

Considerations for Building Services Systems at Early Design Stages

- ✓ **Overall Design Objectives**
 - client's aims and expected level of service
 - budget and investment policies and priorities
 - time constraints and other limitations (e.g. site location)

- ✓ **Design Criteria**
 - external weather (climate information, outdoor design conditions)
 - indoor comfort conditions
 - noise, lighting levels, etc.

- ✓ **Assumptions**
 - for any uncertainties/difficulties crucial to project design development
 - collect all the available information and data
 - seek for client's approval and prepare for adjustments

- ✓ **System Design Concepts (Brief Outline)**
 - system descriptions (brief)
 - major plant and system configurations
 - considerations for zoning, operation, controls, maintenance, etc.

- ✓ **System Selection**
 - options available
 - comparison and reasoning
 - recommended provisions and alternatives

- ✓ **Estimations (Rough)**
 - load and capacity
 - spatial requirements (plant rooms, risers, access)
 - budget indicative costs

- ✓ **Other Matters with Significant Implications**
 - statutory requirements (regulations, codes of practice)
 - utility connections (electricity, water, towngas, telecomm)
 - specific requirements for special areas (if any)
 - cost implications
 - implications to architectural, structural and interior designs
 - areas recommended for further investigations and feasibility study

Project Information Developed by the Project Team at the Inception and Feasibility Stage for Building Services Systems

1. Aims

- To prepare general outline of requirements and plan future action.
- To provide the Client with an appraisal and recommendation in order that he may determine the form in which the project is to proceed, ensuring that it is feasible, functionally, technically and financially.

2. Major Tasks

Careful definition of the project requirements and clarification of the terms of reference (important for later development of the design):

- Obtain and investigate all available information and data relating to the project and agree with the Client the extent and class of Building Services to be provided for the project.
- Identify the scope of work and any uncertainties or difficulties to be clarified and resolved at later stages.

3. On Building Services Systems

To advise the Client on essential aspects and priorities of Building Services system to be considered at the early design stages.

- With the preliminary architectural sketches, identify all necessary and critical requirements for major Building Services systems (e.g. water tanks, pump rooms, vertical ducts and plant rooms) to be incorporated and coordinated into the architectural design.
- To advise the Client on whether specific requirements for the Building Services provisions should be considered at this stage (e.g. special fire services provisions).
- To consult in conjunction with any local and other authorities as necessary on Building Services matters of principle that might affect the project design (e.g. the availability of public and other utilities including source of town main supply).

4. On Statutory Requirements, Standards and Codes

To advise the Client on statutory requirements, standards and codes:

- To state out and present to the Client at the early design stage all the design codes/standards which affect the project development so that the Client's consideration can be sought and necessary adjustment can be made.
- Where local codes/standards are not available, other internationally recognized codes/standards for design configuration should be adopted and their acceptance verified (e.g. British Standards, ASHRAE, CIBSE, NFPA).
- To evaluate the statutory codes/standards regarding Building Services installation for the various type of usage for different area of the building development and particularly list

out all those requirements that need to be considered as early as possible such that necessary provision for room or duct space can be incorporated.

- To analyse all applicable codes with attention to interdisciplinary requirements, energy conservation requirements and safety and health requirements.
- To seek approval or agreement on design principles from authorities who have jurisdiction on the various systems.

5. On Finance, Time and Resource management

To advise the Client on finance, time and resource management:

- To estimate systems construction costs and operating costs.
- To submit for the Client's consideration and decision the estimated cost and budget for the principal Building Services systems.
- To advise the Client on procurement methods, contractual aspects, consultants and specialists to be employed, project management and site appraisal/constraints.
- To advise the Client on work programme and proposed schedule for completion of the project.

6. On Design Development

- To advise the Client on the need for any special survey, investigation or feasibility study, collaborating as required with other nominated professions and confirming objectives and a programme for the work involved.
- To prepare for outline proposals for the Building Services systems.
- To outline preliminary schematic line diagram (conceptual) for various systems in accordance with the provisions and requirements as agreed with the Client.
- To estimate preliminary loading and capacity of systems (e.g. using past data, check figures and rules of thumb).
- To carry out economic analysis on the various systems applicable to arrive at the most cost effective system, plant room location, energy source and equipment arrangement.

Table 1. RIBA Outline Plan of Work

| Stage | Purpose of work and decisions to be reached | Tasks to be done | People directly involved. | Commonly used terminology. |
|--|--|---|--|----------------------------|
| A. Inception | To prepare general outline of requirements and plan future action. | Set up client organization for briefing. Consider requirements, appoint architect. | All client interests, architect. | Briefing |
| B. Feasibility | To provide the client with an appraisal and recommendation in order that he may determine the form in which the project is to conditions proceed, ensuring that it is feasible, functionally, technically and financially. | Carry out studies of user requirements, site conditions, planning, design, and cost, etc., as necessary to reach decisions. | Clients' representative, architects, engineers and QS accordance to nature of project. | |
| Stage C begins when the architect's brief has been determined in sufficient detail. | | | | |
| C. Outline Proposals | To determine general approach to layout, design and construction in order to obtain authoritative approval of the client on the outline proposals and accompanying report. | Develop the brief further. Carry out studies on user requirements, technical problems, planning, design and costs, as necessary to reach decisions. | All client interests, architects, engineers, QS and specialists as required. | Sketch plans |
| D. Scheme Design | To complete the brief and decide on particular proposals, including planning arrangement appearance, constructional method, outline specification and cost, and to obtain all approvals. | Final development of the brief, full design of the architect, preliminary design by engineers, preparation of cost plan and full explanatory report. Submission of proposals for all approvals. | All client interests, architects, engineers, QS and specialists and all statutory and other approving authorities. | |
| Brief should not be modified after this point. | | | | |
| E. Detail Design | To obtain final decision on every matter related to design, specification, construction and cost. | Full design of every part and component of the building by collaboration of all concerned. Complete cost checking of designs. | Architects, QS, engineers and specialists, contractor (if appointed). | Working drawings |
| Any further change in location, size, shape, or cost after this time will result in abortive work. | | | | |
| F. Promotion Information | To prepare production information and make final detailed decisions to carry out work. | Preparation of final production information i.e. drawings, schedules and specifications. | Architects, QS, engineers and specialists, contractor (if appointed). | |
| G. Bills of Quantities | To prepare and complete all information and arrangements for obtaining tender. | Preparation of Bills of Quantities and tender documents. | Architects, QS, contractor (if appointed). | |
| H. Tender Action | Action as recommended in relevant NJCC Code of Procedure for Selective Tendering. | Action as recommended in relevant NJCC Code of Procedure for Selective Tendering. | Architects, QS, engineers, contractor, client. | |
| J. Project Planning | To enable the contractor to programme the work in accordance with contract conditions; brief site inspectorate; and make arrangements to commence work on site. | Action in accordance with RIBA Plan of Work. | Contractor, sub-contractors. | Site operations |
| K. Operations on Site | To follow plans through to practical completion of the building. | Action in accordance with RIBA Plan of Work. | Architects, engineers, contractors, sub-contractors, QS, client. | |
| L. Completion | To hand over the building to the client for occupation, remedy any defects, settle the final account, and complete all work in accordance to the contract. | Action in accordance with RIBA Plan of Work. | Architects, engineers, contractor, QS, client. | |
| M. Feedback | To analyse the management, construction and performance of the project. | Analysis of job records. Inspections of completed building. Studies of building in use. | Architect, engineers, QS contractor, client. | Feedback |

[Source: Royal Institute of British Architects (RIBA)]
(QS = quantity surveyor)

Table 2. The RIBA Plan of Work Stages 1999

The RIBA Plan of Work is a robust process protocol which describes the activities from appraising the clients requirements through to post construction. The stages are also used in the appointing documents to help identify the architects services.

| Stage | Activities |
|---|--|
| A: Appraisal | <ul style="list-style-type: none"> • Identification of client's requirements and possible constraints on development. • Preparation of studies to enable the client to decide whether to proceed and to select probable procurement method. |
| B: Strategic briefing | <ul style="list-style-type: none"> • Preparation of Strategic Brief by, or on behalf of, the client confirming key requirements and constraints. • Identification of procedures, organisational structure and range of consultants and others to be engaged for the project. |
| C: Outline proposals | <ul style="list-style-type: none"> • Commence development of strategic brief into full project brief. • Preparation of outline proposals and estimate of cost. • Review of procurement route. |
| D: Detailed proposals | <ul style="list-style-type: none"> • Complete development of the project brief. • Preparation of detailed proposals. • Application for full development control approval. |
| E: Final proposals | <ul style="list-style-type: none"> • Preparation of final proposals for the Project sufficient for co-ordination of all components and elements of the Project. |
| F: Production information | <ul style="list-style-type: none"> • F1: Preparation of production information in sufficient detail to enable a tender or tenders to be obtained. Application for statutory approvals. • F2: Preparation of further production information required under the building contract. |
| G: Tender documentation | <ul style="list-style-type: none"> • Preparation and collation of tender documentation in sufficient detail to enable a tender or tenders to be obtained for the construction of the Project. |
| H: Tender action | <ul style="list-style-type: none"> • Identification and evaluation of potential contractors and/or specialists for the construction of the project. • Obtaining and appraising tenders and submission of recommendations to the client. |
| J: Mobilisation | <ul style="list-style-type: none"> • Letting the building contract, appointing the contractor. • Issuing of production information to the contractor. • Arranging site handover to the contractor. |
| K: Construction to practical completion | <ul style="list-style-type: none"> • Administration of the building contract up to and including practical completion. • Provision to the contractor of further information as and when reasonably required. |
| L: After practical completion | <ul style="list-style-type: none"> • Administration of the building contract after practical completion. • Making final inspections and settling the final account. |

[Source: Royal Institute of British Architects (RIBA)]

Building Services Provisions Checklist

- 1) HVAC (heating, ventilation and air conditioning) systems**
 - heat rejection method : air-cooled, water-cooled, evaporative cooling, etc.
 - air side systems: e.g. VAV, CAV, FCU
 - chilled water system or DX (direct expansion) system
 - automatic controls for HVAC
 - ventilation system (mechanical ventilation, natural ventilation, mixed-mode or hybrid)
 - heating system and heat recovery system (if any)

- 2) Electrical Services Systems**
 - LV supply and distribution (transformer room, main switch room, risers)
 - standby emergency supply
 - lighting system and emergency lighting
 - lightning protection system
 - earthing and bonding system

- 3) Lifts and Escalators**
 - passenger lifts, goods lifts, services lift
 - escalators

- 4) Fire Services Systems**
 - wet systems: sprinkler system and FH/HR (fire hydrant/hose reel) system
 - fire detection and alarm
 - staircase pressurization system and smoke extraction
 - CO₂/FM200 total flooding system
 - portable extinguishers, sand buckets, etc.
 - fire doors and shutters

- 5) Plumbing and Drainage Systems**
 - foul (soil and waste) water disposal
 - storm (rain) water disposal
 - cold water supply system and flush water supply system

- 6) Security and Alarm Systems**
 - burgular alarm, panic alarm, CCTV, patrol tour
 - central intercomm, 999 link

- 7) Miscellaneous Systems**
 - BAS/BMS and controls, PABX and CABD
 - town gas supply
 - refuse handling / compaction
 - external cleaning (gondola)

- 8) Specialised Systems**
 - compressed air
 - cleansing water system
 - drencher system and fire curtains