. Inbraakveiligheid | | | | | | | | | |
| 3. Toegankelijkheid gebouw en directe omgeving | | | | | | | | | |
| 4. Toegankelijkheid woning en vertrekken | | | | | | | | | |
| 5. Bereikbaarheid voorzieningen | | | | | | | | | |
| 6. Staat van onderhoud gebouw en directe omgeving | | | | | | | | | |
| 7. Identiteit gebouw | | | | | | | | | |
| 8. Luxe uitstraling gebouw | | | | | | | | | |
| 9. Luxe uitstraling woninguitrusting en afwerking | | | | | | | | | |
| 10. Woninggrootte en ruimtelijkheid | | | | | | | | | |
| 11. Gebruiksmogelijkheden en flexibiliteit | | | | | | | | | |
| 12. Gebruiksgemak uitrusting en installatie | | | | | | | | | |
| 13. Gezond binnenklimaat | | | | | | | | | |
| 14. Comfortabel binnenklimaat (thermisch/akoestisch) | | | | | | | | | |

niveau 1 — Uitgangsniveau
niveau 2 — Basisniveau
niveau 3 — Boven basisniveau
niveau 4 — Hoogste niveau

http://www.senternovem.nl/kompas/Woningbouw/Strategisch_Voorraadbeleid/Model_marktsegmenten_met_kwaliteitsprofielen.asp

**The Quality Check List**

Each aspect is analyzed and categorized in one of the three levels. These are not satisfying, satisfying and good.

**<u>Byggeskikk og bokvalitet</u>**

1. **Forhold til omgivelsene**
Ivaretakelse av utsikts- og lysforhold
Hensyn til eksisterende bebyggelse
Utnyttelse av tomtens beliggenhet ?

2. **Landskapstilpassning**
Volumplassering på tomten
Terrengbehandling
Fjernvirkning

3. **Vegetasjon og biologisk mangfold**
Bevaring av eksisterende vegetasjon
Nyplanting

4. **Uterom for lek og opphold**
Plass for ulike aktiviteter
Møteplasser i felles uterom
Rolige soner i felles uterom
Skjermede private uteplasser
Solforhold

5. **Trafikksikkerhet**
Gjennomgangstrafikk
Adkomstforhold
Gang/sykkelveier
Parkeringsløsning

6. **Arkitektur og estetikk**
Volumoppbygning/proporsjoner
Fasadekomposisjon
Materialvalg
Detaljutforming

7. **Byggtekniske løsninger**
Hensyn til klimatiske/geologiske forhold
Rasjonelle løsninger
Utførelse
Løsninger utover krav i TEK
Levetid/Livsløpsøkonomi

8. **Planløsninger**
Funksjonalitet
Fleksibilitet
Arealeffektivitet
Romlige estetiske kvaliteter (takhøyde, siktlinjer o.l)
Møblerbarhet
Dagslys

9. **Fellesarealer**
Adkomst/korridor/trapperom
Felleslokaler

**Miljøvennlig boligbygging**

| | | |
|---|---|---|
| **1.** | **Energibruk** | Lavenergistandard |
| | | Passivhusstandard |
| | | Balansert ventilasjon med varmegjenvinning |
| | | Passiv soloppvarming |
| | | Aktiv soloppvarming |
| | | Varmepumpe (gråvann, jord, sjøvann) |
| | | Redusert varmtvannsforbruk |
| | | Biobrensel/søppel som energibærer (fjernvarme) |
| | | Måleutstyr for energi og varmtvann |
| 2. | **Materialbruk** | Resirkulerbare materialer |
| | | Gjenbruk |
| | | Lokale materialer |
| | | Miljødeklarerte materialer |
| **3.** | **Avfallshåndtering** | Kompostering |
| | | Kildesortering/gjenvinning |
| **4.** | **Byggavfallshåndtering** | Kildesortering (redusere avfall til deponi) |
| | | Resirkulering/gjenbruk |
| | | Forsvarlig deponering av skadelige stoffer |
| 5. | **Vannhåndtering** | Redusert tappevannsforbruk |
| | | Gråvannshåndtering |
| | | Overflatevannshåndtering |
| **6.** | **Klimatilpasning** | Vindtilpasning (lehegn o.s.v) |
| | | Annen klimatilpasning |

**Universell utforming - inne og ute**

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|---|---|---|
| 1. | **Bevegelseshemning** | Livsløpsstandard |
| | | Besøksstandard |
| | | Heis |
| | | Automatisk døråpner |
| | | Fast, sklisikkert dekke utendørs |
| | | Stigningsforhold utendørs (trinnfritt) |
| | | Løsninger utover krav i TEK |
| 2. | **Miljøhemning og innemiljø** | Beplantning tilpasset pollenallergikere |
| | | Tiltak mot støv og forurensing utendørs |
| | | God ventilasjon |
| | | Sunne og avgassfrie materialer |
| | | Fuktfri byggeprosess |
| | | Fuktabsorberende materialer innendørs |
| 3. | **Orienteringshemning** | Enkel/ oversiktlig områdeplan |
| | | Ledelinjer parkering-inngang |
| | | Ledelinjer inngang-uteoppholdsrom |
| | | Tydelig skilting |
| | | Lys og kontraster utendørs |
| | | Lys og kontraster innendørs |