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Impact of Integrated Design on Scope of Services and Remuneration Models

UK version

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MaTriD
Market Transformation Towards Nearly Zero
Energy Buildings Through Widespread Use of
Integrated Energy Design

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The ID guide as part of the MaTrID project.

Contents

Preface

This document is an Annex to the MaTrID ID Process Guide and should be read in conjunction. In the context of the Integrated Design (ID) methods described in the Process Guide, this report provides further information around:

a) The adaptions in the scope of services which are required when an ID process is applied;

b) The impact on the remuneration of designers which emerges from ID.

The document therefore aims to assist the construction industry in understanding the practical implementation of the concept of Integrated Design by describing the impacts on designers and by presenting ways how to deal with these impacts in design practice.

1 ID-related changes to the scope of services

The ID process, being an evolution of current best-practice design and construction processes, requires a shift in the distribution of work in comparison from the status quo. As illustrates, ID projects require processes traditionally performed in series to be performed in parallel.

Throughout the concept and detailed design stage, the iterative problem solving process (2) runs concurrently with the process of monitoring compliance with project targets (3). These two processes are defined during the design basis stage (1). This 'frontloading' of tasks is particular to ID projects, as tasks typically considered later in a project are brought forward in time. Due to this change, it follows that an adaptation of the scope of services is also required.

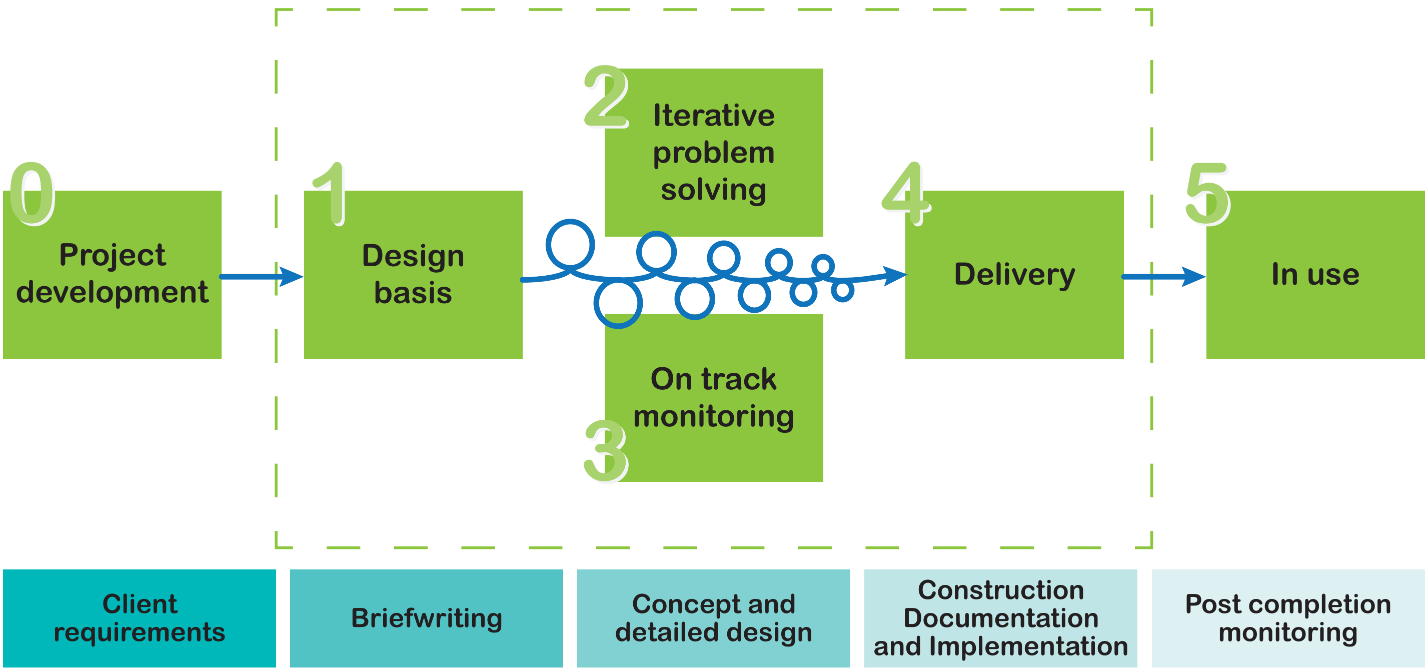

Figure 1:Overview of the ID process (source: MaTrID ID Process Guideline)

1.1 Additional services related to project development and definition of the design basis

One common challenge with existing construction projects is that by the time a sustainability certification is required, the design process has meant any required changes to the design to achieve the certification can lead to increased costs and delays to the project. ID processes feature intensive phases of project development and of setting the design basis in order to avoid such delays and costs. Discussing the project ambitions in depth at the beginning of the design process – e.g. by applying the goals and topics of sustainability certification schemes – and agreeing on project goals with all relevant stakeholders typically means a longer-term design process absorbing increased time and effort. In order to qualify as reference point for ID processes, selected project goals need to be identified and verifiable.

Whilst each project will be unique, this "Brief defining" stage sees two key differences from more prevalent procurement routes that will impact on the scope of services and consequential fee proposals from the core design team. These are:

1. It is likely that an increased consultant time allowance will be required at this stage compared to the commonly very small allowance made in more common procurement routes for this stage of the development.

2. The above input should include the whole core design team, hence compared to currently common routes it is possible that more consultants will be involved.

In both instances, it is recommended that breakdowns of time provisions are requested from the consultants in question (potentially with comparisons to their 'traditional' allowances).

1.2 Additional services related to iterative problem solving

A fundamental element of ID not found in conventional design processes is that, prior to the design team signing off on critical design elements, multiple concepts and technical solutions are thoroughly scrutinised and evaluated. This requirement of ID implies a multiplication of design work during the early stages of the project, as a comprehensive evaluation can only be performed if the concepts and technical solutions are available in a sufficiently advanced state. The process requires an iterative approach to problem solving, with computer simulations and stakeholder workshops assisting and informing the design team.

Again, whilst this will be unique to the scheme, this "Multiple Concepts" stage presents a key differences from more prevalent procurement routes that will impact on the scope of services and consequential fee proposals from the core design team. This is:

1. Core design team consultants will be expected to develop and evaluate more than one concept scheme with the client, with a consequential increase in time & resources necessary.

It is recommended that a minimum number of 'design alternatives' is specified as part of the Scope of Services being agreed, potentially alongside an number of iterations and/or a breakdown of total time provision from the consultants in question (again, for comparison this could also request their 'traditional' allowances).

1.3 Additional services extending from on-track monitoring

The definition of project goals in the initial phase is only useful if compliance is monitored over the full design process. The amount and depth of on-track monitoring and the instruments applied for monitoring purposes are highly dependent on the kind of project goals selected. Examples are:

– If energy performance goals are set, for instance a BREEAM Outstanding benchmark of 10 BREEAM credits under ENE 01, compliance needs to be checked by suitable energy performance calculations with approved software;

– If economic performance has been defined through the identification of LCCA targets during early design stages, these need checking periodically using life-cycle cost assessments;

– If the quality of execution of construction work is defined, for instance, according to the avoidance of thermal bridges, on-track monitoring will require checks on the existence and quality of specific calculations on thermal bridges;

– If project goals on visual comfort are formulated, on-track monitoring will include daylight calculations and the qualification of internal lighting levels;

– etc.

If on-track monitoring discovers deviations from the target range, additional input from the design team is required to adapt the design solutions accordingly. ID projects anticipate this design intensity during the earliest stages, and encourage the initiation of a design optimisation process which is frequently absent in conventional design processes.

This stage of "Delivery against Brief" should not present the core design consultant team with any further work than best practice would expect – typically some form of Key Performance Indicators and/or Environmental Assessment would be commonly used. It is unlikely that significant variations to the Scope of Services of the consultant team is therefore required.

RIBA Plan of Work 2013 - Draft Integrated Energy Design Overlay

The Plan of Work organises the progress of designing, constructing, maintaining and operating building projects into a number of key Work Stages. The sequence or content of Work Stages may vary or they may overlap to suit the procurement method, the project programme and the clients risk profile.

	RIBA Work Stages						
	1	2	3	4	5	6	7
	Preparation	Concept Design	Developed Design	Technical Design	Specialist Design	Construction	Use & Aftercare
Description of Key Tasks	- Identify **Project Objectives,** the client's **Business Case, Sustainability Aspirations** and other parameters or constraints and develop the **Initial Project Brief.** - Examine **Site Information** and make recommendations for further information, including surveys, required. - Preparation of **Feasibility Studies** and assessment of options to enable the client to decide how to proceed. - Determine client's **Risk Profile** and agree the **Project Programme** and preliminary **Procurement Strategy.** - Assemble **Project Team,** agree **Scope of Service, Contract Relationship** and **Design Responsibilities** for each participant. Develop **BIM** and **Soft Landings Strategies, Information Exchanges** and conclude **Appointment Documents.**	- Preparation of **Concept Design** including outline proposals for structural design, services systems, site landscape, outline specifications and preliminary cost plan along with environmental, energy, ecology, access or other **Project Strategies.** - Agree developments to **Initial Project Brief** and issue **Final Project Brief.** - Review **Procurement Strategy,** finalise **Deisgn Responsibility** including extent of **Performance Specified Design** and take action where required. - Prepare **Project Manual** including agreement of **Software Strategy, BIM Execution Plan** and extent of **Performance Specifed Work.** - Prepare **Construction Strategy** including review of off-site fabrication, site logistics and H&S aspects.	- Preparation of **Developed Design** including co-ordinated and updated proposals for structural design, services systems, site landscape, outline specifications, cost plan and **Project Strategies.** - Prepare and Submit **Planning Application** - Implement **Change Control Procedures,** undertake **Sustainability Assessment** and take actions determined by **Procurement Strategy.** - Review **Construction Strategy** including H&S aspects.	- Preparation of **Technical Design** information to include all architectural, structural and mechanical services information and specifications including the **Lead Designer's** review and sign-off of all information. - **Performance Specified Work** to be developed in sufficient detail to allow development and integration by **Specialist Subcontractors** during **Completed Design** stage. - Take actions determined by **Procurement Strategy** including issuing in packages where appropriate. - Prepare and submit **Building Regulations Submission** - Review **Construction Strategy** including sequencing, programme and H&S asepcts.	- Progression of **Specialist Design** by **Specialist Subcontractors** including the integration, review and sign-off of **Performance Specified Work** by the **Lead Designer** and other designers as set out in **Design Responsibility** document - Review **Construction Strategy** including sequencing and critical path. - Undertake actions from **Procurement Strategy** or administration of **Building Contract** as required.	- Offsite manufacturing and onsite construction in accordance with the **Construction Programme** - Regular review of progress against programme and any **Quality Objectives** including site inspections. - Administration of **Building Contract.**. - Resolution of **Design Queries** from site as they arise - Implementation of **Soft Landing Strategy** including agreement of information required for commissioning, training, handover, asset management, future monitoring and maintenance and ongoing compliation of "as-constructed" information.	- Implementation of **Soft Landings Strategy** including **Post Occupancy Evaluation.** - Conclude administration of **Building Contract** - Review of **Project Performance** in use and analysis of **Project Information** for use on future projects. - Updating of **Project Information,** as required, in response to **Asset Management** and **Facilities Management** feedback and modifications.
Procurement	The stage 1, 2, 3 and 4 outputs may be used for tendering and contract purposes depending on the **Procurement Strategy** as influenced by the clients **Risk Profile,** time, cost and quality aspirations and how **Early Contractor Involvement** and **Specialst Subcontractor** input is to be undertaken.						
Programme				Stage 4, 5 and 6 activities may occur concurrently depending on the **Procurement Strategy.** Work may also be undertaken in packages to facilitate its development by **Specialist Subcontractors.** Early package procurement may also occur during stage 3 depending on the procurement route. The **Project Programme** should set out the timesscales for these overlapping design and, where appropriate, construction stages.			
Planning		**Planning Applications** typically be made using the stage 3 **(Developed Design)** output, however, certain clients may wish this task to be undertaken earlier. The project or practice specific **Plan of Work** identifies when the **Planning Application** is to be made. Certain aspects of the Technical Design may also be required as part of the application or in respond to planning conditions.					
Integrated Energy) Design	- Interrogate **Initial Project Brief** and agree to **remove any presumptions** & unnecessarily restricting specifics - Ensure **Site Information** includes comprehensive **boundary condition survey** - Ensure **Project Team** use collaborative/**partnering contracts** and consider ID Facilitator appointment - Project Team to **extend Project Brief to specify** intended measurable project goals/ targets as **Project Metrics** - Project Team **collaboratively develop** initial **Feasibility Studies** to assess options	- **Prepare multiple Concept Designs** that meet the Initial Project Brief **through collaborative workshops** and/ or co-locating the Project Team - Hold **regular reviews** as part of collaboration **to analyse Concept Design** proposals against Project Metrics and Initial Project Brief - Refine Initial Project Brief into Final Project Brief and **finalise Project Metrics** - Client & Project Team to **jointly select preferred Concept Design** to develop	- **Develop preferred design** as a Project Team **collaboratively** to ensure balanced prioritisation of different building demands - **Confirm preferred design delivers** against Final Project Brief and **Project Metrics** prior to submission of Planning Application - Ensure **Change Control Procedures** capture **Project Metrics**	- **Develop preferred technical design** as a Project Team **collaboratively** - **Regularly review design** against Final Project Brief and **Project Metrics,** especially prior to submission of Building Regulations Submission - **Communicate Project Metrics** and collaborative working **to new Project Team members,** including for performance specified work or specialist packages through relevant documentation	- **Communicate Project Metrics** and collaborative working **to new Project Team members** - **Develop specialist design collaboratively** to ensure specialist elements are not adversely influenced or influencing optimum delivery of Project Metrics and Final Project Brief - **Confirm preferred specialist design delivers** against Final Project Brief and **Project Metrics** prior to construction stage	- **Communicate Project Metrics** to **Site Operatives** - Use **collaborative working** to resolve Design Queries from site within **Project Metrics** - **Compile Building Manual** throughout duration of construction works - **Commission systems,** incorporating performance testing **against Final Project Metrics** where possible	- **Communicate Project Metrics** and designed building optimum operational methods/ assumptions to **Building Users** - Consider **post occupancy monitoring against Project Metrics** to inform Building Users and Project Team

Figure 2: Draft Overlay of ID process on RIBA Plan of Work

1.4 Focus on early design phase and impact on the scope of services

As described in detail in the MaTrID ID Process Guide, and as demonstrated in sections 1.1 - 1.3, a principal characteristic of ID is an up-stream shift of work load from detailed design and construction documentation towards the concept design phase.

By extension, this characteristic also has a potentially significant impact on the scope of services. In the UK, a project's scope of services is generally shaped by the Construction Industry Council's (CIC) Scope of Services and the current RIBA Plan of Work (Figure 2). Each assist project managers in planning the workload and personnel tasks throughout the construction project, and highlight key checkpoints for monitoring progress. When adapting the scope of services to an ID project, it becomes not only important *if* certain tasks are implemented, but also *at which point(s) in time* they are implemented. For example:

- Over the last few years, dynamic thermal simulations and daylight calculations have become a standard tool for the design of complex buildings. Very often these instruments are applied during the technical design stage (RIBA Stage 4) and therefore mainly aim at proving that the selected design variants work. From an ID perspective these instruments need to be used as *decision-supporting* tools for filtering out the most suitable variants. This purpose can only be achieved if dynamic thermal simulations and daylight calculations are applied already very early (RIBA Stage 2 & 3) in the design process and if they include the comparative analysis of a broader range of design variants;
- The same is true for life cycle cost assessment (LCCA). Seen from an ID perspective an estimation of the future costs, which are usually calculated rather late during the detailed design phase, is not nearly enough. Instead, ID uses LCCA to compare different design variants from an economic point of view and this kind of comparison is only useful if its results can be fully taken into account without causing larger disruptions in the design process as a whole.

Figure 3 illustrates the most important typical design phase ID-related tasks and when they should be implemented (see Annex I for further details). The accurate timing of tasks is crucial in order to fully reap for the benefits of ID. More broadly, Figure 3 demonstrates how the preparatory, early-stage work load for an ID project minimises the work load during construction, the most costly stage of a building project.

It should be remembered, therefore, that the "Detailed Design" stages of the project could see a reduction in workloads from the consultant teams, as a consequence of the activities being undertaken earlier in the design process. Further discussion on this point can be found in the MaTrID Process Guide.

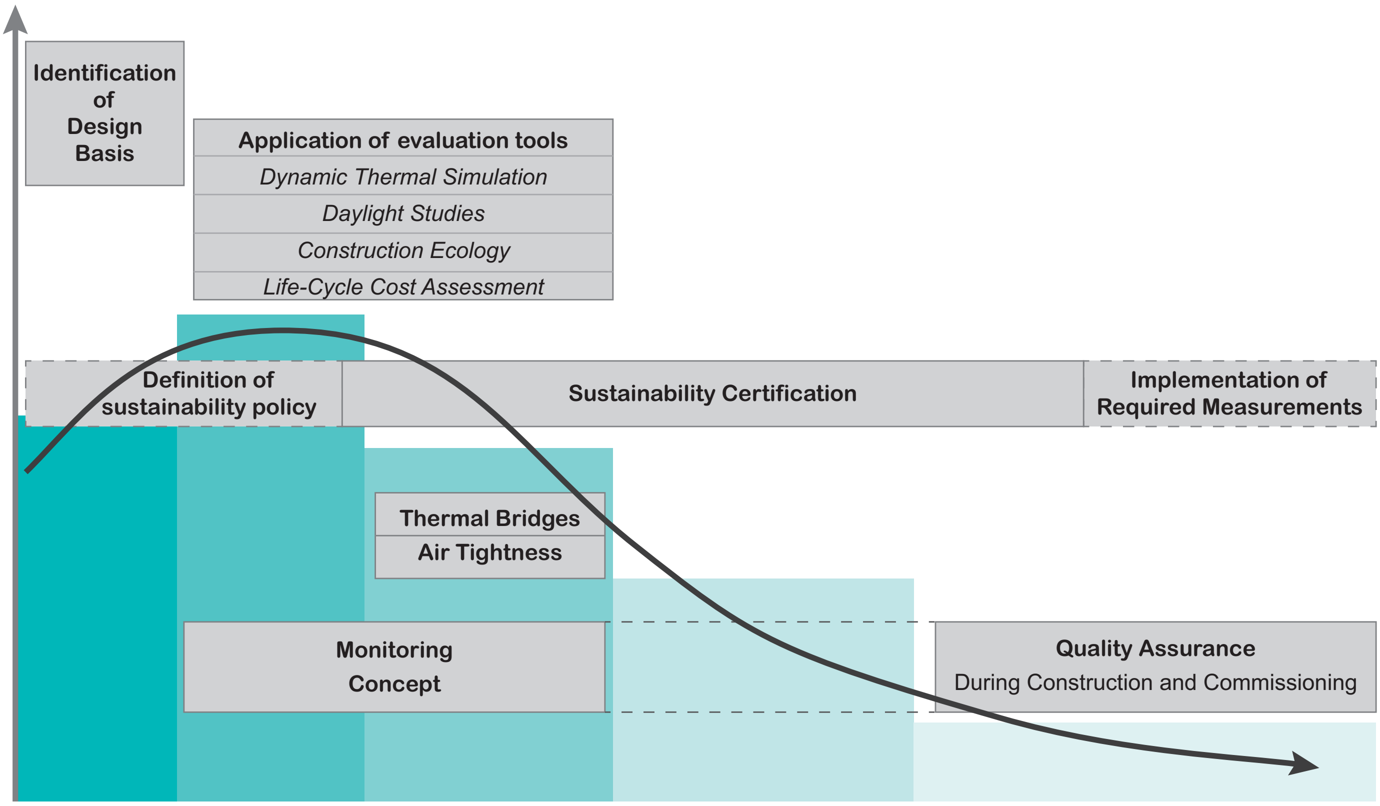

Figure 3: Workload of ID process

2 The 3-level-model for ID-related Fees

ID's impact on a project's Scope of Services also means an impact on fees (remunerations) of design services. This impact can be divided into four components:

1. The *qualitative* component, resulting from the fact that quality targets (e.g. energy performance/ sustainability targets, etc.) are the usual point of reference of ID processes;
2. The *quantitative* component, arising from extra tasks which do not form part of a conventional design process;
3. The *time-related* component, reflecting the fact that ID shifts design efforts earlier into the design phases;
4. The *structural* component, if the ID project calls for an ID Facilitator as additional stakeholder.

The quantitative and qualitative elements are addressed through the 3-level model of remuneration for ID projects. Due to the increased tasks required for an ID project, remuneration for work on the project is atypical to that of standard projects. It is noted, however, that these increased design fees are widely demonstrated to result in larger savings in the overall construction project, and even more significant savings in the subsequent operation of the resultant building(s).

Figure 4 shows how the remuneration for ID projects can be considered in three parts: the first portion is similar to standard design projects, with a second portion reserved for those tasks specific to an ID project. A third portion is available for performance-related tasks which go beyond the ID workload. These three elements are explained below.

2.1 Level 1 – Basic remuneration

The basic remuneration is in accordance with the standard remuneration for conventional design processes. The preferred means of determining this varies from Client to Client and project to project, although there are some common conventions for assessing this:

– Fee based on a certain percentage of construction cost;

– Time-dependent fee (e.g. hourly rate & stated number of hours, commonly with a cap);

– All-inclusive price which is fixed before the design works starts (often calculated by either of the above routes but then fixed).

Whichever methodology is used, this "Basic remuneration" is deemed to be the baseline fee for the consultant's work on the project in accordance with current industry practice: In effect, this is the fee 'before ID' is added.

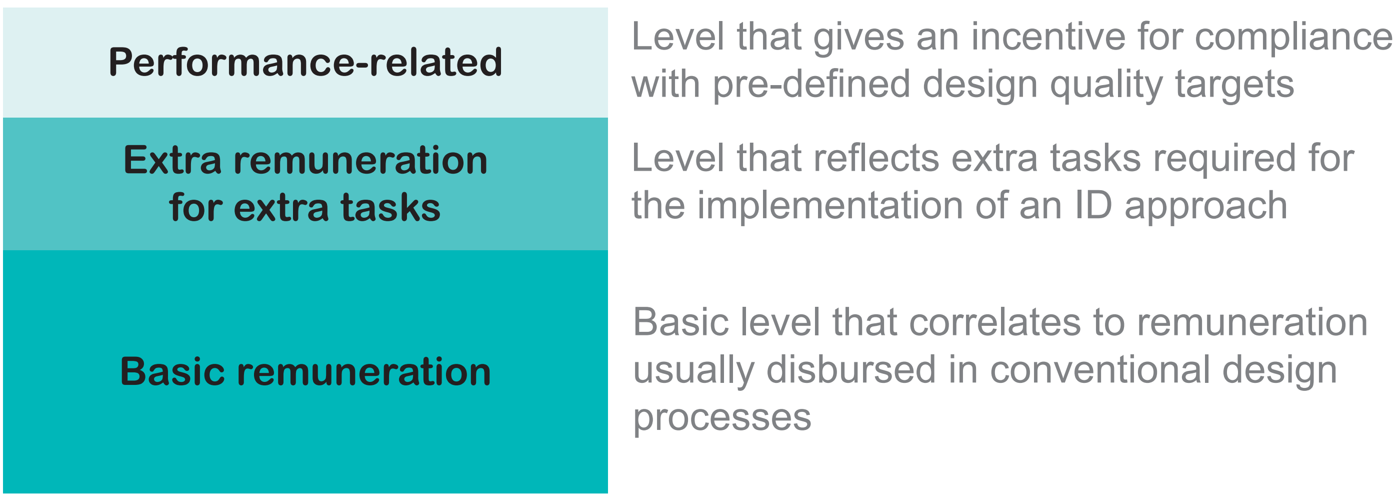

Figure 4: **The 3-level-model for ID-related remuneration of design works**

2.2 Level 2 – Extra remuneration for extra tasks

This remuneration is the element of the consultants' fees associated with tasks not normally associated with the prevailing design methodologies; effectively the additional tasks ID introduces. As highlighted earlier, it is likely that consultants will consider the following additional tasks to arise:

– Earlier appointment (for a larger team to be involved in "1.1" refining the brief)

– Increased workloads (for "1.1" and "1.2"; refining the brief and multiple concept design work

The above are likely to be legitimate additional tasks compared to UK norms. However, when considering fee proposals, it is important to also be aware that some of the tasks required of the design team are 'standard practice', but are undertaken earlier. In this regard, they should not influence the total remuneration proposed, but may influence the stages of payments.

2.3 Level 3 – Performance-related remuneration

Level 3 remuneration reflects the concept that ID can contribute to the improvement of design outcomes beyond the goals identified (where exceeding these is supported by the Client). This is an entirely optional consideration for any project – it endeavours to strengthen the attention of design processes on quality aspects – such as energy performance, user comfort and a broad range of other sustainability criteria – contrary to the omnipresent focus on compliance with construction costs.

The level 3 remuneration's drive on incentivising the core design team is best focused on addressing particular targets defined at the beginning of the design process, and through creating a mechanism for additional reward in proportion to the extent to which these targets are exceeded. For instance, works that the core design team choose to undertake beyond Level 2 remuneration in order to demonstrably reduce future construction costs through extensive modelling or design development could qualify for Level 3 remuneration, were this to be an agreed, 'exceedable' target.

The main challenge for Level 3 remuneration, however, is the measurement of design quality; Annex II describes the complexity and difficulties related to measuring the quality of design work. At this point, it is likely to be feasible to offer only a very limited share of performance-oriented remuneration, since several quality criteria can be checked by well-defined verification methods and neutral verification bodies (e.g. a sustainability certificate at the design stage).

2.4 Is ID more expensive than conventional design?

The 3-level model, as presented above, provides some general guidance to fees which will require adaptation to specific consultant roles, such as architects and engineers.

Overall it has to been underlined that **ID does not make construction more expensive than conventional design methods overall**; it is acknowledged through the three-level-model that some additional design fees may be incurred - and the timing of some fees may change - but that these costs are likely to be more than off-set by savings later in the process. An ID project, as covered above, leads to more time and effort spent at the design stage; unavoidably, this leads to extra costs during this stage than under a traditional contract. However, the purpose of an ID project's design-intensive phase is to reduce the costs and delays often incurred during the construction phase of current projects.

To give a few examples for the cost-cutting impact of ID:

– Comprehensive assessments of design variants and on-track monitoring in the early design phases can contribute to lower design cost in later design phases, since the likelihood that the selected variant needs to be changed/adapted decreases remarkably;

– The extra-task of designing a quality monitoring system (e.g. energy monitoring system) will positively impact the acceptance testing at the end of the construction phase.

2.5 Shift of remuneration to the early design phases

The result of ID projects requiring more intensive work in the early design stages means remuneration schedules will differ from standard construction remuneration time-frames. Larger shares of remuneration will be due during and even prior to the design stage, as ID projects require more intensive work even during RIBA Stages 1 & 2 whilst the brief is more comprehensively and precisely reviewed and refined. The deeper involvement of the client during these stages helps to define the project's goals and highlight the sustainability and cost targets – tasks which will save the project money in the long term, but require larger shares of remuneration up front.

From a client's perspective, higher upfront costs increase the financial risk. If during the early design phase a project has to be stopped unexpectedly, the sunk cost will be higher compared to a conventional design process. On the other hand, ID utilises a risk-reduction strategy through the means of continuous on-track monitoring. Via this process, drawbacks and difficulties in the design process will be detected earlier; early detection means early cure, so lower costs and less disruption are to be expected on an ID project.

2.6 The role of an ID-facilitator

In a typical project scenario, responsibilities for the distribution of tasks lie between two camps: those of the designer and those of the client. Usually, the client embraces the responsibility of setting project targets and ensuring they are met, whilst the designer ensures design solutions are both property identified and technically implemented. As projects increase in size and complexity, additional consultants are added to the team, which dilute the responsibility matrix. These consultants don't necessarily work solely in either camp; rather, they provide a link between the client- and designer-led groups of tasks (the so-called 'grey zone.') The list of additional design tasks, which are typical for ID (refer to the MaTrID Process Guide, Figure 3 and Annex I for the distribution of tasks in the design phases) do not address the question as to who bears the responsibility for performing each task. However, the core elements of ID – the definition of clearly specified targets as design basis, the creative problem solving process, on-track monitoring (see) – suggest a clear division of roles. The core design work should clearly distinguish between the evaluation of design results from any pre-defined quality targets.

To this end, ID supports the introduction of an *ID facilitator* who is mainly responsible for on-track monitoring, but who may also take over further tasks where the client needs support (e.g. responsibility for process-oriented tasks). An ID facilitator would be well-versed in the processes required for an ID project, and be able to collaborate between and champion both the client and the designer, with the future tenant's needs also in mind. Acting as a bridge, an ID facilitator would possibly move toward the 'grey zone,' moderating between the client and the designer – and in the end, an ID facilitator could be installed as part of the design team.

Further complexity is introduced by the fact that there exist different organisational models for design and constructions works, such as:

– Separate contracts for different design tasks (co-ordinated by the client),

– General planner approach, where a general planner summarizes all tasks included in the design and construction planning and is also responsible for site management,

– General contractor approach, where the contractor is responsible for the design as well as for the construction, etc.

The role of the ID facilitator will be driven by the organisational model chosen by the client. If the client decides the project should be more client-led in terms of decisions and on-track monitoring, the ID facilitator will play more into the client camp. However, if the project becomes more contractor-led (D&B, for example), the ID facilitator will work more closely with the contractor. Regardless of the contract, the incorporation of an ID facilitator will provide a smooth transition for seasoned clients and contractors who are used to traditional contracts from the status quo into the benefits an ID projects brings to all stakeholders.

Annex I: Typical additional services arising from ID process

The following list contains additional design tasks, which are not standard in conventional design processes, but which are typical – and in most cases indispensable – for ID processes. The list makes no claim to be complete, but looks to highlight typical adaptations to the scope of services as required in the frame of an ID process.

Identification of the design basis

1. Identification of the client's sustainability policy: This can be done by considering sustainable design requirements (Passivhaus Certification scheme, BREEAM, CfSH, etc.);
2. Evaluation of the local climate and analysis of the prevailing wind directions (summer/winter, day/night). Investigation of the preconditions influencing building orientation, surrounding buildings, obstacles, sun angle, shading, micro-climate, daylight availability, outdoor air quality, noise sources, acoustic intensity etc.;
3. Determination of relevant boundary conditions for building concept regarding thermal, visual and acoustic comfort, indoor air quality, operational and embodied energy etc.;
4. Integration of (preferably on-site) renewable energy sources: Location, availability of natural resources, climate, studies on the feasibility of integrated geothermal systems.

Application of evaluation tools

The following evaluation tools may be part of iterative problem solving and/or part of on-track monitoring (see). They are aimed at supporting the design team in filtering out the optimal design variant by checking to which degree different variants fulfil the defined project goals and targets.

1. Dynamic Thermal Simulation of a building or reference zones in order to assess annual indoor temperature and humidity ranges as well as hourly heating, cooling and power loads for building operation: Assessment of different design alternatives, building forms and functions;
    a. Energy performance calculations: Demand and supply, energy required for heating, cooling, humidification, dehumidification, ventilation, pumping, artificial lighting, electric equipment;
    b. Determination of shaded facades: Sun study, optimisation of shading device;
    c. Project-related climate studies: Insolation, total available solar energy and average temperatures, Mollier-Chart (temperature-humidity), wind rose.
2. Daylight studies
    a. Masterplan model with sun paths;
    b. Fulfilment of daylight requirements;
    c. Analysis of the impact of indirect shading on building facades: Number of hours of sun exposure;
3. Calculation of benchmarks referring to construction ecology (different kinds of material-related indices many of which are now defined only on a national or regional basis): Index of global warming potential, index of photochemical ozone creation potential, index of acidification potential and others;
4. Life-cycle cost assessment: Economic evaluation of different variants to identify cost-optimal solutions over the life-cycle of the building (as complementary information to construction cost);

Sustainability certification

If the sustainability policy for the project has been set on the basis of sustainability certification schemes (e.g. BREEAM), its achievement has to be checked at certain check-points by assessing the fulfilment of single criteria. Depending on the sustainability certification scheme selected, this refers to criteria in the following fields:

1. Architectural requirements,
2. Energy performance related criteria,
3. Parameters relating to user comfort,
4. Water consumption,
5. Materials and construction ecology, and
6. Equipment requirements.

Besides an informal check by the design team, most sustainability certification schemes offer the possibility to conduct a formal pre-check by issuing design certificates at different stages of the design process.

Consultancy for an optimized building envelope design

This task refers to all aspects related to the building's envelope: thermal quality, facade openings, light redirection with respect to the local climate conditions, and is focussed within the detailed design phase.

1. Thermal bridges calculation: Minimization of condensation risks, minimization of thermal losses;

2. Air tightness: Critical points.

Quality assurance during construction and commissioning of the building

Verification of the results achieved with regard to the quality criteria set for the project (sustainability policy, user comfort etc.)

1. Measurements: Blower door test, thermography, in-situ U-value tests, etc.;

2. Measurement of user comfort: For example, detailed short-term or long-term monitoring of indoor environment physical quantities and air quality measurements;

3. Implementation of user survey coupled to comfort monitoring;

4. Quality monitoring of installation and setting of technical systems;

5. Energy monitoring: Energy data analysis aiming at the detection of short-comings in building operation.

Process-oriented tasks

These tasks focus on the design-stage processes, defining those group actions typical to ID projects.

1. Work sessions with the design team for general interdisciplinary issues;

2. Work sessions to develop the specific energy performance and environmental concepts for design issues, such as:

    - Heating, cooling, humidification, dehumidification, ventilation and pumping;
    - Daylight and solar control;
    - Concepts for indoor climate control;
    - Energy supply strategy (e.g. co-generation, solar heating and cooling, PV, etc.);
    - Energy monitoring concept;
    - Use of materials;
    - Water saving;
    - Outdoor environment.

Annex II: Issues related to the measurement of design quality

ID design is seen as an instrument to achieve sustainable buildings with good energy performance – i.e. a remarkably increased quality – at an acceptable cost over the building life-cycle. From the point of view of remuneration, this “promise” of better design quality can be reflected by introducing **performance-related remuneration elements**: If the designer achieves a certain quality target, he/she is remunerated for that, by, say, a bonus. If he/she does not, penalties might be applied.

In design practice, however, this approach is confronted with several challenges:

Which are practical criteria to measure the performance of the design team?

In the context of remuneration only quantifiable performance criteria can be applied, such as:

- Criteria for energy performance
  - Energy performance can be measured for example by a set of various benchmarks for energy performance at different levels: E.g. net heat demand, net cooling demand, final energy demand, primary energy demand, etc.
  - Not only the performance level needs to be fixed, but also the verification methodology (e.g. a standardised calculation methodology such as a building simulation);
- Criteria for environmental quality (or sustainability in a broader sense)
  - Sustainability criteria are reflected by sustainability certificates. Thus, sustainability certificates may also be used to define and measure quality. To give an example: The quality target “BREEAM Excellent” can be measured by applying for a design certificate for BREEAM;
  - Since the sustainability certificates include a wider range of different topics and criteria, the client might wish to select specific focus areas within the frame of sustainability certificates. The achievement of the (sub) targets defined for these focus areas (such as ecological materials or recyclability) can be measured by applying the verification methodologies prescribed by the selected sustainability certificate;
- Criteria for life-cycle cost: The usual criterion for economic performance in the construction sector is compliance with target values on construction cost. From an ID perspective the construction cost target could or should be complemented by a life-cycle cost target. In principle, both values are measurable, although in practice a very precise definition of the verification methodology is necessary;

At which point in the design process should the performance of the design team be measured?

The aspect of measurable performance criteria for design quality – as described above – is closely linked to the question at which point in time the performance of the design team should be measured. It is obvious there is no best solution, but each point in time has advantages and disadvantages in regard to the measurability of design quality. Table 1 gives a short overview.

The general conclusion could be that if compliance with quality targets is measured late in the design/construction process, the picture on the actual achievement of quality becomes more complete; that is, more quality criteria become measurable or they become measureable in a more accurate way. On the other hand, the design team increasingly loses (full) control over important elements of quality, since execution of construction work, operation of the building and building use will become more and more important.

Who should measure the performance of the design team?

The obvious answer to this question is that it is the client who should measure the performance of the design team. In design practice, however, we have to be aware of a significant imbalance of information between the client and the design team, which makes it difficult for the client to assess the quality of the design work based on independent information. Even experienced clients may need assistance to be able to control the quality of design at different stages of the design process. The assessment of performance of the design team might thus be one of the tasks of an ID Facilitator.

Table 1: Characteristics of different points in time to measure the quality of design

Point in Time	Measurability	Advantages	Disadvantages
After concept design resp. after detailed design	Verification only through calculated quality criteria	Design quality (compliance with design targets) depends prevailingly on the design team	Several quality criteria are not measurable at this stage
After construction documentation	Several quality criteria are already closer to reality	More quality criteria are measurable than in the earlier design stages	Increasing influence of suppliers on the quality by submission of tender materials
After construction implementation	Some quality criteria can be measured directly already	Clearer and more distinct picture of the final quality of the project compared to the predefined quality targets	Execution of construction work introduces an additional impact on quality
After a certain period of operation	Operation-related quality criteria can be directly measured	Selected quality criteria can undergo a reality-check (e.g. energy consumption, comfort parameters etc.)	Besides design quality, also quality of execution of construction work and operational quality have an important impact on the overall result

Summary: Performance-related remuneration elements in design practice

From the description above we can deduce that the assessment of quality of design work is a complex challenge that offers no simple solution. Although in theory it is possible to measure certain design-related quality aspects at different points in time, there is hardly any experience of integrating performance aspects into the designer´s fees.

On the other hand, ID puts forward quality targets and therefore a reflection of this aspect in the designer’s fees would be a logical step. Therefore performance-related remuneration elements are proposed to become part of the generic approach for an ID-related remuneration model described in Chapter 2. Taking the complexity of the topic into account, it is clear that performance-related elements are not suitable to become a major part of the designers’ remuneration, but they may serve as extra incentives for performing work better than standard. Bearing in mind this limitation, we think that performance-related fees for designers are feasible.

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