NO STAMP.

Appendices

Appendix A:

Glossary for AutoCAD, CCS, and Microsoft project software applications terms:

Table A.1: Glossary for AutoCAD Design Terms

Object-	Elements of AutoCAD application. A line, view, layers, and combination of those such as door, window are examples of AutoCAD objects.
Property	An attribute of AutoCAD objects Colour, Layer, dimension and any attribute attached to objects are properties of AutoCAD objects.
Object Browser	An object browser displays the available classes (objects), properties, and methods in a dialog box of the applications It can be used to find and use objects that are created, as well as objects from other applications.
block	A block is a collection of objects that can be associated together to form a single object, or block definition a block can be exploded into its component objects, for detailed data.
Block Object	A block definition containing a name and set of objects. Block definitions can also contain attribute definitions
block reference	A block reference can contain other (nested) blocks For example, you can insert a drawing of a mechanical assembly that contains a housing, a bracket, and fasteners, with each fastener composed of a bolt, washer, and nut.
Attribute Object	An object that appears as a text string and describes the characteristics of an attribute reference. This object is called an attribute definition in AutoCAD
An attribute	An attribute provides an interactive label or tag for you to attach text to a block Whenever you insert a block that has a variable attribute, AutoCAD prompts you to enter the data to be stored with the block Examples of data are part numbers, prices, comments, and owners' names
external reference	An external reference (xref) links another drawing to the current drawing. When you insert a drawing as a block, the block definition and all of the associated geometry is stored in the current drawing database.

Table A.2: Glossary for CCS cost estimating Terms

Activities	Activities are the tasks or operations that are required to be carried out in the program Activity information may be created and edited on the screen bar chart, on an activity list or on activity dialog documents The basic information required to create an activity is an activity number, a description and a duration
Trade code	A one-digit alpha code to identify a trade This code may be used to register trades against activities Only one trade code may be entered against an activity The trade code is compulsory for all Op Codes It forms the first digit of a simple Op Code and the second digit of a macro Op Code
Total Quantity Billed	The total quantity for an Op Code is the sum of the billed quantities for the items which that Op Code has been used against.
Op Code	Simple Op Codes take the form of a trade code followed by up to seven further characters In Candy system every bill item must have an Op Code (Operation Code) It is the Op Code that contains key information including the description and any pricing information Every Op Code must begin with a previously defined trade code The trade codes are defined on the trade definition document. The first digit of the Op Code must be a valid trade code The balance of the code, used against the bill item, may be any alphanumeric combination to create a code no more than a maximum of eight digits in total The trade code should be a broad categorisation of the different types of items in the bill of quantities Trade codes may be used in the following processes
Op-Code Attributes(Attr)	Op Codes in Candy can have various attributes, which are displayed in the Op Code, attributes field, headed Attr This is a four-digit field that may contain up to three different markers
Task Code	Task codes are optional eight digit alphanumeric codes, which may be allocated to Op Codes for the purpose of sieving, grouping or summarising the information that is produced from a bill type report They may also be used for linking to a SitePlan program
Work Code	Work codes are optional eight digit alphanumeric codes, which may be allocated to Op Codes for the purpose of sieving, grouping or summarising the information that is produced from a bill type report. They may also be used for linking to a SitePlan program
Bill Code	Bill codes are optional eight digit alphanumeric codes, which may be allocated to bill items for the purpose of sieving, grouping or summarising the information that is produced from a bill type report
	ASCII Files (Text) This utility may be used to create a bill of quantities in Candy from an ASCII (text) file
secondary codes	Various secondary codes may be allocated to each activity in the program in order to group and sort them for reporting purposes The secondary codes that are available in SitePlan are all 8-digit alphanumeric codes, and may be defined before they may be allocated to activities
Macro-Op Code	Macro Op Codes take the form of a number, followed by a trade code followed by up to six further characters Sometimes the client's bill contains composite items These are items that describe more than one operation or trade, examples of which are manholes or caissons In Candy, a mini bill of quantities may be created for such items using a macro Op Code Macro Op Codes may be created on the bill writer by combining or imploding simple Op Codes and / or lower level macros from the bill of quantities or an area bill
Production Code	Production codes are one-digit alpha codes which may be used for analysing outputs and production by bill item or by task code They are optional and may be allocated to resources, together with a unit conversion factor, on the basis of one code per resource
Resource Type Definitions	If any split of the rate is required, then resource types must be defined On the resource types definition document a resource type is defined by entering a letter in the first field and a description in the second field Resource type definitions are used as an essential part of a simple resource, and are used to broadly categorise the list of resources into Labour, Plant, Material etc
Resource Code	An eight digit alphanumeric code which is unique to each resource or resource heading The resource list is automatically sorted on this code
Simple resources	Simple resources are the basic building blocks of an estimate They are the things which are actually required to build the job - examples of which might be bags of cement, m3 of sand, labour paid by the hour or plant hired by the week Resource type definitions are used as an essential part of a simple resource, and are used to broadly categorise the list of resources into Labour, Plant, Material etc
Complex resources	Complex resources are combinations of other resources For example, every time that you wish to price a concrete item in the bill of quantities, it would be fairly tedious to have to bring the sand, stone and cement into that item, and combine them in the correct proportions When you have a concrete item to price you have only one resource to bring into that item Further levels of resource may be introduced to produce a complex chain
resource list	The resource list is used to create simple resources by registering them on the list and allocating each one a type, resource codes, description, unit, rate, etc Once simple resources exist, they can in turn be used to create complex resources
Total Quantity use-of-a resource	This value represents the total use of a resource against each activity to which it has been allocated, and may be calculated in one of three ways, depending on the resource distribution type for the resource Total type - The resource quantity is the total utilisation for this type of resource for an activity Rate type - The total utilisation is calculated from the resource quantity x duration Pool type - The resource quantity is the total utilisation for this type of resource for an activity

(continued)Table A.2: Glossary for CCS cost estimating Terms

Production Rates	Production rates or outputs may be obtained for user defined categories of resources, for either individual bill items or for task codes Production codes may be combined in order to compile total man hours for inclusion on a bill scroller and on worksheet or dual currency bill reports
Cost Per Unit	Resources may be given a cost per unit that is used when a histogram by value is required The daily quantity is multiplied by the cost per unit to produce a cost per day
worksheet	A worksheet is the document on which resources are allocated to an operation, together with production rates, factors, etc to arrive at a unit rate for the billed item
Gross Rate	The gross rate is a calculated rate, and is based upon the nett rate plus any markup that has been applied
Nett Rate	The nett rate represents the internal value or cost of an item It may be created using any one of the following methods plug rate, split rate, worksheet, subcontract rate
Nett-Split Rates	The nett split rate columns represent the nett rate for an item, broken down into resource types The value of each resource type is calculated from the contribution of each simple resource type, based upon the use of resources on the worksheet
Plug-Rate Pricing	The simplest way of pricing in Candy is by using plug rates Plug rate pricing is best achieved on a bill or Op Code scroller, with the nett rate and attributes columns displayed As the name implies, this is simply an all up rate entered against an item It produces value for this bill item in the tender total, however, there is no breakdown of that value whatsoever
Split-Rate Pricing	The next level of pricing in Candy is to use split rates Split rate pricing is best achieved on a bill or Op Code scroller, with the nett split rates and attributes columns displayed
Worksheet Pricing	The most detailed way of pricing in Candy is by using worksheets to prepare a fully detailed analytical estimate
Subcontract Rate	The subcontract rate selector provides the mechanism for pricing Op Codes in subcontract rate mode Up to 10 subcontractors together with rates and remarks may be listed against any Op Code
Provisional Worksheet	You may mark any worksheet as being provisional For example, if you were pricing items in the bill for which you had to supply materials, but you were using a labour only subcontractor to install those materials Having sent out for labour only quotes, you could price the material element of the applicable worksheets, and mark them as provisional while waiting for the labour only quotes to be received
Markup	Markup is the process of enhancing the estimated nett rates in a tender to allow for profit, indirect costs, escalation, risk etc This marked up rate is termed the gross rate in Candy
Pricing Currency	When working with multiple currencies, it is advisable to name the pricing currency - that is the currency to which all resources priced in a foreign currency are converted This would normally be the currency in which a tender is to be submitted
Pricing Mode	The first position in the attributes (Attr) column indicates the current pricing mode for the Op Code The following indicators may be displayed in this column U Unpriced P Plug rate S Split rate W Worksheet w Provisional worksheet X Subcontract rate ' Unpriced items in a macro worksheet ? Plug rate items in a macro worksheet
Cost Plan	The detailed bill of quantities may be presented in a cost plan format, which breaks down the bill into summary construction elements
Resource Importers	If a resource list is available as a file (CSV or ASCII) or a backup file from one of the widely used word-processing or spreadsheet software packages, the resource importer utility in Candy may be used to create the Candy resource list If a file is not available, a paper copy may be used to generate a suitable file using a scanner, together with an OCR (Optical Character Recognition) software package The following resource importer methods are available Delimited files (CSV) ASCII files (Text)

Table A.3: Glossary for Microsoft Project Scheduling Terms

Schedule	The timing and sequence of tasks within a project The schedule consists mainly of tasks, dependencies among the tasks, durations, constraints, and time-oriented project information
Task	A job that has a beginning and an ending The completion of a task is important to the project's completion Projects are made up of tasks A task is sometimes referred to as an activity Each task in project has work that must be done
Task Dependency	A task dependency describes how a task is related to the start or finish of another task Microsoft Project provides four task dependencies you can use to connect a series of tasks in a schedule By using these dependencies effectively, you can modify the critical path and shorten your project schedule slack Tasks dependency constrains start and Finnish time
Task dependencies (FS, SS, FF, SF)	The nature of the dependencies between linked tasks You link tasks by defining a dependency between their finish and start dates For example, the "Contact caterers" task must finish before the start of the "Determine menus" task There are four kinds of task dependencies in Microsoft Project Finish-to-start (FS) The task (B) cannot start until another task (A) finishes Start-to-start (SS) The task (B) cannot start until another task (A) starts Finish-to-finish (FF) The task (B) cannot finish until another task (A) finishes Start-to-finish (SF) The task (B) cannot finish until another task (A) starts
Recurring task	A task that occurs repeatedly during the course of a project. You might define the weekly status meeting as a recurring task
Lag Time	Lag time delay tasks A delay between tasks that have a dependency For example, if you need a two-day delay between the finish of one task and the start of another, you can establish a finish-to-start relationship and specify a two-day lag time You enter lag time as a positive value relationship
Lead time	Overlap tasks An overlap between tasks that have a dependency For example, if a task can start when its predecessor is half-finished, you can specify a finish-to-start relationship with a lead-time of 50 percent for the successor task You enter lead-time as a negative value
Predecessor	A task whose start or finish determines the start or finish of another task A task that must start or finish before another task can start or finish
Successor	A task that cannot start or finish until another task starts or finishes A task that cannot start or finish until another task starts or finishes
Early Start	The Early Start field contains the earliest date that a task could possibly begin, based on the early start dates of predecessor and successor tasks, and other constraints Early Start is calculated as follows When you first create a task, its early start date is the same as the scheduled start date As you link the task to predecessors and successors and apply any other constraints, Microsoft Project calculates the early start date as the earliest possible date this task could be started, if all predecessor and successor tasks also start on their early start dates If there is a leveling delay on the task, this is also figured into the early start date
Early Finish	The Early Finish field contains the earliest date that a task could possibly finish, based on early finish dates of predecessor and successor tasks, other constraints, and any leveling delay
Late Start	The Late Start field contains the latest date that a task can start without delaying the finish of the project. This date is based on the task's start date, as well as the late start and late finish dates of predecessor and successor tasks, and other constraints
Late Finish	The Late Finish field contains the latest date that a task can finish without delaying the finish of the project. This date is based on the task's late start date, as well as the late start and late finish dates of predecessor and successor tasks, and other constraints
Critical task	A task that must be completed on schedule for the project to finish on time If a critical task is delayed, the project completion date is also delayed A series of critical tasks makes up a project's critical path
Critical path	The series of tasks that must be completed on schedule for a project to finish on schedule Each task on the critical path is a critical task Most tasks in a typical project have some slack and can therefore be delayed a little without affecting the project finish date Those tasks that cannot be delayed without affecting the project finish date are the critical tasks As you modify tasks to resolve over allocations or other problems in your schedule, be aware of the critical tasks and that changes to them will affect your project finish date A task that must be completed on schedule for the project to finish on time If a critical task is delayed, the project completion date is also delayed A series of critical tasks makes up a project's critical path
Critical Path Method (CPM)	A project management method of calculating the total duration of a project based on individual task durations and their interdependencies
Milestone	A reference point marking a major event in a project, used to monitor the project's progress Any task with zero duration is displayed as a milestone
Slack (or Float)	The amount of time a task can slip before it affects another task's dates or the project finish date Slack is sometimes referred to as float time
Free Slack	The amount of time a task can slip before it delays another task
Total Slack	The amount of time a task can slip before it delays the project finish date When the total slack is negative, the duration for a task is too long for its successor to begin on the date required by its constraint

(Continued) Table A.3: Glossary for Microsoft Project Scheduling terms

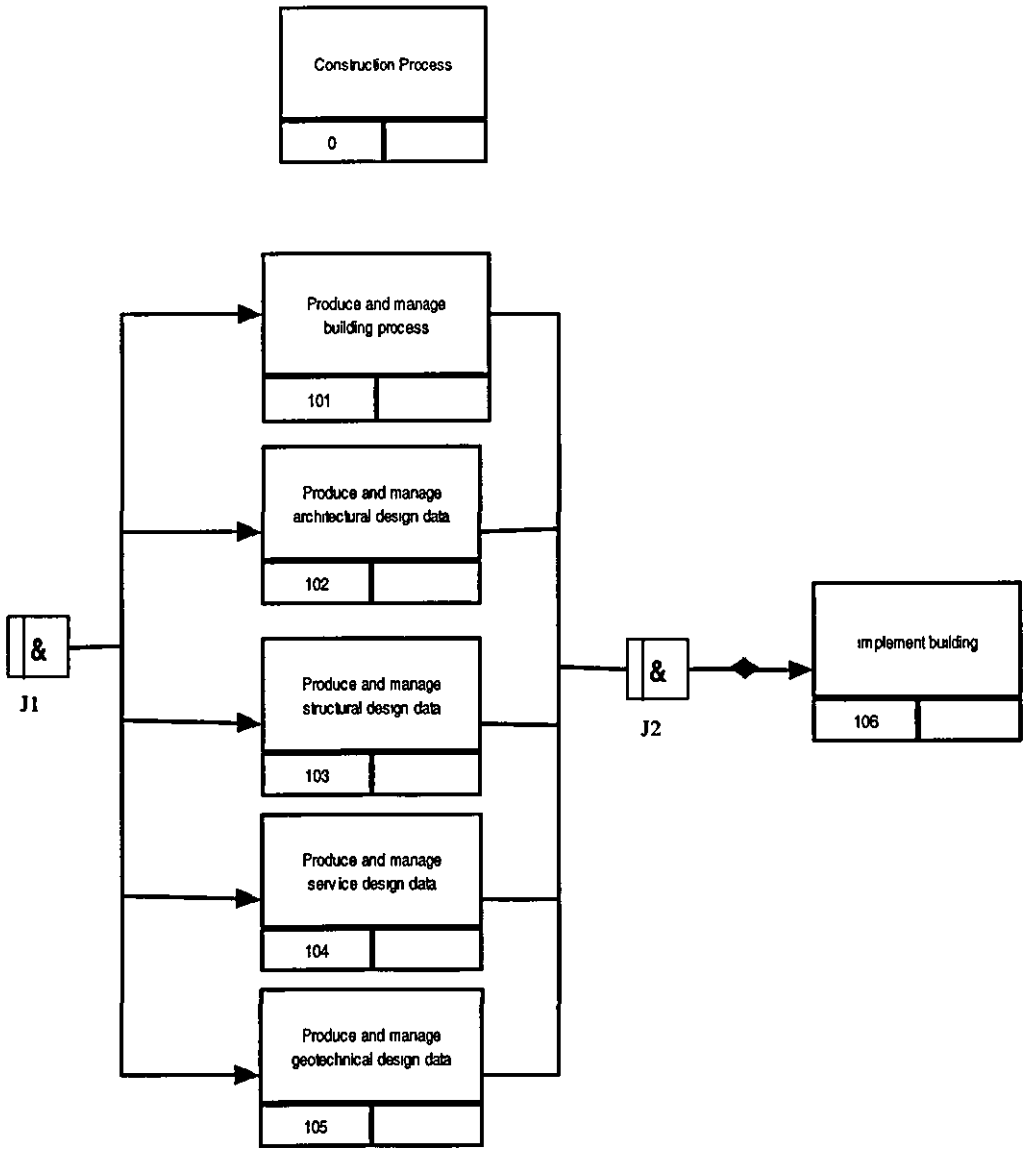
Duration	The amount of time required completing a task Elapsed duration includes working and non-working time A duration value is followed by a time unit abbreviation Working time Elapsed time min = minute emin = elapsed minutes hr = hour ehr = elapsed hours day = dayedays = elapsed days wk = week ewk = elapsed weeks
Interim plan	A set of task start and finish dates, and sometimes resource and cost information, that you can save at certain stages of your project You can compare an interim plan with the baseline plan to monitor project progress or slippage You can save up to ten interim plans
Project calendar	The base calendar used by a project.
Resource calendar	A calendar that specifies working and non working time for an individual resource A resource calendar differs from a base calendar, which specifies working and non working time for more than one resource You can use resource calendars to define unique exceptions for individual resources, such as vacations, different working days, or different shifts
Base calendar	A calendar that specifies working and non working time for a project or set of resources A base calendar differs from a resource calendar, which specifies working and non working time for an individual resource
Baseline plan	The original project plan you use to track progress during a project The baseline plan includes task start and finish dates and resource and cost information
Cost	The total scheduled cost for a task, resource, resource assignment, or for an entire project Sometimes this is also called current cost, or budget
Task cost rates	MS project 98 uses DFD cost estimating procedure to assign cost rates to resource's work i e work items or BoQs or activities are assigned with cost rates that include elements for the people, equipment, and supplies used to complete tasks in a project
Fixed cost	A cost that remains constant regardless of the task duration or the work performed by a resource can be assigned to a task Microsoft Project also allows you to assign rates to resources so you can manage project costs accurately You can assign multiple standard rates, overtime rates, or per-use rates to resources along with the dates for each rate to go into effect
Actual-	Information that shows what has actually occurred For example, the actual start for a task is the day the task started and its actual cost is the amount spent up to the present
Resources	The people, equipment, and supplies used to complete tasks in a project. Should include subcontractors who subcontracts a task so fixed cost are assigned to the task If you don't know which resources have the availability to take on extra work, you can see current resource allocations
Resource group	A set of resources that shares some characteristic, categorised by a group name For example, you can categorise resources by job function and use group names such as plumbers or editors Or, you can categorise resources by employment status and use group names such as contractors and permanent employees Enter rates for resource's work on tasks or fixed tasks costs
Units	The number of units or the quantity of a resource assigned to a task For example, if you have a plumbing task, you could assign two units, or two plumbers, to the task If you have one plumber, you could assign 5 units (half of the plumber's time) to the task. The maximum unit is the maximum number of units available for the resource For example, if you have three plumbers working on a project, the maximum units is three---three plumbers working full-time A resource list includes the names of the resources and the maximum number of units as a percentage of each resource's availability
Constraint	A restriction or limitation you set on the start or finish date of a task For example, you can specify that a task must start on a particular date or finish no later than a particular date

Appendix B:

IDEF3 Models of Building, Design, Cost Estimating and Scheduling Processes:

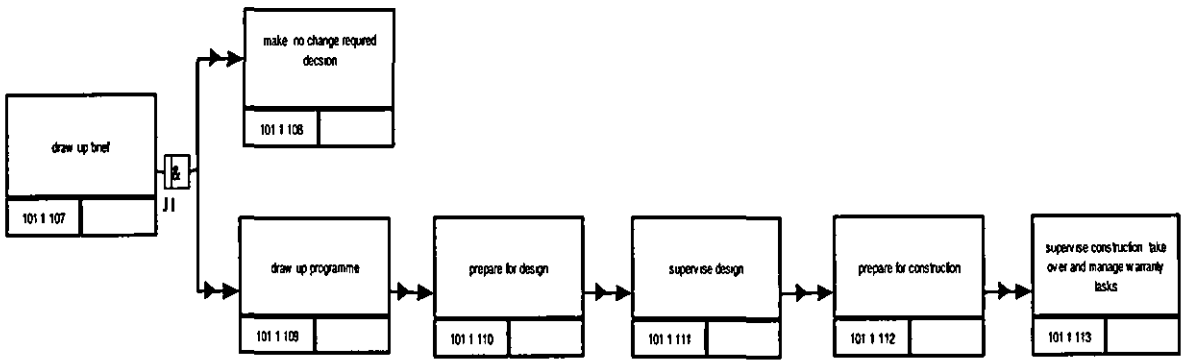
IDEF3 Model of Overall construction process:

- **Process View**

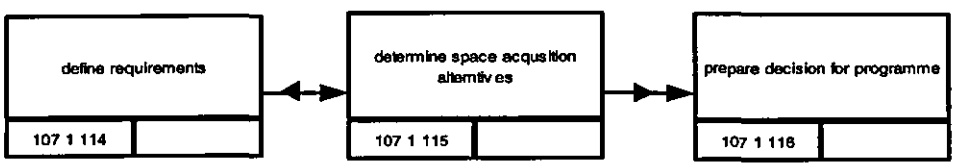


Scenario 0 1 Construction Process

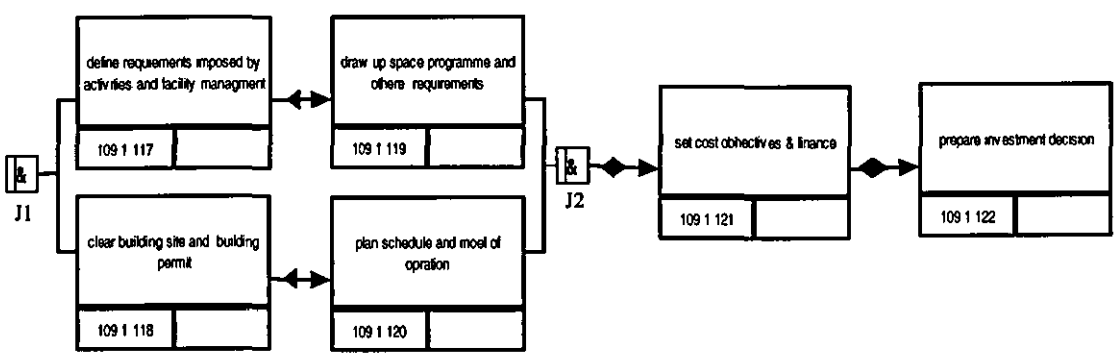
IDEF3 Model of Produce and Manage Building Process



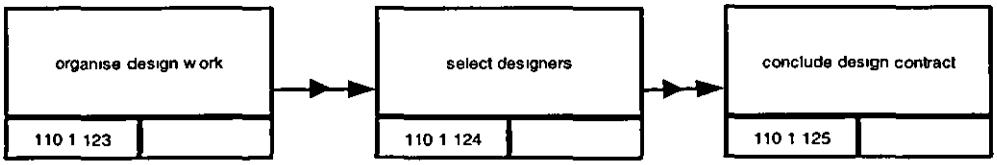
Scenario 101 1 Produce and Mange Building Process



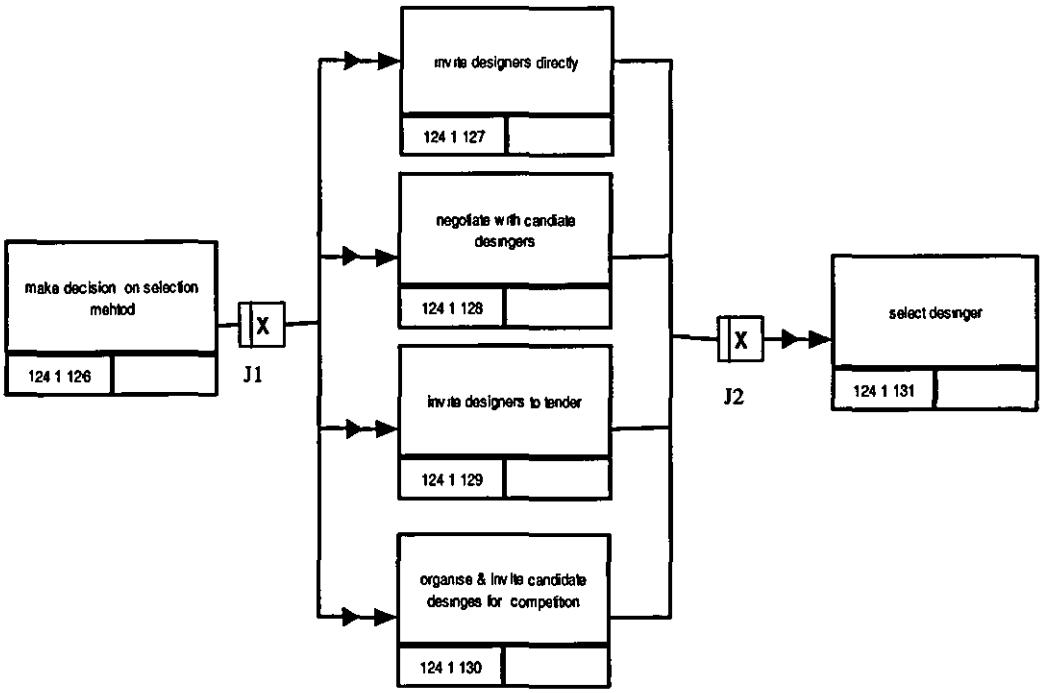
Scenario 107 1 Draw up Brief



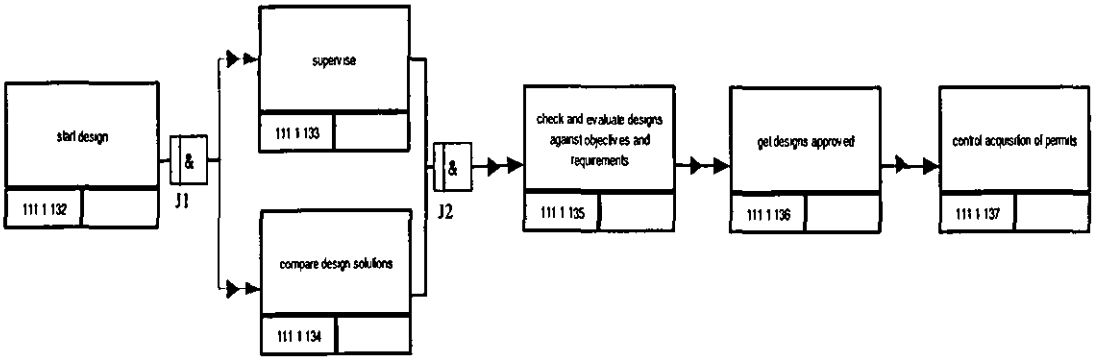
Scenario 109 1 Draw up Programme



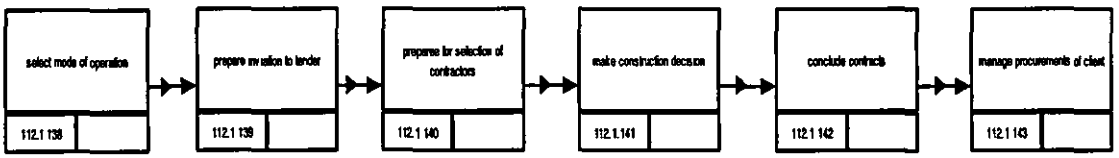
Scenario 110 1 Prepare for Design



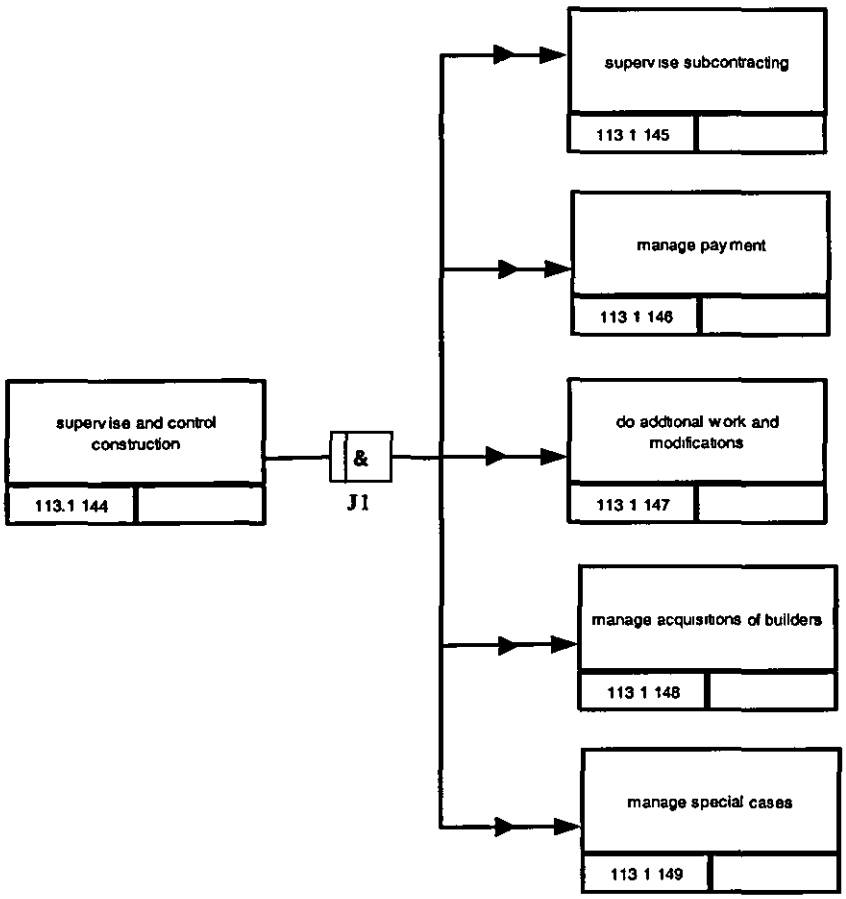
Scenario 124 1 Select Designer



Scenario 111 1 Supervise Design



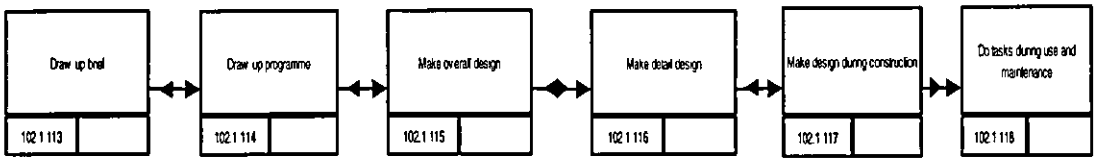
Scenario 112.1 Prepare for Construction



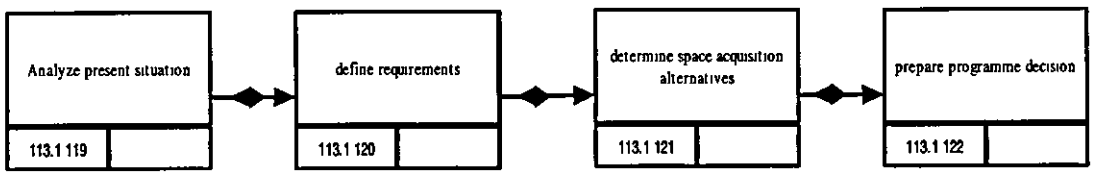
Scenario 113 1 Supervise construction, Take over & Warranty Task

IDEF3 Model for Produce and manage Architectural Design Data Process:

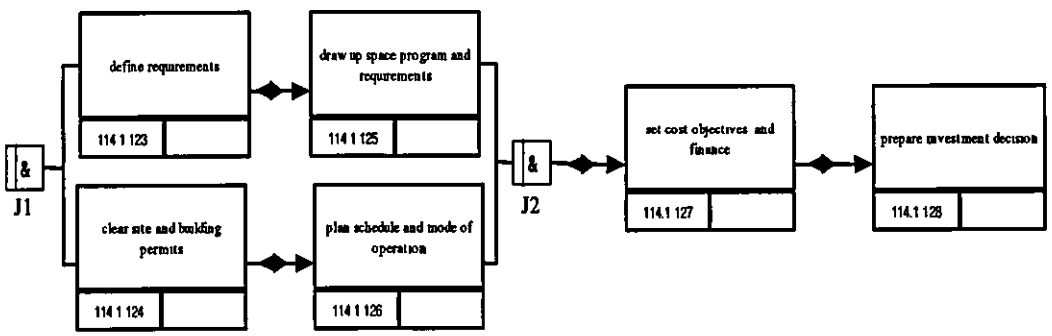
- **Process View**



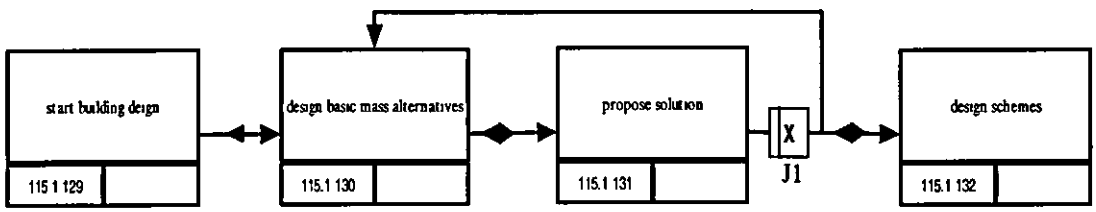
Scenario 102 1 Produce and Manage Architectural Design Data



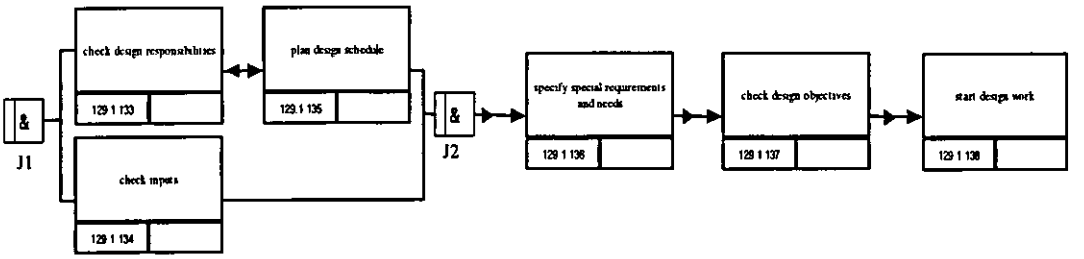
Scenario 113 1 Draw up Brief



Scenario 114 1 Draw up Programme

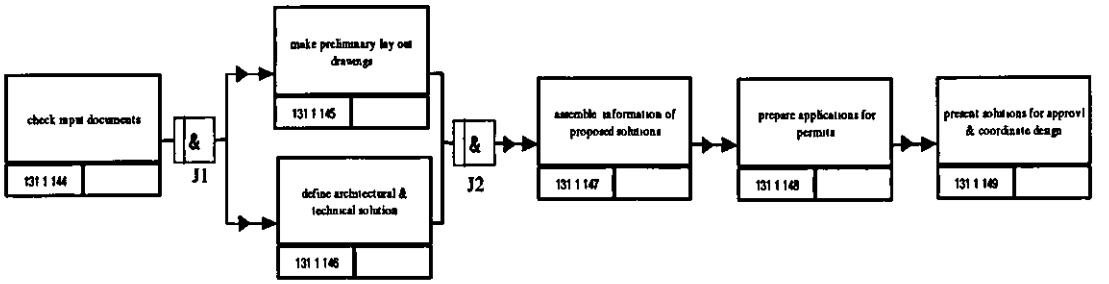


Scenario 115 1 Make overall Design

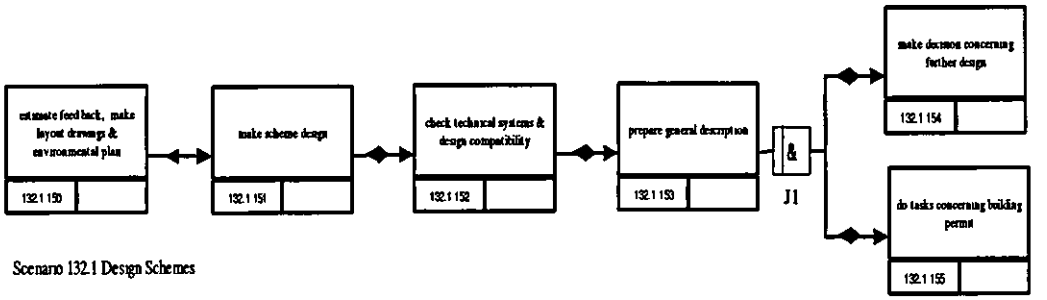


Scenario 129 1 Start Building Design

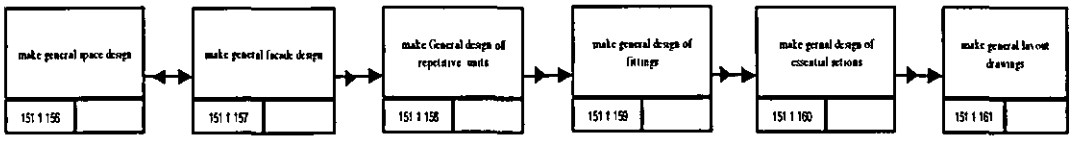
Scenario 130 1 Design Basic Mass Alternatives



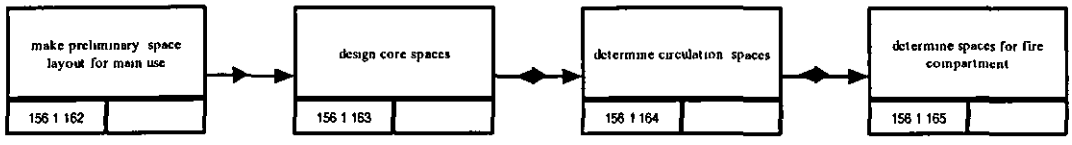
Scenario 131 1 Propose Solutions



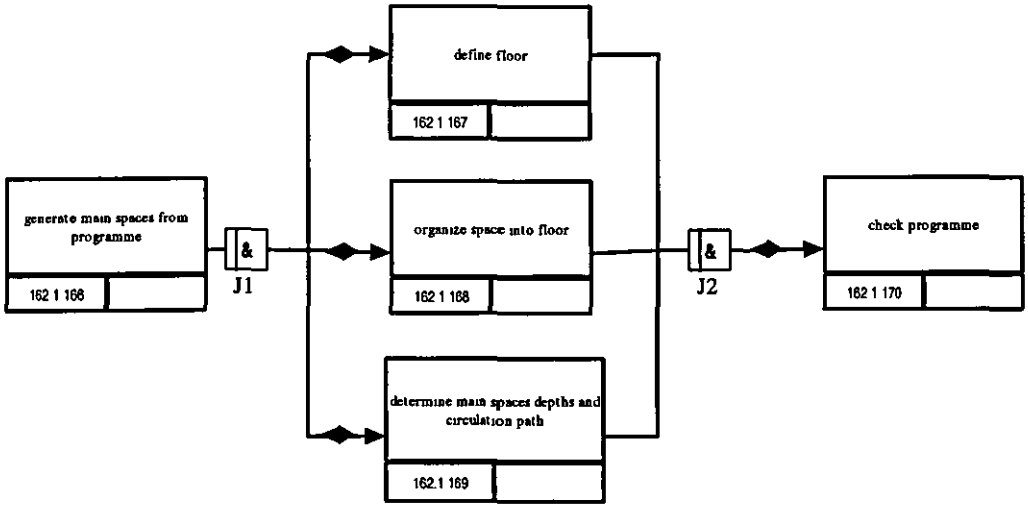
Scenario 132.1 Design Schemes



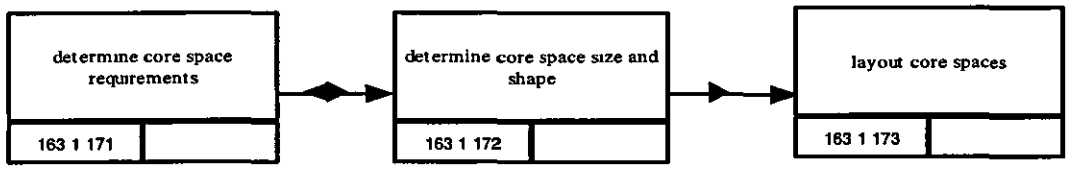
Scenario 151 1 Make Schemes Design



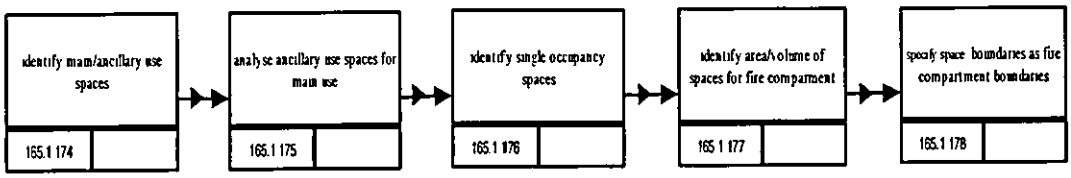
Scenario 156 1 Make General Space Design



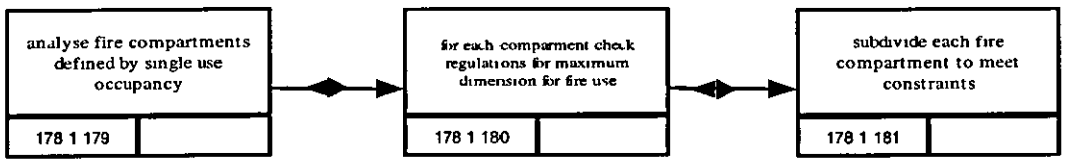
Scenario 162.1 Make Prelimnary Space Layout for Main Use



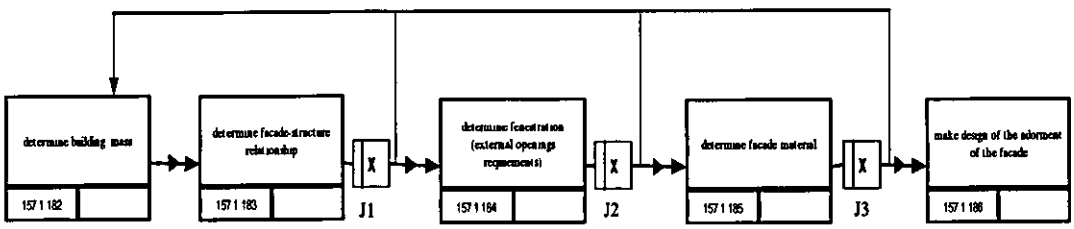
Scenario 163 1 Design Core Spaces



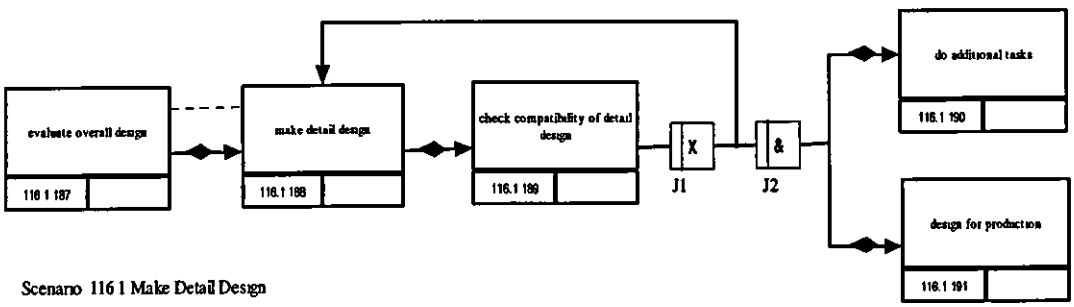
Scenario 165 1 Determine Spaces for Fire Compartment



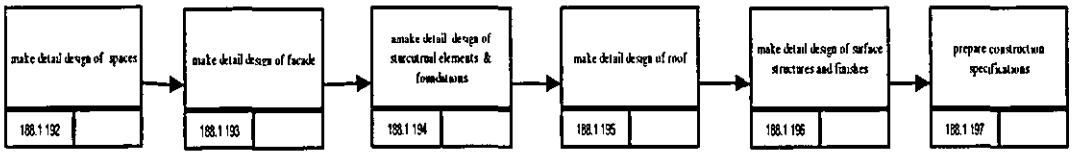
Scenario 178 1 Specify Space Boundaries as a Fire Compartment



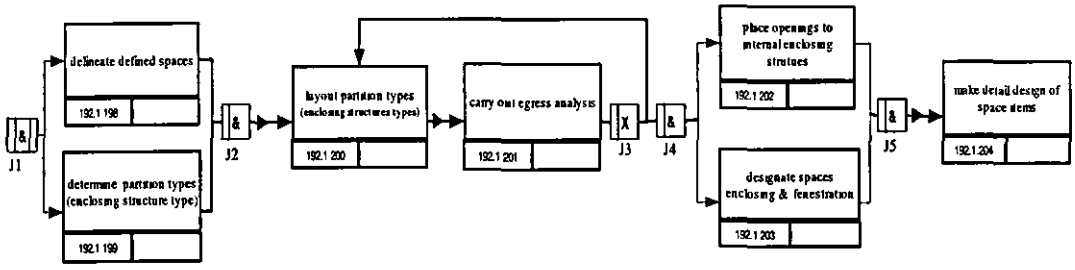
Scenario 157 1 Make General Facade Design



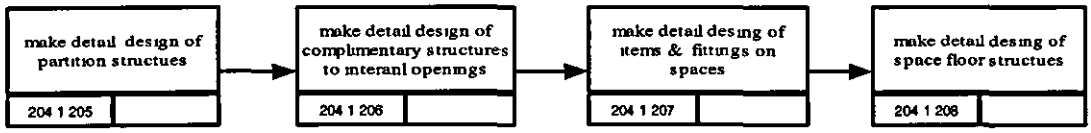
Scenario 116 1 Make Detail Design



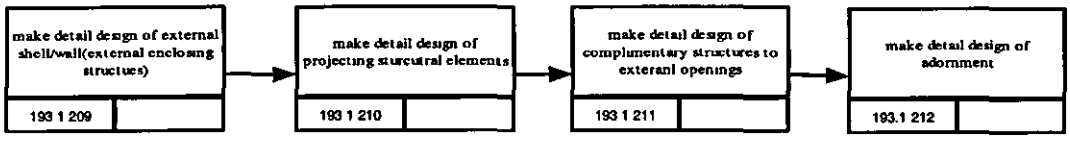
Scenario 188 1 Make Detail Design



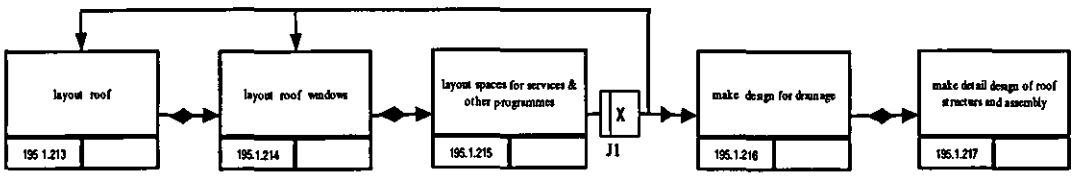
Scenario 192.1 Make Detail Design of Spaces



Scenario 204 1 Make Detail Design of Space Items



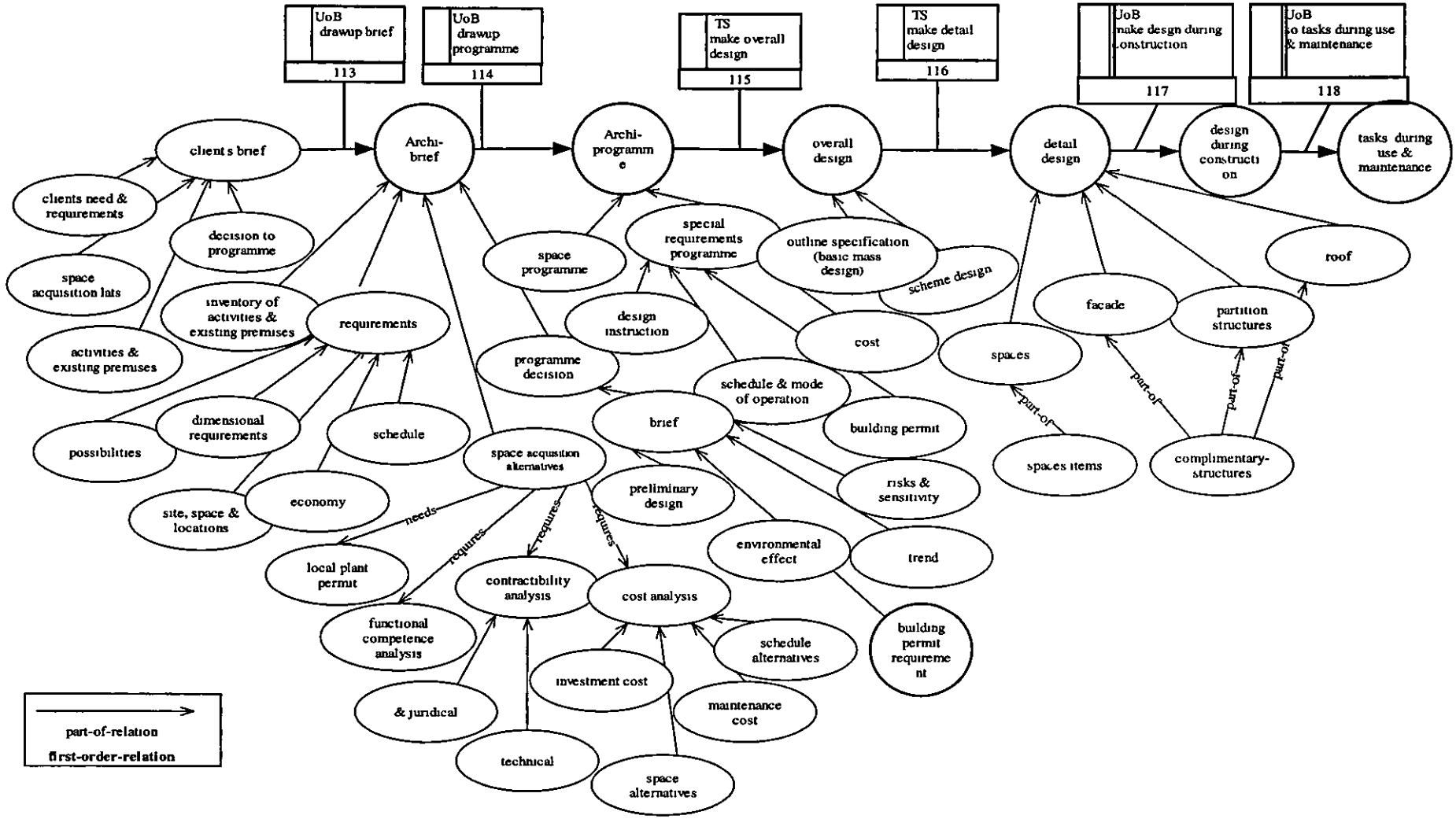
Scenario 193 1 make Detail Design of Facade



Scenario 195 1 Make Detail Design of Roof Structures

IDEF3 Model for Produce and manage Architectural Design Data Process:

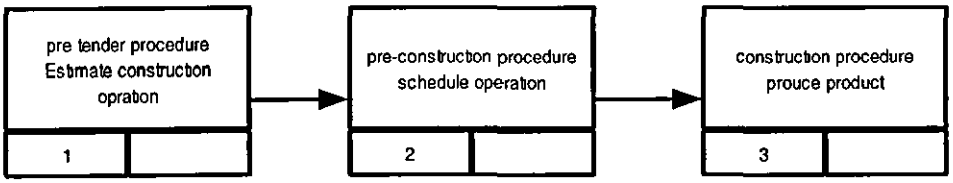
- **Object View**



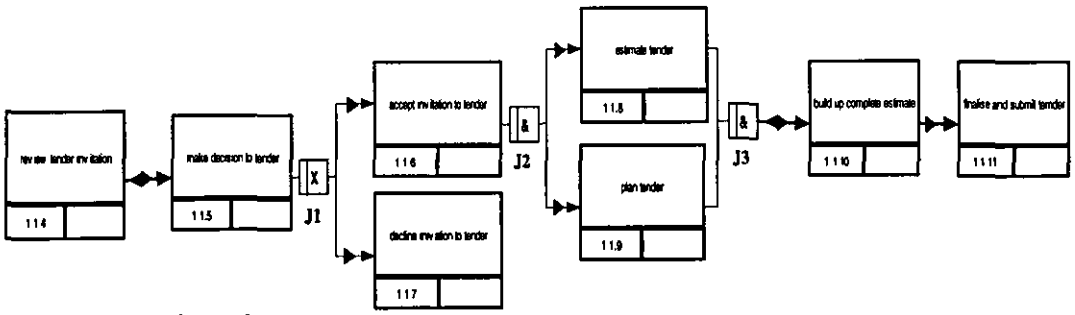
Scenario 102 1 produce and manage architectural design data process

IDEF3 Model for Produce and manage Architectural Design Data Process: Object View

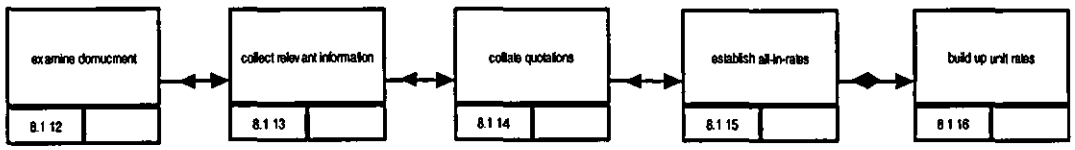
IDEF3 Model for Pre-tender Procedure: Process View



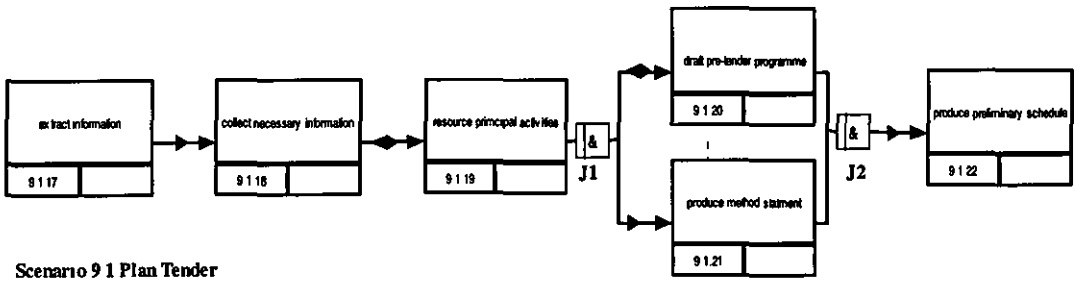
Scenario 0 Construction Operation



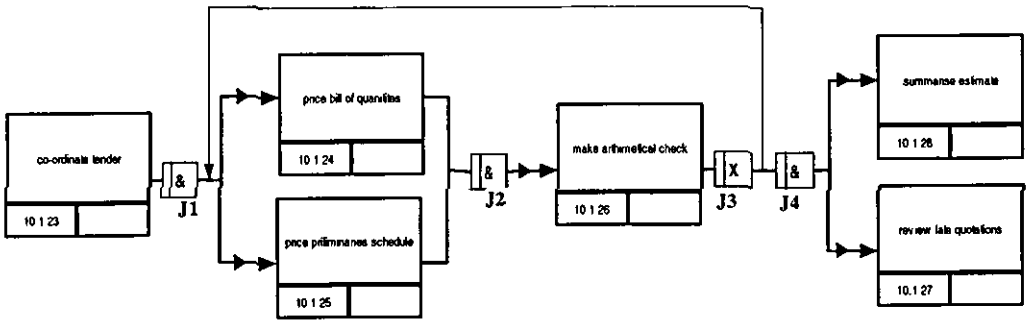
Scenario 1 1 Pre tender procedure



Scenario 8 1 Estimate Tender

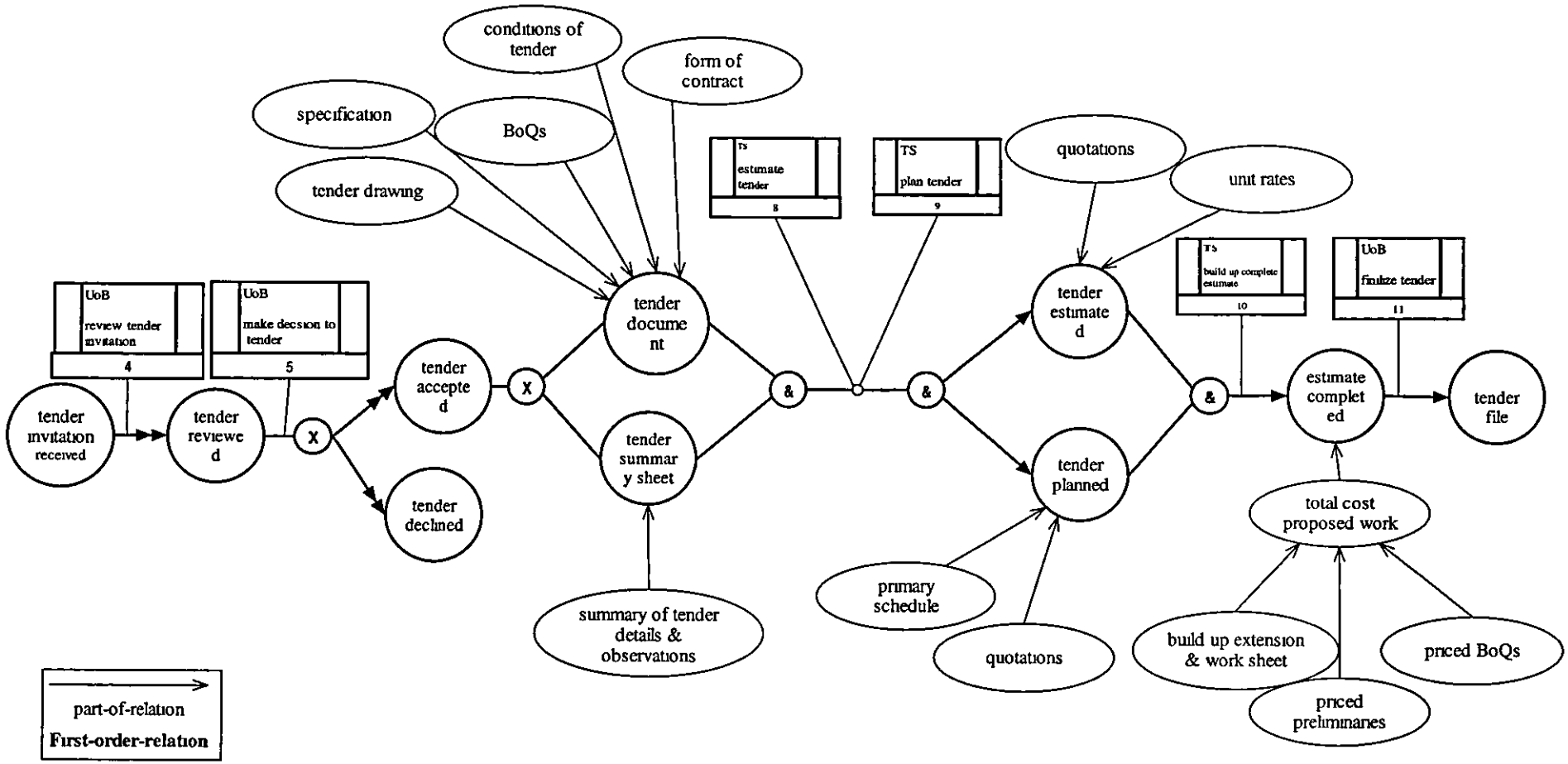


Scenario 9 1 Plan Tender



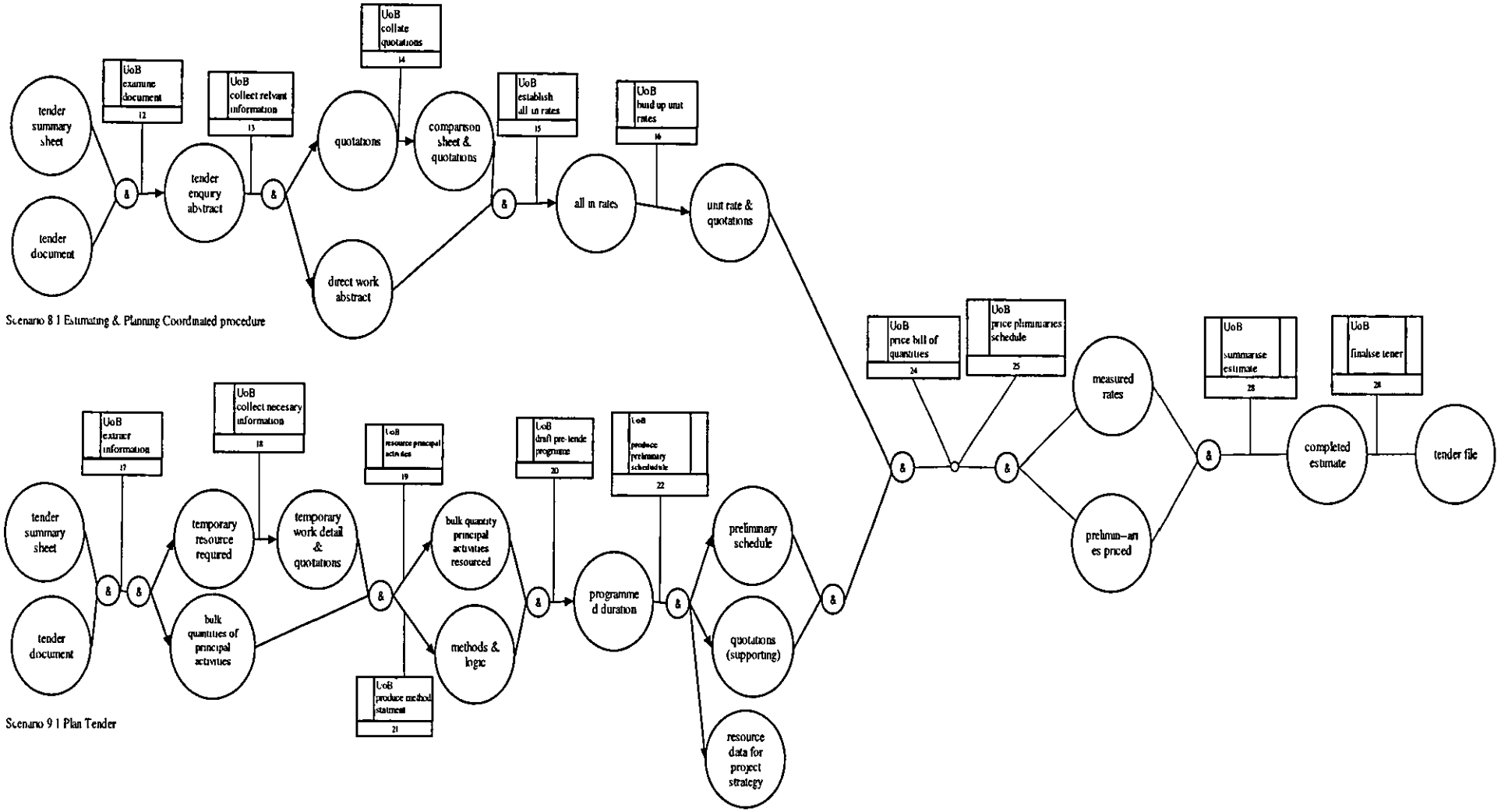
Scenario 10 1 Build up Complete Estimate

IDEF3 Model for Pre-tender Procedure:
Object View



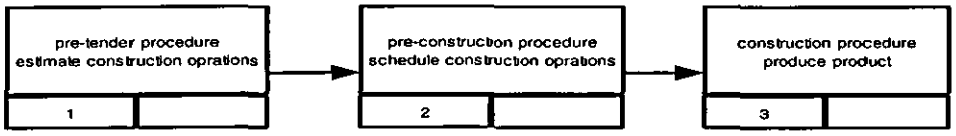
Scenario 1 0 pre-tender procedure

IDEF3 Model for Pre-tender Procedure: Object View

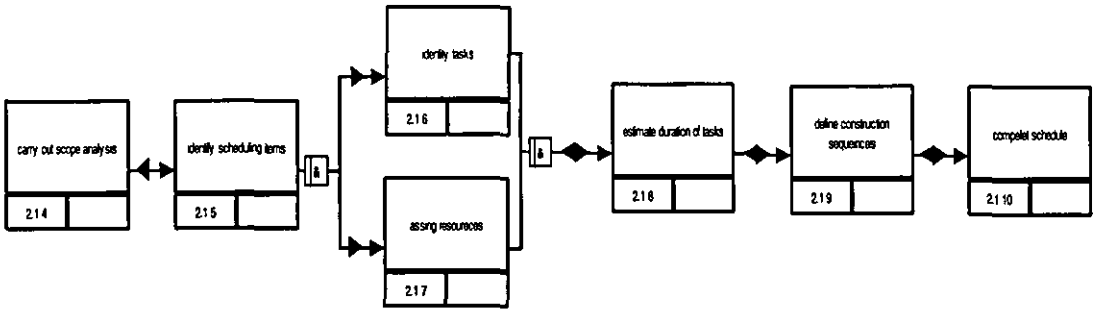


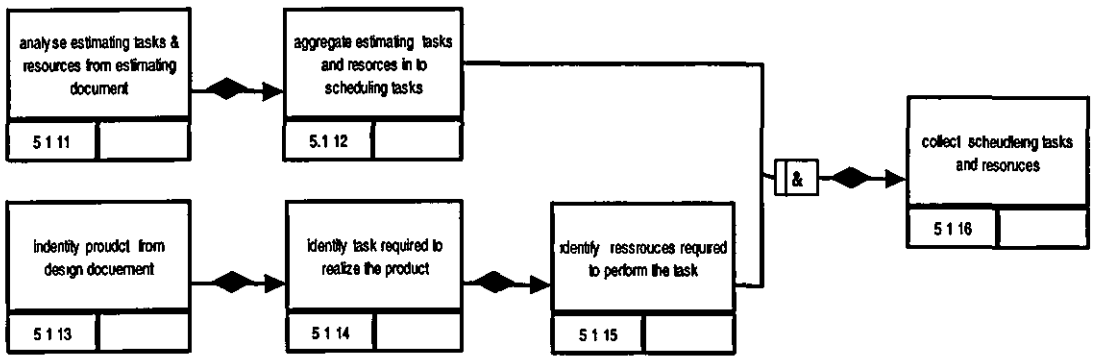
IDEF3 Model for Pre-tender Procedure: Object View

IDEF3 Model for Pre-construction Scheduling Process: Process View

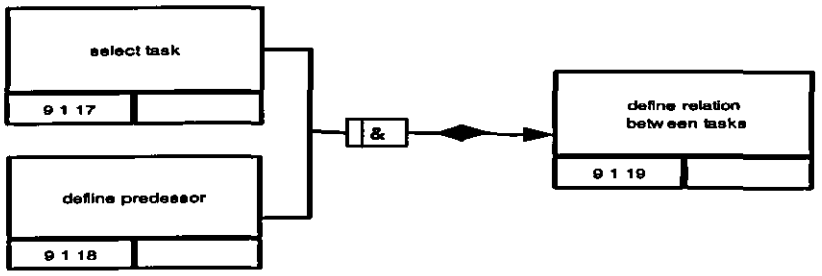


Scenario 0 Construction Operation



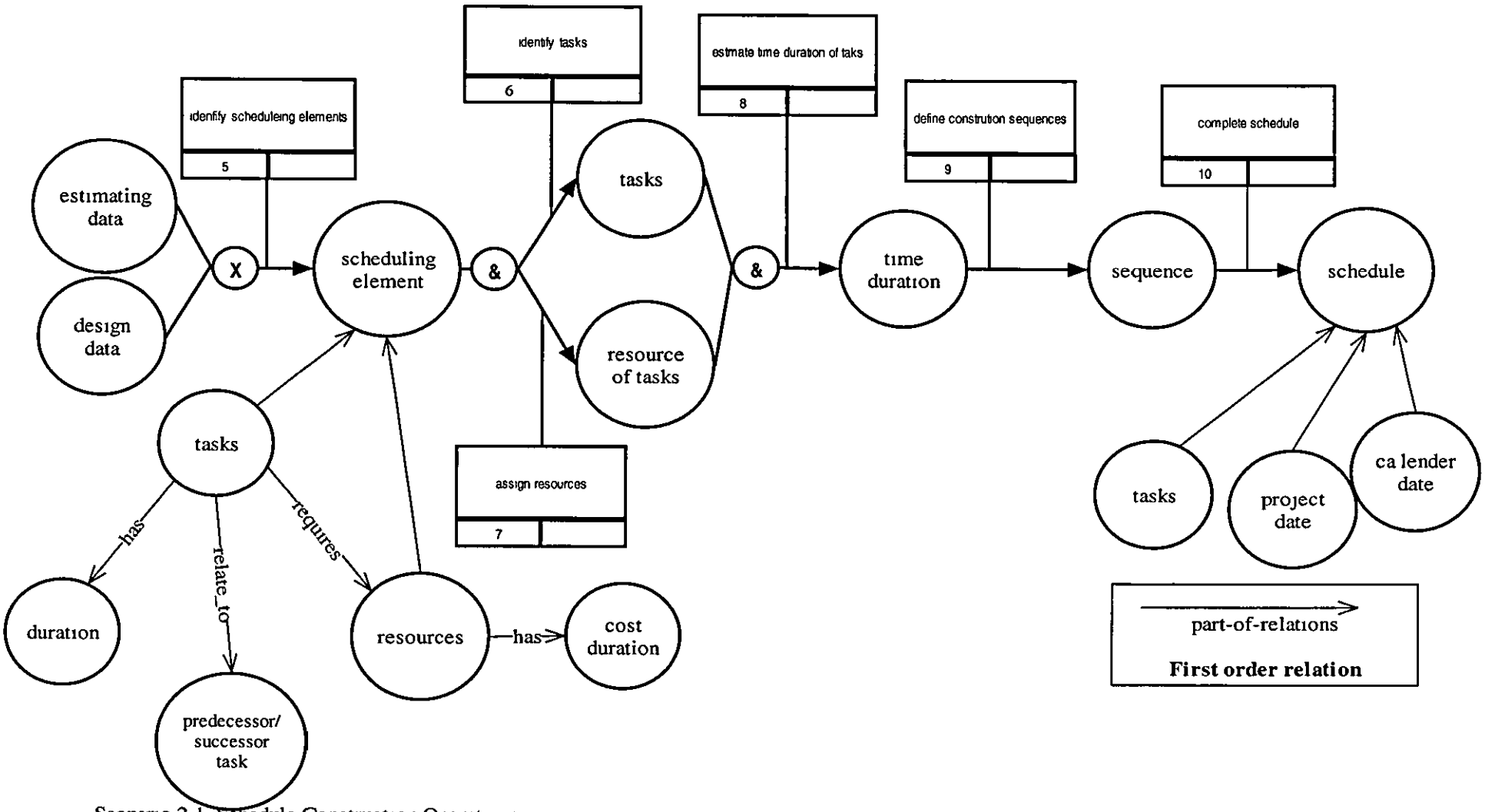


Scenario 5.1 Identify Scheduling Items



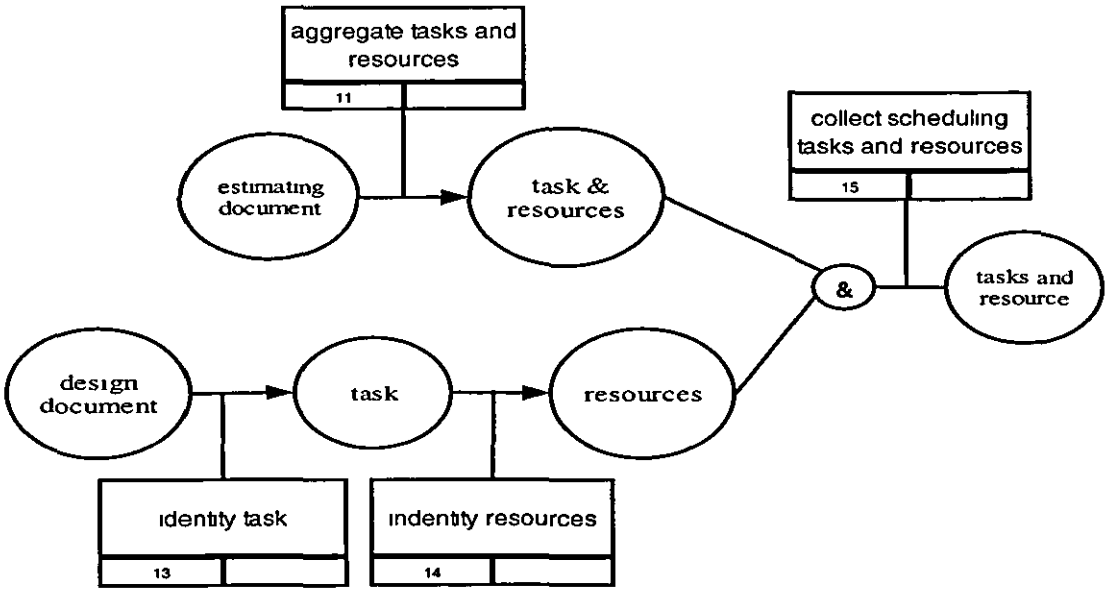
Scenario 9.1 define construction sequences

IDEF3 Model for Pre-Construction Scheduling: Object View

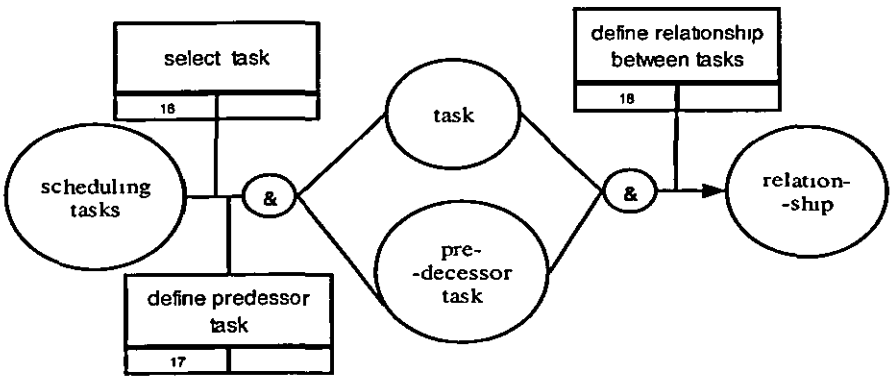


Scenario 2.1 Schedule Construction Operations

IDEF3 Model for Pre-Construction Scheduling: Object Vie



Scenario 5.1 Identify scheduling items



Scenario 9 1 Define Construction Sequence

Appendix C

Elaboration Forms for the IDEF3 Process Models

USED AT	ANALYST Genet Tesfagaber, DATE, 15 02 02 PROKJECT. Process description capture NOTE REV:	X	WORKING	REVIEWED	DATE
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			RELEASED		

UoB NO.	UoB Name: produce and manage building process UoB label: P & M building process
UoB 101	**Objects:** building process, client, brief, programme,(ARCH, Struct, BS, Geo programmes) design; construction, candidate designer, design disciplines, candidate contractor, project existing/new, company strategy, design team, activities, project brief, building project data; project plan, design schedules, design instructions **Facts:** The clients briefing identifies changes in activities of their customers', the requirement and the possibilities to satisfy the requirements with information contributed from the design discipline (ARCH, Struct, BS, Geo design). The purpose of programming is to lay a foundation for investment decision, the programme includes programmes from the design discipline The main designer task plays an important role in the establishment of space programme and other requirements Requirements set during programming concern functional aspects, cost, profitability, schedule, and mode of operation, maintenance and building permits. In Preparation for design, the client organises design, prepares alternatives for choosing of designers, concludes contracts after choosing designers and assembles design instruction and schedules The main designer gives design instruction during programming stages In the supervision of design, the clients check, compares and approve design solutions at different stages of the design development process The client makes the decision and it guarantees in yielding and acceptable design concerning functional, economical, esthetical, as well as environmental aspects In preparation for construction the client prepares and processes tender invitation for selection of contractors from possible candidates In the supervision of construction the client checks and ensures the execution of work according to the contract, schedule and budget **Constraint:** the briefing process requires information from statement of clients needs and requirements and company's strategy Programming requires clients brief and programme from design discipline· (ARCH, STUCT, BS, GEO programme) The preparation for design requires prepared programme and design instructions (ARCH programme) Supervision of design requires prepared design and contracts and schedule Prepare for construction, requires supervised design Supervision of construction, is constrained by the contract, project schedule, and budget **Description:** white space

CONTEXT SETTING REFERENCE	ITEM DESCRIBED:	FORM TYPE: UoB elaboration

USED AT.	ANALYST: Genet Tesfagaber, DATE; 15 02 02 PROKJECT: Process description capture NOTE REV:	X	WORKING	REVIEWED	DATE·
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			RELEASED·		

UoB NO	UoB Name: draw up brief UoB label: draw up brief
UoB 107	**Objects:** clients activities, client, activities changes, requirements for activities changes, possibilities and operation alts, design discipline, existing project, new project, brief, design discipline information (ARCH, Struct, BS, Geo design information) , clients' project brief, design disciplines' project brief, **Facts:** in the define requirements process, the client defines the requirements and objectives with input from the design discipline (ARCH, STruct, BS, Geo)briefs Determination of space acquisition alternatives is clients task to determine on space acquisition alternatives analyse conditions and profitability with input from the design discipline (the ARCH, STruct, BS, and Geo design) The preparation of decision for programme is carried out by the client taking in to account the defined requirements and objectives, design disciplines' brief, site acquisition alternatives, and risk, susceptibility and trend analysis Analysis of environmental effects is carried out and requirements for building permit are established **Constraint:** the definition of requirements process requires output from the clients business & facility management process, statement of clients' needs, established clients' needs Determination of space acquisition alternatives requires clients' statement of needs, defined requirements and objectives, layout drawings, and brief from the design discipline. Fort the preparation of decision for programme to hold there must be a decision to implement programme **Description:** white space

CONTEXT SETTING REFERENCE:	ITEM DESCRIBED:	FORM TYPE: UoB elaboration

USED AT:	ANALYST Genet Tesfagaber, DATE, 15 02 02 PROKJECT Process description capture NOTE REV:	X	WORKING:	REVIEWED·	DATE
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UoB NO	UoB Name: draw up programme programme	UoB label: draw up
UoB 108	**Objects:** programme, investment decision, requirements, main design, client, design discipline, client's activities and facility management/ project schedule/ mode of operation, . ..	
	Facts: the definition of requirements imposed by the activities and facility management carried out by the client, includes, describing of activities and their objectives, space management, profitability, life cycle and ecological objectives, and maintenance programme Dimensional requirements, Space programmes, scope objectives and other requirements, are established by the client with input or major work from the main designer (space programme, ARCH & INT) The client clears building site and procedures for building permit with information from the Geo analysis, city plan (AUTH), local planning/zoning (AUTH) and ownership (AUTH) During the planning of schedule and mode operation, The client organises design, construction and mode of operation and produces project schedule The client sets cost objectives and clears up financing, profitability and budget The client assembles the programme and prepares investment decision	
	Constraint: definition of requirements imposed by the activities and facility management requires clients brief Space programming requires description of requirements and clients brief Clearing building site and procedures for building permit requires clients brief The planning of schedule and mode operation requires clients brief and description of cleared building site and procedures for building permit The cost objective setting and clearing up of finance, profitably and budget requires clients brief, space programme, requirements and scope and objectives For the preparation of investment decision there must be an investment decision, defined requirements, space programme, description of building site information and procedures for building permit, project schedule and cost objectives and finance profit and budget	
	Description: white space	

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED	FORM TYPE· UoB elaboration

USED AT:	ANALYST Genet Tesfagaber, DATE, 15 02 02 PROKJECT: Process description capture NOTE REV.	X	WORKING	REVIEWED	DATE·
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			RECOMMENDED ·		
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UoB No	**UoB Name:** prepare for design **UoB label:** prepare for design
UoB 109	**Objects:** design, designer, design contract, client, design schedule, design instruction, tender, **Facts:** the designer organises design work with input from the ARH design schedule Selection of designers from possible candidate of designers may be made in several different ways i e direct selection, negotiation, tender based selection, or competition The client decides on selection method based on the organised design and candidate designers The client and the selected designers conclude the design contract **Constraint:** the organisation of design work requires a programme For the selection of designer there must be an organised design work For the contract to be concluded there must be selected designers and decision on the constract **Description:** white space

CONTEXT SETTING REFERENCE	ITEMD DESCRIBED:	FORM TYPE· UoB elaboration

USED AT:	ANALYST Genet Tesfagaber, DATE, 15 02 02 PROKJECT Process description capture NOTE REV.	X	WORKING.	REVIEWED	DATE
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			RECOMMENDED.		
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UoB NO

UoB Name: supervise design **UoB label:** supervise design

Objects: design, design solutions, design stages, clients, designers, prepared design,

Facts: Design process starts with minutes of start meeting regarding design instructions, minutes of agreed procedures and agreed design schedules between the client and designer
In controlling and supervising of design process the client compares, checks and approve/make decision on design solutions at deferent stages of design development process the decision ensures/guarantees the production of acceptable design concerning functional, economical, esthetical, technical and environmental aspects The client and may be the designers compare design solutions form users, profitability, cash flow perspectives and hold memos of comparison and explanations The client checks and evaluates design solutions against objectives and requirements This involves inspections of design, estimating building parts, and presentation of foundation for approval of design The client obtains design approval of design solutions and document decisions The client controls acquisition of permits and estimation of environmental effects

UoB 110

Constraint: The start of design process requires prepared design Controlling and supervising design solutions requires prepared design, specified design instructions, agreed procedures and agreed design schedule Comparison of design solutions requires prepared design, start of design, supervised design solutions and decision on design solutions. the checks and evaluates and evaluation of design solutions requires prepared design, start of design and design solutions. Obtaining of design approval requires start of design and decision on approved design solutions. control acquisition of permit requires decisions on approved design solutions and environmental effects estimate

Description: white space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

USED AT	ANALYST: Genet Tesfagaber, DATE, 15 02 02 PROKJECT: Process description capture NOTE REV.	X	WORKING·	REVIEWED	DATE
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UoB NO	**UoB Name:** prepare for construction **UoB label:** prepare for construction
UoB 111	**Objects:** tender, invitation to tender, mode of operation, contractors, contracts, client, **Facts:** The client selects the mode of operation based on the supervised design The client prepares contract programs, requirements of contact programme concerning schedule, blank sheets, bills of quantities, scope of contract appendices, technical documents, work safety programme for invitation to tender The client prepares list of contractors, invitation to tender, makes announcements, prepare additional requirements, cost estimates, minutes of tender opening, meeting memos and comparison of tenders for selection of contractors The client makes decisions on construction based on the tender received and compared The contractor and client conclude the contract based on the mode of operation The client manages procurement (invitation to tender, tenders, orders and contracts) based on the contract. **Constraint:** The preparation of invitation to tender requires supervised design and mode of operation The preparation for selection contractors requires prepared invitation to tender and possible candidate contractors For construction decision there must be construction decision The concluding of contract requires prepared invitation to tender, invitation to tender, and construction decision For the management of procurement requires there must be a contract **Description:** white space

CONTEXT SETTING REFERENCE	ITEMD DESCRIBED	FORM TYPE: UoB elaboration

USED AT.	ANALYST: Genet Tesfagaber, DATE; 15 02 02 PROKJECT· Process descnption capture NOTE REV	X	WORKING	REVIEWED	DATE
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UoB NO

UoB Name: Supervise construction **UoB label:** Supervise construction

Objects: Construction stage, contract, project schedule,

Facts: The client controls and supervises construction to ensure the execution of construction according to the contract and project schedule The client supervises subcontracting and approves selected subcontractors and equipments

UoB 112

The client manages payments (financing schedule, budget reports, invoices) based on bills The client carries out additional work and modifications based on the need for additional work or modification from/on the client's work

The client manages acquisition of builder and special cases based on the prepared construction

Constraint: Control and supervision of construction requires prepared construction

Supervision of subcontracting requires prepared construction

Management of payments requires prepared construction

Additional work and modifications requires prepared construction

Description: White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

USED AT	ANALYST. Genet Tesfagaber, DATE, 15 02 02 PROKJECT· Process description capture NOTE REV.	X	WORKING	REVIEWED	DATE.
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UoB NO UoB 102	**UoB Name**· produce & manage architectural data **UoB label** produce & manage architectural data **Objects:** Main designers (may be a team of representatives from various design disciplines), architect, design, brief, programme, global design(overall design), detail design, design during construction and during use and maintenance, task during handover, client's need, architectural data, **Facts:** Briefing involves collection of basic information needs, requirements and possibilities from the client . IFCs Briefing and programming involve complementing the client's project brief and programme with architectural point of view to assist in the definition of the client's need Briefing and programming activities are carried out by the main designer and gets input from the client work (client's brief and programme) The client usually carries out programming with assistance from the main designer The overall design involves producing design, sufficient for building permit, based on the architectural programme and design instructions Detail design involves elaboration of the overall design until sufficient accuracy is achieved for invitation to tender Design during construction is carried out based on the procurement contract **Constraint:** The briefing requires statement of client's needs The programming activity requires architectural brief and clients brief The overall design activity requires programme from client and architectural programme The detail design activity requires approved cost objectives, building permit, checked design instructions, and approved overall design form other disciplines (STR, BS,GEO, INT) design activity during construction requires detailed design **Description:** White space

CONTEXT SETTING REFERENCE:	ITEM DESCRIBED:	FORM TYPE: UoB elaboration

USED AT	ANALYST: Genet Tesfagaber, DATE, 15 02 02 PROKJECT Process descnption capture NOTE REV.	X	WORKING	REVIEWED·	DATE
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			RECOMMENDED		
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UoB NO. **UoB Name.** Draw up Bnef **UoB label** Draw up Bnef

Objects:

UoB 113

Facts:

Analysis of the present situation involves study of the activities and existing premises by the main designer based o the existing premises and activities
Definition requirement involves defining strategic alts, possibilities, dimensional requirements, location criteria, site requirement, economical requirements, and schedule goals
Determination of space acquisition alternatives involves space acquisitions alternatives ad location alternatives and comparisons
The preparation of programme decision is carried out by the main designer based on the inventory of activities and exiting premises, defined requirements and determined space acquisition alternatives

Constraint:

Analysis of the present situation requires statement of the need of the client.
Definition requirement requires statement of the need of the client and analysed present situation
Determination of space acquisition alternatives requires statement of the need of the client, analysed present situation (inventory of activities and existing premises), defined requirements and layout drawing

Description: White space

CONTEXT SETTING REFERENCE·	ITEM DESCRIBED:	FORM TYPE. UoB elaboration

USED AT·	ANALYST Genet Tesfagaber, DATE, 15 02 02 PROKJECT· Process description capture NOTE REV:	X	WORKING	REVIEWED	DATE:
			DRAFT		
			RECOMMENDED		
			RELEASED		

UoB NO.	UoB Name Draw up Programme	UoB label Draw up Programme
	Objects:	
UoB11 4	**Facts:**	The definition of requirements set by the activities and facility management involves definition of design instructions, lifecycle principles, and profitability and maintenance requirements The drawing up of space programme and requirements involves drawing space programmes (room programmes, diagrams, areas, volumes, special requirements and connectivity diagrams) based on space programme (INT) Clearing site and building permit involves clearing the maintenance requirements, technical constructability, juridical constructability, local plan acceptability and environmental effects based on the geotechnical analysis (Geo), City plan (AUTH), Ownership (ATUH), and Local planning (AUTH) Planning schedule and mode of operation involves analysis of economic trend, project schedule (total schedule) production, and mode of operation (design limits) The setting of cost objectives and clearing financing, profitability and budget involves identification of cost objectives, activity costs analysis, financing plan, tenancy estimate, profitability and budget analysis based on the defined requirements set by activities and facilitate management The preparation of the investment decision is carried out based on the defined requirements, space programmes and special requirements, cleared site and building permits, planned schedule and mode of operation and cost objectives and financing,
	Constraint:	profitability and bugdet The definition of requirements set by the activities and facility management requires analysis of present situation The drawing up of space programme and requirements requires defined requirements and analysis of present situation Clearing site and building permit requires location criteria and sit requirements Planning schedule and mode of operation requires preliminary schedule and cleared site and building permits The setting of cost objectives and clearing financing, profitability and budget requires cost objectives, space programmes and special requirements and planned schedules and mode of operation
	Description:	White space

CONTEXT SETTING REFERENCE.	ITEMD DESCRIBED·	FORM TYPE: UoB elaboration

USED AT·	ANALYST Genet Tesfagaber, DATE, 15 02 02 PROKJECT. Process description capture NOTE REV	X	WORKING	REVIEWED	DATE
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UoB NO	**UoB Name:** Make Over all Design	**UoB label:** Make Over all Design
	Objects:	
UoB11 5	**Facts:**	Starting building design involves the main designer's task based on design instructions Design of basic mass alternatives involves studying massing of building by the main architect The proposal of solutions is carried out by the main architect based on the chosen basic mass alternatives Design of schemes involves preparing and submitting an application for a building permit
	Constraint:	Starting building design requires architectural programme Design of basic mass alternatives requires checked design instructions and decision on basic solutions The proposal of solutions requires checked design instructions and decision on proposed solution Design of schemes involves requires checked design instruction and scheme decision
	Description:	White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

USED AT:	ANALYST. Genet Tesfagaber, DATE, 15 02 02 PROKJECT. Process descnption capture NOTE REV:	X	WORKING.	REVIEWED·	DATE
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			RELEASED		

UoB NO	**UoB Name:** Start Building Design	**UoB label:** Start Building Design
	Objects:	
UoB 129	**Facts:**	Checking the design responsibilities involves the main designer task Planning the design schedule involves the main designer's activity based on the design schedule from the client The checked result of the site map (AUTH), geotechnical information (Geo), Drawing of existing building, municipal engineering (AUTH), and state of real estate (AUTH) are used as a control in the specification of special requirements and needs and checking of design objectives The specification of special requirements and needs involves the main designers task based on the user information Checking the design objectives involves main designer's task based on the special requirements and needs of users The start of design work involves the production of design instructions based on the checked design responsibilities, design schedules, checked site and site (AUTH) information, user's special requirements and needs and checked design objectives
	Constraint:	Start Building Design requires architectural programme Checking of design responsibilities requires task lists and architectural programme Planning the design schedule requires checked design responsibilities and architectural programme Checking process of site map (AUTH), geothecnical information (Geo), Drawing of existing building , municipal engineering (AUTH), and state of real estate(AUTH) requires architectural programme Specification of special requirements and needs requires architectural programme, design schedule and checked site and AUTH information The start of design work requires architectural programme.
	Description:	White space

CONTEXT SETTING REFERENCE·	ITEM DESCRIBED:	FORM TYPE: UoB elaboration

USED AT	ANALYST Genet Tesfagaber, DATE; 15 02 02 PROKJECT. Process description capture NOTE REV	X	WORKING:	REVIEWED	DATE·
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			RELEASED		

UoB NO.	**UoB Name:** Design Basic Alternatives	**UoB label:** Design Basic Alternatives
	Objects:	
UoB 130	**Facts:**	The design of basic mass alternatives starts with designing of alternatives for site usage and the approved site usage design is elaborated on further to design alternative basic solutions Design of basic mass alternatives involves preliminary definition of the external shell, shape and volume based on the site usage alternatives Estimating, scope, efficiency and costs involve analysis of the scope, efficiency and cost effects of the initial mass design based on the mass alternatives (by the QS) Analysis of environmental effects involves study and comparison of the alternative solutions for environment effects based on the basic mass alternatives and estimated scope, efficiency and cost Alternative solutions are presented to the client for further design decision based on the site usage alternatives, basic mass alternatives, estimated scope, efficiency and cost of the solutions and environmental effects of the solutions
	Constraint:	The process of design alternatives for site usage is controlled by the client and requires layout drawing and decision on site usage alternative Presenting the solution to client for decision requires decision on basic solutions
	Description:	White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

USED AT:	ANALYST· Genet Tesfagaber, DATE, 15 02 02 PROKJECT: Process description capture NOTE REV:	X	WORKING·	REVIEWED·	DATE
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			RECOMMENDED·		
			RELEASED		

UoB NO	**UoB Name:** Propose Solution	**UoB label:** Propose Solution
	Objects:	
UoB 131	**Facts:**	The checking of input documents involves studying of the basic solution based on the mass alternatives produced and preliminary layout of drawing process proceeds based on the checked documents, and basic mass solutions The definition of the principal architectural and technical solutions depicts the process of of the solutions based on the checked documents, chosen site mass alternative, proposed solutions from other design team (STR, BS, GEO, INT) Assembly of the general information of proposed solution involves data collection on the architectural and structural aspects, scope, efficiency, and space group comparison and cost estimate vs objectives of the proposed solution based on the checked documents and principal architectural and technical solutions Preparation of application for exceptional permits and getting advance opinions involves based on the general report on the proposed solution, preliminary layout drawing and advance opinions (AUTH). Presenting of solution for further design and co-ordination of design work involves organising and proposing solution for further design decision based on the advance opinions and exceptional permits, general report on the proposed solution, preliminary layout drawing and proposed solution from the design team (STR, BS, GEO, INT)
	Constraint:	The definition of the principal architectural and technical solutions requires preliminary layout drawing and objective of programme The client controls preparation of application for exceptional permits Presenting of solution for further design and co-ordination of design work requires decision on proposed solutions
	Description:	White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

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UoB NO	**UoB Name:** Design Schemes	**UoB label:** Design Schemes
	Objects:	
UoB 132	**Facts:**	The design schemes starts with estimation of feed back from the proposed solution and making layout drawing and environmental plan base on the proposed solution and feed back from the client The scheme design involves general design of spaces, façade, reptitive units, fittings, layout drawing, elevations, and essential sections based on the general layout drawing and environmental plan Review of the technical systems and checking of the compatibility of designs involves the main designers task based on the scheme design from the architect and schemes from other design teams (schemes, STR, BS, GEO, and INT) Preparation of general description involves description of construction method and general description of architectural and structural solutions calculation concerning permitted building volume and area, information involving space group based comparison and comparison of cost and design objectives with requirements based on the technical systems and compatibility and description of construction method (STR) Tasks concerning building permits involve submitting application for building permit based on the prepared general description The decision for further design involves the client's task based on the general layout drawing and environmental plan, scheme design, technical systems and compatibility and the prepared general description of the scheme design
	Constraint:	Scheme design requires briefing of feed back. The client controls tasks concerning building permits The decision for further design requires scheme decision
	Description:	White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

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UoB NO	
	UoB Name Make Scheme Design **UoB label.** Make Scheme Design
	Objects:
UoB 151	**Facts:** The general space design involves determination and layout of preliminary spaces based on a space (building) programme, creating of core spaces, circulation and fire compartments spaces based on the building programme requirement The general façade design involves determination of the initial building massing based on the floor plates created during the preliminary space lay out, determination of the façade-structures relationship based on the effect the designer want to achieve Determination of fenestration based on the amount of light and visual impact of the glass and opening on the façade Determination of generic façade and roof material of construction based on the regional style and culture, climate, client's desire durability, regional construction methods, ease of use, cost and availability and generic design of adornment based on the based on the clients desire and regional location General design of repetitive units and fittings involve definition of required repetitive units and fittings based on the requirement and layout drawing of locations based on the function General design of essential sections involves graphical representation of essential sections for more detailed information of the scheme design based on the level of detail required The general lay out drawing provides general graphical information on the design
	Constraint: general space design The general façade design General design of repetitive units and fittings general lay out drawing
	Description: White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

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UoB NO	UoB Name· Make General Space Design	UoB label. Make General Space Design
	Objects:	
UoB1 56	**Facts:**	The general spaced design starts with a preliminary space layout from space programme The preliminary space layout task involves generating spaces, from building programme, definition of floor and organisation of the spaces in to the floor, determination of space depths (dimensions) and circulation path around them and checking space lay out against the programme The task includes determination of dimensions, shape and locations of the spaces Design and determination of core and circulation spaces activities is balance between making available ancillary spaces and programme requirements The task involves determination of core and circulation spaces requirements based on the programme requirements and determination of dimension and location on the floor based on the type and size of items required in the spaces and programme requirements, structural systems, and occupants Determination of fire compartment spaces involves subdividing the building in to compartments enclosing by fire resisting construction to limit spread of fire and provide means of escape
	Constraint:	The preliminary space layout activity is constrained by the information defined in the building or space programme The design and determination of core and circulation spaces is constrained by relevant code Determination of fire compartment spaces is constrained by fire regulation governing the maximum distance for fire use and sprinkler systems provision.
	Description:	White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

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UoB NO.	**UoB Name:** Make General Façade Design	**UoB label:** Make General Façade Design
	Objects:	
UoB 157	**Facts:**	The general façade design starts with building massing Massing involves definition of volume and shape of the building based on the floor plates created during space layout and floor to floor height of each interior spaces and proposed mass solution and determination of fenestration, cladding materials and detail of adornment of the facade The determination of façade-structures relationship involves determination of construction method at the intersection between façade and structure based on the effect the designer wants to achieve Design and determination of fenestration involves designing opening to spaces and determination of complimentary structures to the openings based on the amount of light and visual impact of the opening and complimentary structures on the façade in the design of opening and complimentary structures size and shape of the openings and material of the complimentary structures is identified
	Constraint:	Determination of material of construction and design of adornment is carried out based on the regional style, culture, client's desire, durability, regional constriction method, cost, availability and ease of use The building massing process is constrained by the regional height restrictions and briefing of feed back on proposes solution The determination of façade-structures relationship requires information of materials used Design and determination of fenestration requires information concerning orientation of the face where the fenestration is located and briefing of feed back from the proposes solution Determination of material of construction and design of adornment is constrained by the style
	Description:	White space

CONTEXT SETTING REFERENCE:	ITEM DESCRIBED: Make General Façade Design	FORM TYPE: UoB elaboration

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UoB NO		
	UoB Name. Make Detail Design	**UoB label** Make Detail Design
	Objects:	
UoB 116	**Facts:**	The detail design starts with an evaluation of the overall design based on the overall design and the evaluation is used as a control for further design Detail design involves elaboration of the design until sufficient accuracy is achieved for invitation to tender based on the overall design from ARCH-design, STR-design, and Bs-design The checking of compatibility of detail design involves the main designers task based on the detailed design of the team (ARCH), BS-designs and STR-designs Additional tasks involve assistance by the QS or main architect in preparation of invitation to tender and analysis of tender and includes design of movable pieces of furniture, landscape, guidance systems and signs based on the detail design, components supplier design ad tender (contractor) Design for production involves production of specialised detailed design, according to the contractors specific instruction, based on
	Constraint:	the detail design, description of compatibility of detail design and the complimentary designs of for production Detail design requires evaluated overall design and proposed changes to design The checking of compatibility of detail design requires proposed changes to design Additional tasks require proposed changes to design Design for production requires proposed changes to design
	Description:	White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

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UoB NO.	UoB Name· Make Detail Design	UoB label: Make Detail Design
	Objects:	
UoB 189	**Facts:**	The detail design process starts with detailing of the spaces and façade design, roof structures and continues to further detail until sufficient accuracy is achieved for production information and concludes the process with preparation of construction specification The detail design of space involves further elaboration of the spaces created during the scheme design, and design of partition structures, internal openings and their complimentary structures, items and fittings on spaces and space floor structures (where applicable) based on the over all design scheme design The detail design of façade involves further elaboration of the façade and external projecting structural elements of the external shell, complementary structures to external openings and detail of adornments designed in the scheme design based on the overall design The assistance in the design of structural frame and foundation involves provision of information for the design of the external structures and foundations The detail design of roof structures involves final determination of, roof type, shape, and material of construction, detailing design of the skylight, and design of drainage Detail deign of surface structures and finishes involves determination of material of construction for the surface based on the proposed design in the scheme design and client's feedback Preparation of construction specification involves . ... . . based on the detail design of the project
	Constraint:	The detail design of space The detail design of façade The assistance in the design of structural frame and foundation is controlled by the layout drawing and detail design of space and façade The detail design of roof structure is controlled by the design of space and façade, and external structure and foundations Detail deign of surface structures and finishes, are constrained by regional style and culture of the area
	Description:	White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED:	FORM TYPE UoB elaboration

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UoB NO	UoB Name Make Detail Design of Spaces Objects·	UoB label: Make Detail Design of Spaces
UoB 193	Facts.	The detail design of space starts with delineation of the defined spaces indicating the existence of physical separation using standard lines based on the programme requirement and information available at the point Determination of partition types involves definition of partition structural types and material of construction and dimensions based on the building programme requirement The layout of partition structures involves elaboration of the partition types determined by graphical representation on the floor that details the type of structure Egress analysis is examination of code to determine the distance between the enclosed space ad the location of the proposed exit If required the partition layout can be adjusted to meet the requirements of applicable codes Determination and layout of openings to spaces and complementary structures depicts the process of defining internal circulation patterns by placing a break to create opening in the internal enclosing structures This activity involves determination of dimension and location of the opening and selection of generic type and material for complimentary structure Designation of spaces, partition structures and complimentary structures or openings is the process of attachment of some text annotations for reference to details and schedule of the elements Detail detailing partition structures involves elaboration and delineation of the partition structures by graphical sections that detail the assembly, material of construction, and dimensions and other properties such as fire rates Detailing the complimentary structures involves determination of type, size, material, finish of the complimentary structure based on the environment and building programme requirement, and the functional operations and location of the complimentary structures based on the relationship of the complimentary structures with other building objects The task includes definition of a tabular scheduling, for the complimentary structures that display attributes type, dimension, material of construction, finish etc Detail design of the items and fitting on the spaces depicts the process detailing the items defined, during the general space design for determination of space size, based on the discipline concerned with item on space Detail design of space floors structures is a process of elaborating the material of construction and surface structures and finishes
	Constraint: Description	White space White space

CONTEXT SETTING REFERENCE·	ITEMD DESCRIBED:	FORM TYPE. UoB elaboration

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UoB NO	**UoB Name·** Make Detail Design of Facade	**UoB label:** Make Detail Design of Facade
	Objects:	
UoB 194	**Facts:**	Detail design of the façade depicts the process of elaboration and delineating the external shell and external (projecting) structures by graphical sections that detail the assembly, material of construction, dimensions and other properties and attributes such as fire rates of the shell Based on the proposed overall design, Detail design of the complimentary structures to external shell opening involves determination of type, size, material, and finish of the complimentary structures, based on the environmental conditions and building programme requirement and external shell The functional operations and location of the complimentary structures based on the relationship of the complimentary structures with other building objects The task includes definition of a tabular scheduling, for the complimentary structures that display attributes type, dimension, material of construction, finish etc The detail design of the adornment involves elaboration of the material-of-construction for façade (external shell) and external structure decoration based on the proposed solution and regional style
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE·	ITEMD DESCRIBED	FORM TYPE UoB elaboration

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UoB NO	UoB Name Make Detail Design of Roof	UoB label Make Detail Design of Roof
UoB 196	**Objects:**	
	Facts:	The roof design process involves determination and selection of roof type and material of construction based on the form required, and functions of the building and space below, and types of services supported Decision on the style and shape based on the client's desire, space programme requirements, regional style & climate, needs to enclose building services, the type of martial used and the impact on the building form, and size of projection through the roof items Integration of sky light or roof windows involves determination, layout and locations of roof windows based on the amount of light required, the impact on the building form it can have The lay out of services process determines spaces required based on the space programme requirements and projections such as vents, stairs, elevators, telecommunications, that need enclosing structures based on the size and type of the projections The layout of services may change the roof type, shape, and lay out of windows Design of drainage involves designing snow and water-shedding systems based on the roof planes, slops, regional climate and selection of size and type of systems material and material. Detailing the roof structures involves elaboration of the roof structure-mass (roof-façade) intersection, roof structure-skylight window intersection based on the shape of the roof, detailing systems for keeping moisture out and detail design of intersection and assembly of roof structural elements and material of construction
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE·	ITEMD DESCRIBED:	FORM TYPE: UoB elaboration

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Object State No.		
OS 1	**Object State Name:**	Client's brief
	Label:	Client's brief
	Transition From Object State	Client's need
	Transition To Object State(s):	Architectural brief
	Facts:	Client's brief includes client's activities and change in client's activities, existing premises, client's strategy, requirements, space alternatives, and decision to programme
	Constraints:	
	State Condition:	The client's brief must have defined requirements and space acquisition alternatives
	Exit Condition:	The client's brief must lead to a project and there must be a decision to programme
	Other:	
	Description:	As a need for a space, facility or for change of activity arises from a client, the client briefs an architect or rep consultant and so the architect prepares architectural brief for definition of the client's need

CONTEXT SETTIGNG REFERENCE:	ITEM DESCRIBED	FORM TYPE:
Scenario 102 1	Client's brief	Object State Elaboration

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Object State No.	**Object State Name:**	Architectural brief
	Label:	Archi brief
	Transition From Object State	Client's brief
OS 2	**Transition To Object State(s):**	Architectural programme
	Facts:	Architectural brief includes analysed inventory of activities and existing premises, requirements, space acquisition alternatives and programme decision
	Constraints:	
	State Condition:	The architect must have analysed existing premises and activities and define the requirements and space acquisition alternatives
	Exit Condition:	The architectural brief requires appraisal from the clients or client's feed back brief and the architect must prepare programme decision
	Other:	
	Description:	As, the architect prepared the architectural brief, the client checks and approves or makes decision on the brief One decision is made on the archi- brief the architect prepares programme decision

CONTEXT SETTIGNG REFERENCE.	ITEM DESCRIBED	FORM TYPE:
Scenario 102 1	Architectural brief	Object State Elaboration

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Object State No.	**Object State Name:**	Architectural programme
	Label:	Archi programme
	Transition From Object State	Architectural brief
OS 3	**Transition To Object State(s):**	Over all design
	Facts:	The architectural programme includes space programme, and other requirements concerning, functional, cost, profit, schedule, mode of operation, maintenance and building permit
	Constraints:	
	State Condition:	The architect must have defined a programme consisting of requirements set by activities and facility management, space programme, building permit requirements, schedule and mode of operation, cost objectives, finance profit and budget
	Exit Condition:	The architectural programme requires approval and feed back brief from the client. The architect must prepare investment decision
	Other:	
	Description:	Up on receipt of approval and feed back brief from the client and after decision is made the architect papers investment decision

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED·	FORM TYPE:
Scenario 102 1	Architectural programme	Object State Elaboration

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Object State No.	**Object State Name:**	Overall design			
	Label:	Overall design			
	Transition From Object State	Architectural programme			
OS 4	**Transition To Object State(s):**	Detailed design			
	Facts:	The over all design includes outline specification of the client's need and mass design of the facility and scheme design			
	Constraints:				
	State Condition:	The architect must have prepared alternative basic mass solutions and proposed a solution based on the alternatives The client must approve different design solutions and the scheme must be elaborated And the main designer to control further design must check design instruction			
	Exit Condition:	The overall design, mass alternatives and scheme design require inspection from the main designer and client's approval. The overall design must be evaluated for further design activity control			
	Other:				
	Description:	Upon receipt of feed back brief on proposed solutions the architect elaborated the scheme			

CONTEXT SETTIGNG REFERENCE:	ITEM DESCRIBED.	FORM TYPE.
Scenario 102 1	Overall design	Object State Elaboration

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Object State No.		
	Object State Name:	Detail design
	Label:	Detail design
	Transition From Object State	Over all design
OS 5	**Transition To Object State(s):**	Design during construction
	Facts:	The detailed design includes a further elaboration of the over all design, these are, spaces, space enclosing structure, complimentary structures and structures and items on spaces
	Constraints:	
	State Condition:	The architect must have further elaborated the overall design
	Exit Condition:	The detailed design requires inspection from the main designer and approval and feed back brief from the client
	Other:	
	Description:	The architect elaborates detail design until sufficient accuracy is achieved for invitation to tender A chosen contractor approves the design or requires modification and corrections The chosen contractor may require a specialised detailed design to be done according to his instruction

CONTEXT SETTIGNG REFERENCE:	ITEM DESCRIBED	FORM TYPE
Scenario 102.1	Detail design	Object State Elaboration

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Object State No.	**Object State Name:**	Design during construction
	Label:	Design during construction
	Transition From Object State	Detail design
OS 6	**Transition To Object State(s):**	Tasks during use and maintenance
	Facts:	Design during construction mainly consists of supervision and inspection
	Constraints:	
	State Condition:	There must be an architect or consultant and a detailed design for the design during construction
	Exit Condition:	There must be a take over decision made
	Other:	
	Description:	Architects and/or consultants supervise and inspect construction work based on the detailed design prepared for the production to ensure production work according to the design

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED	FORM TYPE
Scenario 102 1	Design during construction	Object State Elaboration

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Object State No.	**Object State Name:**	Task during use and maintenance
	Label:	Task during use and maintenance
	Transition From Object State	Design during construction
OS 7	**Transition To Object State(s):**	----------
	Facts:	Task during use and maintenance includes warranty inspections
	Constraints:	
	State Condition:	Checking the usage and maintenance plan as well as planning the guidance and archiving of the design document is required
	Exit Condition:	Task during use and maintenance requires warranty release
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE.	ITEM DESCRIBED	FORM TYPE.
Scenario 102.1	Task during use and maintenance	Object State Elaboration

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Object State No.		
	Object State Name:	Space programme
	Label:	Space programme
	Transition From Object State	Architectural brief (scenario 102 1)
OS 1	**Transition To Object State(s):**	General space deign
	Facts:	The architectural space programme defines/includes, room programme, area, volume, space areas, and counts of spaces contained in a group and % age increase allowance for space area Spaces are defined either as a total square spaces or in dimensions
	Constraints:	
	State Condition:	The space programme must state the spaces dimensions and counts and the percentage allowed for increase in to the spacer programme
	Exit Condition:	The architectural space programme requires client's approval The space programme is the basis for space design
	Other:	
	Description:	Space programme is prepared by the main designer with input from the client's programme, space programme refnes evaluation and check by the client

CONTEXT SETTIGNG REFERENCE Scenario 151.1	ITEM DESCRIBED. Space programme	FORM TYPE: Object State Elaboration

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Object State No.	**Object State Name: Label:**	General space design
	Transition From Object State	Space programme
OS 2	**Transition To Object State(s):**	Enclosed
	Facts:	General space design includes spaces generated form the programme and based on the programme requirement, these are programmed spaces and supporting spaces core and circulation spaces
	Constraints:	
	State Condition:	The space design must include information such as the shape, dimensions, location and count of the spaces generated Including the layout and organisation of the spaces
	Exit Condition:	The general space design requires inspection and approval from the main designer and client The spaces generated and organised require enclosing structures
	Other:	
	Description:	The spaces generated from a building programme are for the main use purpose spaces and the spaces based on building programme requirements are supporting spaces to the main use spaces The supporting spaces include for circulation spaces, elevators stars and path ways, and for core spaces; rest room spaces, telecommunication services spaces and other services spaces required for the main use spaces

CONTEXT SETTIGNG REFERENCE.	ITEM DESCRIBED·	FORM TYPE:
Scenario 151 1	General space design	Object State Elaboration

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Object State No.	**Object State Name:**	Spaces enclosed
	Label:	Spaces enclosed
	Transition From Object State	General space design
OS 3	**Transition To Object State(s):**	Spaces visually and physically accessed
	Facts:	Spaces enclosed consist of spaces and enclosing structures The enclosing structures include external shell (façade), initial structural grid and roof structure Spaces enclosed provide the mass of building
	Constraints:	
	State Condition:	The enclosed structure must provide dimensional information, volume including area of the building and material of construction for the enclosing structures
	Exit Condition:	The enclosed spaces require opening for visual and physical access And require approval and inspection from the main designer and client
	Other:	
	Description:	Enclosing structures are external shell or wall for external enclosing purpose only The initial structural grid information is given in relation with the external shell

CONTEXT SETTIGNG REFERENCE. Scenario 151 1	ITEM DESCRIBED· Spaces enclosed	FORM TYPE: Object State Elaboration

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Object State No.		
OS 4	**Object State Name:**	Spaces accessed visually and physically
	Label:	Spaces accessed visually and physically
	Transition From Object State	Spaces enclosed
	Transition To Object State(s):	Detail design (scenario189 1)
	Facts:	Accessed spaces include external openings on enclosing structures including external shell openings and roof openings
	Constraints:	
	State Condition:	The spaces accessed must provide information, the dimension, shape location, counts of the openings and material for complimenting the openings
	Exit Condition:	The accessed spaces require inspection and approval from the main designer and client. The accessed spaces require complimentary structures.
	Other:	
	Description:	Accessed spaces are space design with the accesses located and dimensioned on their enclosing structures Complimentary structures are including doors, windows, roof windows etc

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED	FORM TYPE·
Scenario 151 1	Spaces accessed visually and physically	Object State Elaboration

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Object State No.	**Object State Name:**	Scheme design
	Label:	Scheme design
	Transition From Object State	Architectural programme (scenario 102 1)
OS 1	**Transition To Object State(s):**	Space detail design
	Facts:	Scheme design includes general design of spaces, facades, repetitive units, fittings, layout drawings, elevations, essential sections and general description design method of construction
	Constraints:	
	State Condition:	The scheme design must provide the general design information the dimensional information of the designed items, material and method of construction and general description on the method of construction
	Exit Condition:	The scheme design requires approval and inspection from the main designer and client The scheme design requires further elaboration and detailing.
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED	FORM TYPE:
Scenario 189 1	Scheme design	Object State Elaboration

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Object State No.	**Object State Name:**	Space detailed design			
	Label:	Space detailed design			
	Transition From Object State	Scheme design			
OS 2	**Transition To Object State(s):**	Façade detailed design			
	Facts:	Detailed space design includes items and structures on spaces, space floor plates, and internal partition structures their openings and complimentary structures,			
	Constraints:				
	State Condition:	The detailed space design must include elaboration of the partition structures, the items on spaces, and space floor plates including their locations, dimensional information and material and method of construction in graphical and textual form			
	Exit Condition:	The space-detailed design requires inspection and approval from the main designer and client The space-detailed design requires external enclosing structures			
	Other:				
	Description:	Items and structures on spaces are the items and structures raised for the need of spaces and used in the determination of the space requirements and dimensional requirements Internal partition structures are spaces internal separating structures and the internal openings on them etc			
CONTEXT SETTIGNG REFERENCE Scenario 189 1	**ITEM DESCRIBED.** Space detailed design				**FORM TYPE:** Object State Elaboration

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Object State No.		
OS 3	**Object State Name:** Label:	Façade detail design
	Transition From Object State	Space detail design
	Transition To Object State(s):	Roof detail design
	Facts:	Façade detail design includes elaboration of the external enclosing structures and design of adornments
	Constraints:	
	State Condition:	The façade detail design must detail information on the locations, dimensional information, and material and method of construction of the external structures including adornments, the openings and their complimentary structures
	Exit Condition:	The façade detail design requires inspection and approval from the main designer and client The façade detail design requires enclosing structure
	Other:	
	Description:	The façade, external-enclosing structures is the external shell of the building including other structural item associated with the external shell of the wall The complimentary structure is the external openings complimenting structure this includes including external doors, windows

CONTEXT SETTIGNG REFERENCE: Scenario 189 1	ITEM DESCRIBED Façade detail design	FORM TYPE· Object State Elaboration

DATE AT.	ANALYST Genet Tesfagaber date PROJECT NOTES REV		WORKIGNG	REVIEWR	DATE
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Object State No.	**Object State Name:**	Roof detail design
	Label:	Roof detail design
	Transition From Object State	Façade detail design
OS 4	**Transition To Object State(s):**	Surface structure detail design
	Facts:	The roof detail design includes elaborated design of roof structures, roof openings and their complimentary structures and drainage
	Constraints:	
	State Condition:	The roof detail design must include detailed information on the roof layout openings and drainage including the dimensional information and material and method of construction of the roof and roof elements.
	Exit Condition:	The roof detail design requires inspection and approval from the main designer and client The roof detail design requires surface structure elaboration and detailing
	Other:	
	Description:	Method of construction includes detailed design of the connection and intersection between the elements of the roof and between the roof and mass and roof and complimentary structures

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED	FORM TYPE
Scenario 189 1	Roof detail design	Object State Elaboration

DATE AT:	ANALYST: Genet Tesfagaber date: PROJECT: NOTES REV·		WORKIGNG	REVIEWR·	DATE
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Object State No.		
	Object State Name:	Surface structure and finishes
	Label:	Surface structure and finishes
	Transition From Object State	Roof detail design
OS 5	**Transition To Object State(s):**	----------
	Facts:	The surface structure and finishes detail design includes internal and external surface of a building, every elements and structures designed
	Constraints:	
	State Condition:	The surface structure and finishes detail design must detail the quantitative and material and method of construction of the structure
	Exit Condition:	The surface structure and finishes detail design requires inspection and approval from the main designer and client
	Other:	
	Description:	The material and method of construction details the construction detail including connection and intersections Surface structures include surface decorations and finishes of the

CONTEXT SETTIGNG REFERENCE: Scenario 189 1	ITEM DESCRIBED: Surface structure	FORM TYPE: Object State Elaboration

USED AT	ANALYST· Genet Tesfagaber, DATE; 15 02 02 PROKJECT Process description capture NOTE REV	X	WORKING·	REVIEWED	DATE·
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UoB NO	**UoB Name:** Pretender Procedure **UoB label:** Pretender Procedure
UoB 1	**Objects:** **Facts:** Pretender procedure involves all activities associated with tendering This includes method statements that describes, how a contractor intends to carry out a specific project work, and both strategy, operational methods, resources needed and identify key milestones, Planning and estimating, obtaining all prices for materials, plant, components, subcontract work and preliminaries It is a process of estimating of the likely cost of all proposed work of a project And planning of ways in which a project might be built indulging key milestones and likely rates of construction necessary to meet any imposed completion dates based on the contract document **Constraint:** Pretender procedure is constrained by the terms and conditions of client's form of contract **Description:** White space
UoB 4	**UoB Name:** Review tender invitation **UoB label** Review tender invitation **Objects:** **Facts:** Review of tender invitation involves the director and chief estimator task Up on receipt of tender invitation, the director and chief estimator review the tender document prior to decision to generally examine the type, size and location of the proposed project. **Constraint:** White space **Description:** White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED: Pretender Procedure and Review tender invitation	FORM TYPE: UoB elaboration

USED AT:	ANALYST· Genet Tesfagaber, DATE; 15 02 02 PROKJECT· Process description capture NOTE REV·	X	WORKING	REVIEWED	DATE
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UoB NO	**UoB Name:** Make Decision to Tender **UoB label:** Make Decision to Tender **Objects:**
UoB 5	**Facts:** The decision to tender invitation involves the director and chief estimator task Up on receipt of an invitation to tender a decision is taken by the director and chief estimator based on the review result of the tender document, the type of work, the location of the proposed contract, and the current work load and expected competitors The production of letter of acceptance or decline is part of this task **Constraint:** White space **Description:** White space
UoB 8	**UoB Name:** Estimate Tender **UoB label:** Estimate Tender **Objects:** **Facts:** Estimating tender involves the tender estimator's task The estimator examines the tender document and collects all relevant and necessary information and collates them in a file to establish all-in- rates and build unite rates in order to estimate the likely cost of all proposed project work **Constraint:** The estimating process is constrained by the terms and condition of the client's form of contract **Description:** White space

CONTEXT SETTING REFERENCE.	ITEMD DESCRIBED. Make Decision to Tender and Estimate Tender	FORM TYPE· UoB elaboration

USED AT·	ANALYST Genet Tesfagaber, DATE, 15 02 02 PROKJECT Process description capture NOTE REV:	X	WORKING	REVIEWED	DATE
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UoB NO	**UoB Name:** Plan Tender	**UoB label:** Plan Tender
	Objects:	
UoB 9	**Facts:**	Planning tender involves the planner's task The tender planner extracts and collects all necessary and relevant information, identify requirements, resources the items of work and principal activities, and examines alternative methods in order to produce a programme in which the project might be built and determine the likely rates of construction necessary to meet any imposed completion dates
	Constraint:	The tender planning process is constrained by terms and condition of the client's form of contract
	Description:	White space
	UoB Name:	Build up complete estimate **UoB label:** Build up complete Estimate
	Objects:	
UoB 10	**Facts:**	Building up of complete estimate involves the tender estimators and planner task This includes tender co-ordination meeting between the estimator and planner, pricing of bill of quantities and preliminaries following by arithmetical check of all works and review of later quotations in order to prepare complete estimate that report the total cost of all works including preliminaries outlined in the tender documentation
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE·	ITEMD DESCRIBED Plan Tender and Build up complete Estimate	FORM TYPE: UoB elaboration

USED AT·	ANALYST Genet Tesfagaber, DATE; 15 02 02 PROKJECT· Process description capture NOTE REV	X	WORKING	REVIEWED	DATE
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UoB NO	**UoB Name:** Finalise and Submit Tender	**UoB label:** Finalise and Submit Tender
	Objects:	
UoB 11	**Facts:**	Finalisation and submission of tender involves finalisation meeting followed by submission based on the tender estimator's work, tender planner's work, and buyer's information and construction management's knowledge When a need for alternative contract duration and price arise the issue is considered and discussed On the basis of the agreed construction method, programme, selection of subcontractors and adjustments established, finalisation of the mark-ups for overheads, profit and insurance and agreement on the fixed price allowance is sought when applicable
	Constraint:	White space
	Description:	White space
	UoB Name:	Examine Document **UoB label:** Examine Document
	Objects:	
UoB 12	**Facts:**	The estimation of tender starts with examination of the tender document The estimator conducts detailed examination of the tender document to reveal the items in the bill of quantities in connection with their tender drawings and specifications for which quotation is required
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE	ITEMD DESCRIBED: Finalise and Submit Tender and Examine Document	FORM TYPE: UoB elaboration

USED AT·	ANALYST: Genet Tesfagaber, DATE; 15 02 02 PROKJECT Process description capture NOTE REV·	X	WORKING	REVIEWED	DATE.
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UoB NO	**UoB Name:** Collect Relevant Information	**UoB label:** Collect Relevant Information
	Objects:	Insurance manager, estimator, enquiry clerk, tender invitations, subcontractors, suppliers, prices or quotation, chief estimator, insurance, contract, estimator, planner, site information, detailed and working drawings
UoB 13	**Facts:**	
	Constraint:	Collection of relevant information involves the following activities, The enquiry clerk's despatches invitations to tender to subcontractors and suppliers for submission of prices and cash settlement terms The chief estimator prepares an insurance enquiry sheet and seeks information on insurance on the contract. The estimator and planner collects site information form site visit and examine and collect detailed and working drawings not included in the tender documents from the (architects or engineers) consultant's office visit
	Description:	
	UoB Name:	Collate Quotations **UoB label:** Collate Quotations
	Objects:	Tender enquiry abstract. lists pages numbers in the BoQs together with appropriate drawings that sent with a particular group of enquiry, estimator, quotations, subcontractors, suppliers, trades, analysis sheet, work items, drawings, bill extracts, tender invitations, analysis sheet
UoB 14	**Facts:**	
	Constraint:	Collation of quotations involves the estimator's task The estimator edits the quotations received back from subcontractors and suppliers into trades as appropriate. The quotation are then (filed) entered in to an analysis sheet for comparison to be made The analysis sheet contains detail of work items in each trade A file for every trade comprises the relevant tender enquiry abstract, the drawings and bill extracts despatched with the invitations to tender, the quotations received back and analysis sheet.
	Description:	White space

CONTEXT SETTING REFERENCE·	ITEMD DESCRIBED	FORM TYPE:
	Collect Relevant Information and Collate Quotations	UoB elaboration

USED AT.	ANALYST Genet Tesfagaber, DATE; 15 02 02 PROKJECT· Process description capture NOTE REV·	X	WORKING·	REVIEWED	DATE.
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UoB NO	**UoB Name.** Establish All-In-Rates	**UoB label** Establish All-In-Rates
	Objects:	
UoB15	**Facts:**	The establishment of all-in-rate process involves the estimator's task The estimator prices little of the work or trade To build up unit rates for these items the estimator first establishes an all-in-rates for labour, plant and materials For labour, an all-in-hourly rate is calculated, major items of plant are charged under the project overhead (preliminaries), and for small plants all-in-rates which include all services (basic hire charges, running costs, erection and transport costs) are calculated, material all-in-rates are based on the quotations received back from suppliers Before meaningful comparisons are made the quotations are transferred in to all-in-rates by making allowance for other associated service's cost Having calculated all-in-rates the estimator selects
	Constraint:	the keenest reliable supply quote for inclusion in the tender For meaningful comparison the tenders are adjusted by means of
	Description:	allowance for risk, attendance and price fluctuations. This is done in liaison with the buyer
	UoB Name:	Build up Unit Rates **UoB label:** Build up Unit Rates
	Objects:	
UoB16	**Facts:**	Building up of unit rates involves the estimator's task For the trades that are priced in the building up of all-in-rates process unit rates are built up for each measured items in the bill of quantities Unit rates usually consist of elements for labour, plant and materials. The subcontract tenders selected are examined and checked to ensure allowance have been included for other services such as stores, protection etc
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE·	ITEMD DESCRIBED·	FORM TYPE:
	Establish All-In-Rates and Build up Unit Rates	UoB elaboration

USED AT·	ANALYST· Genet Tesfagaber, DATE, 15 02 02 PROKJECT Process description capture NOTE REV·	X	WORKING.	REVIEWED	DATE
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UoB NO	**UoB Name:** Extract Information	**UoB label:** Extract Information
UoB1 7	**Objects:**	
	Facts:	The process involves the tender planner's task The tender planning process starts with extraction of relevant information Up on receipt of the completed tender summary sheet and a set of tender document, the tender planner extracts all the bulk quantifies form the bill of quantities and identifies the plant and scaffold requirements The abstraction of scaffold requirements onto scaffold schedule and the list of major plant requirements enable for enquiry to be despatched Any temporary work requirements may be referred to the engineering department for the design for difficult propping and support systems
	Constraint:	The extraction of relevant information requires the preamble and specifications for example, for restrictions in countering bay sizes, the type of concrete mixes to be used and any other production related constraints.
	Description:	White space
UoB1 8	**UoB Name:**	Collect Necessary Information **UoB label:** Collect Necessary Information
	Objects:	
	Facts:	The collection of necessary and relevant information involves the planner's responsibility in acquiring quotations for scaffold, pant, and temporary work that may be required The scaffold schedule with enquiry letter is despatched as soon as the scaffold requirements have been defined The major plant requirements are highlighted as the method of construction is decided and the programmed activity duration calculated The planner in conjunction with the estimator makes visit to the site as well as the consultant's office to collect more information, which is not included in the tender document
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE:	ITEMD DESCRIBED: Extract Information and Collect Necessary Information	FORM TYPE. UoB elaboration

USED AT	ANALYST Genet Tesfagaber, DATE; 15 02 02 PROKJECT Process descripuon capture NOTE REV·	X	WORKING	REVIEWED.	DATE·
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UoB NO	**UoB Name:** Resource bill of quantities & activities	**UoB label:** Resource BoQs & Principal Activities
	Objects:	
UoB1 9	**Facts:**	The resource of bill of quantities and principal activities involves the planner's task The planner proceeds to resource the bulk quantities abstracted for each principal activity in terms of their labour and plant content Using own output the constants for labour and plant, activity duration are calculated initially on the basis of the most sensible and obvious resource strength All possible method of construction are analysed and resourced and alternative solutions are appraised and the optimum solutions are sought for each activity
	Constraint:	White space
	Description:	White space
	UoB Name:	Produce Method Statement **UoB label:** Produce Method Statement
	Objects:	
UoB 20	**Facts:**	The production of method statement involves the tender planner's task As the activities are resoruced and optimum solutions are calculated, they are entered onto a method statement sheet Each activity is numbered and given a brief description (in an operational logic), Plant requirements for each activity are also listed The average output and quantities of work in each activity together with resulting duration are listed under the appropriate heading A note is made of the method sequence (dependent and related activities) together with any remarks; such as assumptions made
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE	ITEMD DESCRIBED: Resource bill of quantities & activities and produce method statement	FORM TYPE· UoB elaboration

USED AT	ANALYST Genet Tesfagaber, DATE, 15 02 02 PROKJECT. Process description capture NOTE REV	X	WORKING	REVIEWED.	DATE
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UoB NO	**UoB Name:** Draft Pre-tender Programme	**UoB label:** Draft Pretender Programme
	Objects:	
UoB2 1	**Facts:**	The draft pre-tender process involves the production of pre-tender construction programme, which is a graphical representation of the proposed construction process The programme is produced based on the activities, duration and calendar dates, which are entered on the method statement sheet In addition to showing the activities the planer marks up the dates by which design information is required for each activity The level of detail given at the pre-tender stage depends largely upon the nature of the work
	Constraint:	White space
	Description:	White space
	UoB Name:	Produce Preliminary Schedule **UoB label:** Produce Preliminary Schedule
	Objects:	
UoB 22	**Facts:**	The production of preliminary schedule involves the tender planner's work The planner upon completion of the pre-tender programme fills a standard company's preliminaries schedule This comprehensive list prompts consideration of all the possible project overheads not attributable to measured items
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE	ITEMD DESCRIBED. Draft Pretender Programme And Produce Preliminary Schedule	FORM TYPE: UoB elaboration

USED AT	ANALYST Genet Tesfagaber, DATE; 15 02 02 PROKJECT. Process description capture NOTE REV:	X	WORKING:	REVIEWED	DATE:
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UoB NO	**UoB Name:** Co-ordinate Tender	**UoB label:** Co-ordinate Tender
	Objects:	
UoB23	**Facts:**	The building up of complete estimate start with, co-ordination meeting between the tender estimator and planner, to discuss the tender and bring the two sections of estimate together prior to the final stage This is for the purpose of consistency to the tender preparation and to give both parties a fuller appreciation of the estimate The meeting focuses on the preliminaries schedule, exchange of tender information, pre-tender programme and associated method statements and discuss on alternatives to client's completion date
	Constraint:	White space
	Description:	White space
UoB 24	**UoB Name:**	Price Bill of Quantities **UoB label:** Price Bill of Quantities
	Objects:	
	Facts:	Pricing the bill of quantities involves the estimator's task The estimator builds up measured rates against the bill of quantity items based on the unit rates for labour, plant and materials. An analytical bill showing labour, plant and materials subtotals are completed and all workings, build-ups and extensions are passed for arithmetical checking
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE.	ITEMD DESCRIBED. Co-ordinate Tender and Price Bill of Quantities	FORM TYPE: UoB elaboration

USED AT:	ANALYST. Genet Tesfagaber, DATE; 15 02 02 PROKJECT. Process description capture NOTE REV	X	WORKING	REVIEWED:	DATE.
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UoB NO	**UoB Name:** Price Preliminaries Schedule	**UoB label:** Price Preliminaries Schedule
	Objects:	
UoB25	**Facts:**	Pricing the preliminary schedule involves estimator's task the estimator prices the resourced preliminaries schedule based on the quotations obtained by the planner and passed to the estimator, that forms the basis for the rates used for scaffold, major plants and tower-cranes requirements. Each resourced item is priced The value of the preliminaries is summariser and priced at cost The priced schedule together with any working etc are passed for checking
	Constraint:	White space
	Description:	White space
	UoB Name:	Make Arithmetical Check **UoB label:** Make Arithmetical Check
	Objects:	
UoB 26	**Facts:**	Arithmetical check process follows the pricing of the bill of quantities and preliminaries schedule All the work sheets, extensions, measured rates, trades/section totals are checked and mistakes are corrected
	Constraint:	White space
	Description:	White space

CONTEXT SETTING REFERENCE	ITEMD DESCRIBED. Price Preliminaries Schedule and make arithmetical check	FORM TYPE: UoB elaboration

USED AT·	ANALYST Genet Tesfagaber, DATE; 15 02 02 PROKJECT Process descnption capture NOTE REV:	X	WORKING	REVIEWED	DATE·
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UoB NO	**UoB Name:** Review Quotations	**UoB label:** Review Quotations
	Objects:	
UoB2 7	**Facts:**	Review of the late quotations can be carried out after the closing data As further subcontractors and suppliers quotations arrived after closing date may be analysed and compared against those already selected for inclusion in the estimate before the finalisation of meeting
	Constraint:	This process may be constrained by the condition and agreement of the conratct
	Description:	White space
	UoB Name:	Summarise Estimate **UoB label:** Summarise Estimate
	Objects:	White space
	Facts:	White space
UoB 28	**Constraint:**	White space
	Description:	White space

CONTEXT SETTING REFERENCE.	ITEMD DESCRIBED Review Quotations and Summarise Estimate	FORM TYPE UoB elaboration

DATE AT.	ANALYST Genet Tesfagaber date· PROJECT. NOTES. REV.		WORKIGNG	REVIEWR·	DATE:
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Object State No.	**Object State Name:**	Tender invitation			
	Label:	Tender invitation			
	Transition From Object State	Design document			
	Transition To Object State(s):	Tender received			
OS 1	**Facts:**	Tender invitation includes tender document, tender drawings, specifications, bill of quantities, conditions of tender and proposed form of contract and any other relevant or unusual conditions			
	Constraints:				
	State Condition:	The tender invitation must include all the necessary information at the required level for estimating these include; the bill of quantities, drawings, and specifications			
	Exit Condition:	Tender invitation requires review and analysis by the chief estimator before decision can be made			
	Other:				
	Description:	The bill of quantities represent gives a brief description and the quantities of all the items of work involved in a proposed project Tender drawings are represent the detailed drawing produced during the design stage of a project The specifications specify the .			
CONTEXT SETTIGNG REFERENCE. Scenario 1 0	**ITEM DESCRIBED** Tender invitation				**FORM TYPE:** Object State Elaboration

DATE AT	ANALYST. Genet Tesfagaber date PROJECT NOTES REV		WORKIGNG	REVIEWR	DATE·
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Object State No.	**Object State Name:**	Tender declined
	Label:	Tender declined
	Transition From Object State	Tender received
OS 3	**Transition To Object State(s):**	----------
	Facts:	Tender declined includes letter of decline Up on receipt of the tender invitation the chief estimator reviews the tender document before decision can be made A letter of decline is prepared and sent to the client
	Constraints:	
	State Condition:	A letter of decline must be prepared
	Exit Condition:	A letter of decline must be sent to the client
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE: Scenario 1 0	ITEM DESCRIBED Tender declined	FORM TYPE· Object State Elaboration

DATE AT	ANALYST. Genet Tesfagaber date· PROJECT: NOTES: REV		WORKIGNG	REVIEWR	DATE:
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Object State No.		
OS 4	**Object State Name:**	Tender accepted
	Label:	Tender accepted
	Transition From Object State	Tender received
	Transition To Object State(s):	Tender document Tender summary sheet
	Facts:	Tender accepted lead to tender estimating and planning It includes tender acceptance letter
	Constraints:	
	State Condition:	There must be a decision made to accept tender invitation and letter of acceptance prepared
	Exit Condition:	A letter of acceptance must be sent to client .
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE Scenario 1 0	ITEM DESCRIBED: Tender accepted	FORM TYPE· Object State Elaboration

DATE AT.	ANALYST: Genet Tesfagaber date· PROJECT NOTES REV		WORKIGNG	REVIEWR	DATE·
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Object State No.		
OS 5	**Object State Name:**	Tender document
	Label:	Tender document
	Transition From Object State	Tender accepted
	Transition To Object State(s):	Tender estimated
		Tender planned
	Facts:	Tender document includes tender drawings, specifications, bill of quantities, and conditions of tender
	Constraints:	
	State Condition:	The tender document must contain the drawings, specifications of the project and the items of work and quantities of the work items
	Exit Condition:	The tender document requires examination and check by the chief estimator and director before estimating and planning stages
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE: Scenario 1 0	ITEM DESCRIBED. Tender document	FORM TYPE Object State Elaboration

DATE AT.	ANALYST. Genet Tesfagaber date PROJECT: NOTES: REV:		WORKIGNG	REVIEWR	DATE
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Object State No.	**Object State Name:**	Tender summary sheet
	Label:	Tender summary sheet
	Transition From Object State	Tender accepted
OS 6	**Transition To Object State(s):**	Tender estimated
		Tender planned
	Facts:	Tender summary sheet is a summary of the tender details and including observations or unusual features noted by the director and chief estimator
	Constraints:	
	State Condition:	Tender summary sheet must summaries all the details in the tender document.
	Exit Condition:	The ender summary sheet requires examination and check by the chief estimator before estimating and planning
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE: Scenario 1.0	ITEM DESCRIBED: Tender summary sheet	FORM TYPE· Object State Elaboration

DATE AT.	ANALYST Genet Tesfagaber date: PROJECT: NOTES· REV·		WORKIGNG	REVIEWR	DATE:
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Object State No.		
	Object State Name:	Estimated tender
	Label:	Estimated tender
	Transition From Object State	Tender document Tender summary sheet
OS 7	**Transition To Object State(s):**	Complete estimate
	Facts:	Estimated tender includes the likely cost of all proposed work, including all-in-rates and unite rates and measured rates
	Constraints:	
	State Condition:	The estimated tender must include all the likely cost of each work item in the BoQs, measured rates and unite rates prior to the completion and finalisation of the estimate process
	Exit Condition:	The estimated tender requires tender coordination meeting between the estimator and planner
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE. Scenario 1 0	ITEM DESCRIBED Tender estimated	FORM TYPE· Object State Elaboration

DATE AT.	ANALYST. Genet Tesfagaber date: PROJECT: NOTES: REV:		WORKIGNG	REVIEWR	DATE·
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Object State No.	**Object State Name:**	Tender planned
	Label:	Tender planned
	Transition From Object State	Tender document Tender summary sheet
OS 8	**Transition To Object State(s):**	Complete estimate
	Facts:	The tender planned includes way in which project might be built, key milestones, and likely rates of construction necessary to meet any imposed completions dates
	Constraints:	
	State Condition:	The planned tender must include the preliminary schedule completed and quotations.
	Exit Condition:	The planned tender requires check and estimating and tender coordination meeting between the estimator and the planner prior to completion of the estimate
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE:	ITEM DESCRIBED.	FORM TYPE
Scenario 1 0	Tender planned	Object State Elaboration

DATE AT·	ANALYST. Genet Tesfagaber date: PROJECT. NOTES REV		WORKIGNG	REVIEWR	DATE
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Object State No.	**Object State Name:**	Estimate completed
	Label:	Estimate completed
	Transition From Object State	Tender estimated Tender planned
OS 9	**Transition To Object State(s):**	Tender file
	Facts:	The completed estimate includes the total cost of all proposed works, including preliminaries in the tender documentation
	Constraints:	
	State Condition:	The complete estimate must include all the costs of the proposed project in detail
	Exit Condition:	The completed estimate requires tender finalisation
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE·	ITEM DESCRIBED·	FORM TYPE
Scenario 1 0	Estimate completed	Object State Elaboration

DATE AT:	ANALYST. Genet Tesfagaber date. PROJECT· NOTES REV		WORKIGNG	REVIEWR	DATE
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Object State No.		
	Object State Name:	Tender file
	Label:	Tender file
	Transition From Object State	Completed estimate
OS 10	**Transition To Object State(s):**	Tender file
	Facts:	Tender file includes
	Constraints:	
	State Condition:	Tender file must include
	Exit Condition:	Tender file requires check and analysis for completeness
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE: Scenario 1 0	ITEM DESCRIBED Tender file	FORM TYPE: Object State Elaboration

DATE AT:	ANALYST. Genet Tesfagaber date· PROJECT NOTES· REV·		WORKIGNG	REVIEWR	DATE
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Object State No.		
	Object State Name:	Tender enquiry abstract
	Label:	Tender enquiry abstract
	Transition From Object State	Tender document
OS 3	**Transition To Object State(s):**	Tender summary sheet Quotations Direct work abstract
	Facts:	Tender enquiry abstract contains list of page numbers in the BoQs together with appropriate drawings that's sent with particular group of enquiries It is a data that is sent with a letter of invitation for enquiries to material suppliers
	Constraints:	
	State Condition:	The tender enquiry abstract must contain bill extracts from the BoQs and appropriate drawings and for enquiry for supply of material or/and equipment
	Exit Condition:	The tender enquiry abstract requires check and examination by the enquiry clerk before despatch to suppliers
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE Scenario 8 1	ITEM DESCRIBED Tender enquiry abstract	FORM TYPE. Object State Elaboration

DATE AT:	ANALYST. Genet Tesfagaber date· PROJECT· NOTES REV		WORKIGNG	REVIEWR	DATE:
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Object State No.		
OS 4	**Object State Name:**	Direct work abstract
	Label:	Direct work abstract
	Transition From Object State	Tender enquiry abstract
	Transition To Object State(s):	All-in-rates
	Facts:	Direct work abstract is an item of work, which is priced as a whole work package
	Constraints:	
	State Condition:	The direct work abstract must state the work as a whole task or work
	Exit Condition:	For direct work abstract requires unit rates so all in rates must be developed
	Other:	
	Description:	Direct work abstract does not need quotations for separate resources Such as labour, material, plant or equipment Direct work abstract is a package of work contracted or supplied as a package for certain amount of money

CONTEXT SETTIGNG REFERENCE:	ITEM DESCRIBED	FORM TYPE.
Scenario 8 1	Direct work abstract	Object State Elaboration

DATE AT	ANALYST Genet Tesfagaber date: PROJECT NOTES REV:		WORKIGNG	REVIEWR·	DATE·
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Object State No.		
	Object State Name:	Quotations
	Label:	Quotations
	Transition From Object State	Tender enquiry abstract
OS 5	**Transition To Object State(s):**	Comparison sheet
	Facts:	Quotations are quitted prices or cost for supply of material or for subcontract of work that are received from suppliers and subcontractors upon invitation to tender for particular work or enquiry for material supply
	Constraints:	
	State Condition:	The quotations must state the prices or costs and cash settlement terms and other relevant information
	Exit Condition:	Quotations require comparison so they need to be edited in to file for a comparison to be made
	Other:	
	Description:	Quotations are quitted prices for separate material, labour or equipment

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED	FORM TYPE
Scenario 8 1	Quotations	Object State Elaboration

DATE AT	ANALYST Genet Tesfagaber date:		WORKIGNG	REVIEWR	DATE:
	PROJECT		DRAFT		
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	NOTES REV		RELEASED		

Object State No.	**Object State Name: Label:**	Comparison sheet
	Transition From Object State	Quotations
OS 6	**Transition To Object State(s):**	All-in-rates
	Facts:	Comparison sheet comprises a relevant tender enquiry abstract, quotations and analysis sheet for each trade.
	Constraints:	
	State Condition:	Comparison sheet must contain the quotations received with appropriate enquiry abstracts entered into analysis sheet for comparison to be made
	Exit Condition:	
	Other:	
	Description:	Analysis sheet is a file containing the quotations received with appropriated tender enquiry abstracts for comparison purpose

CONTEXT SETTIGNG REFERENCE: Scenario 8 1	ITEM DESCRIBED	FORM TYPE: Object State Elaboration

DATE AT:	ANALYST: Genet Tesfagaber date PROJECT: NOTES: REV:		WORKIGNG	REVIEWR·	DATE
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Object State No.		
	Object State Name:	All-ın-rates
	Label:	All-ın-rates
	Transition From Object State	Comparıson sheet
OS 7	**Transition To Object State(s):**	Dırect work abstract
	Facts:	All-ın-rates are establıshed prıce rates made of all-ın-hourly rates for labour and plant, and all-ın-rates for materıal, for a trade or sectıon of work
	Constraints:	
	State Condition:	All-ın rates must comprıse all-ın-hourly rates for labour and plant and all-ın rates for materıals Thıs does not comprıse rates for major ıtems of plant
	Exit Condıtion:	For trades or work sectıon that are prıced, or for whıch All-ın-rates ıs establıshed requıre unıte rates built up for each measured ıtems ın the BoQ
	Other:	
	Description:	All-ın rates are made up of all-ın rates for the resources, labour, materıal, and plants or equıpment Major ıtems of plant are charged under project overhead

CONTEXT SETTIGNG REFERENCE: Scenarıo 8 1	ITEM DESCRIBED All-ın-rates	FORM TYPE Object State Elaboratıon

DATE AT:	ANALYST: Genet Tesfagaber date: PROJECT· NOTES REV·		WORKIGNG	REVIEWR	DATE·
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Object State No.		
	Object State Name:	Unite rates
	Label:	Unite rates
	Transition From Object State	All-in rates
OS 8	**Transition To Object State(s):**	Measured rates Preliminaries priced
	Facts:	Unit rates are price rates per measure unit for each measured item in the BoQ
	Constraints:	
	State Condition:	Unit rates must consists of elements for labour plant and materials
	Exit Condition:	Unit rates are built up for pricing the measured items in the BoQs Unit rates built up for each measured work items in the BoQ requires tender co-ordination meeting to prior to completion of the estimate
	Other:	
	Description:	Unit rates are built up based on the all-in-rates established for a trade or section of work So it consist elements for labour, plant and materials.

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED	FORM TYPE
Scenario 8 1	Unite rates	Object State Elaboration

DATE AT	ANALYST Genet Tesfagaber date:		WORKIGNG	REVIEWR	DATE
	PROJECT		DRAFT		
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	NOTES: REV:		RELEASED		

Object State No.	**Object State Name:**	Measured rates
	Label:	Measured rates
	Transition From Object State	Unit rates and quotations
OS 9	**Transition To Object State(s):**	Preliminary schedule and supporting quotations Completed estimate
	Facts:	Measured rates are rates that are built up from the basis of the unit rates against the measured items in the BoQs
	Constraints:	
	State Condition:	Measured rates must consist of elements for labour, plant, material and direct work. Quitted and direct work items must have measured rates
	Exit Condition:	All the workings, build-ups and extensions require arithmetical check before completions of the estimate.
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED.	FORM TYPE
Scenario 1 1	Measured rates	Object State Elaboration

DATE AT	ANALYST: Genet Tesfagaber date PROJECT NOTES REV:		WORKIGNG DRAFT RECOMNED RELEASED	REVIEWR:	DATE:
Object State No.	**Object State Name:**	Preliminaries priced			
	Label:	Preliminaries priced			
	Transition From Object State	Unit rates and quotations			
OS 10	**Transition To Object State(s):**	Preliminary schedule and supporting quotations			
	Transition To Object State(s):	Completed estimate			
	Facts:	Priced preliminaries are a company's standard preliminaries schedule with comprehensive list, which is filled and resourced by the planner and priced by the estimator			
	Constraints:				
	State Condition:	The priced preliminaries must have all the possible project overheads not attributable to measured items, pried on the basis of the quotations obtained by the planner			
	Exit Condition:	The priced preliminaries require arithmetical check prior to completion and summary of the estimate			
	Other:				
	Description:	Priced preliminaries or company's standard preliminaries schedule includes components summary sheet, accommodation, supervisions, site set up, temporary services, temporary site electric, mechanical plant, cranage, scaffolding, protections and sundries, maintain and tidy, transport, special conditions			

CONTEXT SETTIGNG REFERENCE. Scenario 1 1	ITEM DESCRIBED· Preliminaries priced	FORM TYPE: Object State Elaboration

DATE AT	ANALYST: Genet Tesfagaber date:		WORKIGNG	REVIEWR·	DATE
	PROJECT		DRAFT		
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	NOTES REV·		RELEASED		

Object State No.		
	Object State Name:	Completed estimate
	Label:	Completed estimate
	Transition From Object State	Measured rates Preliminaries priced
OS 11	**Transition To Object State(s):**	Tender file
	Facts:	A complete estimate represents the total cost of all construction work including preliminaries outlined in tender documentation
	Constraints:	
	State Condition:	The completed estimate must consistes elements of cost for every items of work in the BoQs and preliminaries outlined in tender documentation
	Exit Condition:	The completed estimate requires tender finalisation meeting for consideration and discussion on alterations in contract duration, price mark-ups for overheads, profit and insurance; price allowances or other relevant issues
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED	FORM TYPE:
Scenario 1 1	Completed estimate	Object State Elaboration

DATE AT	ANALYST Genet Tesfagaber date:		WORKIGNG	REVIEWR	DATE·
	PROJECT		DRAFT		
			RECOMNED		
	NOTES REV·		RELEASED		

Object State No.	**Object State Name:**	Tender file
	Label:	Tender file
	Transition From Object State	Completed estimate
OS 12	**Transition To Object State(s):**	Tender submitted
	Facts:	Tender file includes a completed estimate that represent total cost of all work times and preliminaries, contract duration, total cost, etc
	Constraints:	
	State Condition:	Tender file must include cost of all work items and preliminaries
	Exit Condition:	Tender file requires check and analysis by the client
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE.	ITEM DESCRIBED·	FORM TYPE
Scenario 1 1	Tender file	Object State Elaboration

DATE AT·	ANALYST Genet Tesfagaber date· PROJECT: NOTES· REV		WORKIGNG	REVIEWR·	DATE:
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Object State No.		
	Object State Name:	Bulk quantities of principal activities
	Label:	Bulk quantities of principal activities
	Transition From Object State	Tender document Tender summary sheet
OS 3	**Transition To Object State(s):**	Bulk quantities of principal activities resourced Method logic
	Facts:	The bulk quantities are the major work items in the bill of quantity
	Constraints:	
	State Condition:	The bulk quantity must contain brief description and quantities of all the major work items based on the method of construction used
	Exit Condition:	The bulk quantities require resources for the principal activities
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE: Scenario 9 1	ITEM DESCRIBED· Bulk quantities of principal activities	FORM TYPE Object State Elaboration

DATE AT	ANALYST: Genet Tesfagaber date· PROJECT: NOTES: REV:		WORKIGNG	REVIEWR:	DATE:
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Object State No.		
	Object State Name:	Temporary resource required
	Label:	Temporary resource required
	Transition From Object State	Tender document
		Tender summary sheet
OS 4	**Transition To Object State(s):**	Temporary work details and quotations
	Facts:	Temporary resources are the major resources such as scaffolds, major plants, and temporary work that may be require to perform the bulk quantities of the bill of quantities
	Constraints:	
	State Condition:	The temporary resources required must be abstracted into schedules and lists as appropriate to be despatched for enquiry and invitation to tender
	Exit Condition:	The schedule and list of the temporary resources required require check for completeness and letter of enquiry that despatched along with the schedule and list of the major resources for quotations enquiry from suppliers
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE: Scenario 1 1	ITEM DESCRIBED Temporary resource required	FORM TYPE Object State Elaboration

DATE AT:	ANALYST· Genet Tesfagaber date:		WORKIGNG	REVIEWR	DATE·
	PROJECT		DRAFT		
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	NOTES REV·		RELEASED		

Object State No.		
OS 5	**Object State Name:**	Quotations
	Label:	Quotations
	Transition From Object State	Temporary resource required
	Transition To Object State(s):	Bulk quantities of principal activities resourced
		Method logic
	Facts:	Possible suppliers and subcontractors quote quotations for the resources required
	Constraints:	
	State Condition:	The quotations must contain detail of the prices and any other relevant conditions necessary
	Exit Condition:	The quotations are required for pricing the preliminaries schedule the quotations requires estimator's work for pricing the preliminaries schedule
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE: Scenario 1 1	ITEM DESCRIBED Temporary work detail and quotations	FORM TYPE· Object State Elaboration

DATE AT	ANALYST: Genet Tesfagaber date:		WORKIGNG	REVIEWR·	DATE
	PROJECT:		DRAFT		
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	NOTES REV:		RELEASED		

Object State No.	**Object State Name:**	Method/ logic
	Label:	Method/ logic
	Transition From Object State	Temporary work details and quotations
OS 6	**Transition To Object State(s):**	Bulk quantities of principal activities Programmed duration
	Facts:	Method/logic is the operational method or method of construction considered in the resource exercise
	Constraints:	
	State Condition:	The method/logic must state the methods of construction considered or chosen
	Exit Condition:	The method/logic are required in the resource exercise of the principal activities
	Other:	
	Description:	

CONTEXT SETTING REFERENCE	ITEM DESCRIBED	FORM TYPE.
Scenario 1 1	Method/ logic	Object State Elaboration

DATE AT	ANALYST: Genet Tesfagaber date: PROJECT NOTES REV·		WORKIGNG	REVIEWR·	DATE
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Object State No.	**Object State Name:**	Bulk quantities of principal activities resourced
	Label:	Bulk quantities of principal activities resourced
	Transition From Object State	Bulk quantities of principal activities
		Programmed duration
OS 7	**Transition To Object State(s):**	
	Facts:	The principal activities resourced are list of principal activities resourced in terms of their labour and plant contents based on the method of construction considered in the resource exercise
	Constraints:	
	State Condition:	The principal activities must be principal activities resourced with optimum solution
	Exit Condition:	The resourced principal activities require time duration for the resource to perform the activities
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE:	ITEM DESCRIBED·	FORM TYPE:
Scenario 1 1	Bulk quantities of principal activities resourced	Object State Elaboration

DATE AT:	ANALYST Genet Tesfagaber date. PROJECT. NOTES REV		WORKIGNG	REVIEWR	DATE·
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Object State No.		
	Object State Name:	Programmed duration
	Label:	Programmed duration
	Transition From Object State	Bulk quantities of principal activities resourced Method logic
OS 8	**Transition To Object State(s):**	Preliminary schedule Supporting quotations Resource data
	Facts:	Programmed duration are construction programme i e a graphical representation of a proposed construction process
	Constraints:	
	State Condition:	Programmed duration must have description of the work items programmed and placed calendar dates Activity duration must have start and completion times determined by the logic imposed by the constriction method considered
	Exit Condition:	Programmed duration requires check for completion and constructablity
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE:	ITEM DESCRIBED·	FORM TYPE
Scenario 1 1	Programmed duration	Object State Elaboration

DATE AT:	ANALYST Genet Tesfagaber date PROJECT. NOTES REV.		WORKIGNG	REVIEWR	DATE
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			RECOMNED		
			RELEASED		

Object State No.		
OS 9	**Object State Name:**	Preliminary schedule
	Label:	Preliminary schedule
	Transition From Object State	Programmed duration
	Transition To Object State(s):	Measured rates and preliminaries priced
		Measured rates
	Facts:	Preliminary schedule is a standard company's preliminaries schedule, which is filled by the planner upon completion of the pre-tender programme
	Constraints:	
	State Condition:	The preliminary schedule must consider all the possible project overheads not attributable to measured rates
	Exit Condition:	The preliminary schedule requires check and approval by the director for completeness and need be priced by the estimator
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE: Scenario 1 1	ITEM DESCRIBED Preliminary schedule	FORM TYPE· Object State Elaboration

DATE AT:	ANALYST Genet Tesfagaber date:		WORKIGNG	REVIEWR	DATE
	PROJECT		DRAFT		
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Object State No.	**Object State Name:**	Supporting quotations
	Label:	Supporting quotations
OS 10	**Transition From Object State**	Programmed duration
	Transition To Object State(s):	Measured rates and preliminaries priced
		Measured rates
	Facts:	Supporting quotations are competitive quotations under consideration received from suppliers and sub contractors
	Constraints:	
	State Condition:	Supporting quotations must state the prices and other relevant condition
	Exit Condition:	Supporting quotations required for pricing the preliminaries schedule
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE	ITEM DESCRIBED:	FORM TYPE
Scenario 1 1	Supporting quotations	Object State Elaboration

DATE AT:	ANALYST. Genet Tesfagaber date· PROJECT· NOTES. REV:		WORKIGNG	REVIEWR	DATE
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Object State No.	**Object State Name:** **Label:**	Resource data
	Transition From Object State	Programmed duration
OS 11	**Transition To Object State(s):**	
	Facts:	Resource data are data for project strategy ıncludes resources data, sıte lay out plan, method statement, pre-tender programme and programme alternatıves
	Constraints:	
	State Condition:	White space
	Exit Condition:	White space
	Other:	
	Description:	White space

CONTEXT SETTIGNG REFERENCE: Scenarıo 1 1	ITEM DESCRIBED·	FORM TYPE. Object State Elaboratıon

USED AT:	ANALYST· Genet Tesfagaber, DATE, 15 02 02 PROKJECT. Process description capture NOTE REV	X	WORKING	REVIEWED·	DATE
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UoB NO	**UoB Name:** Plan & Schedule Construction Operation	**UoB label:** Plan & Schedule Construction Operation
	Objects:	
	Facts:	Task (work items), resource, construction-task, time-duration, task-sequences, construction-schedule, planner, calendar date
UoB 2	**Constraint:**	Planning and scheduling involves analysing the work items and resource usage and aggregating them in to construction tasks at the appropriate level for scheduling The possible time duration of each task is estimated A construction schedule is then created based on the tasks aggregated and time duration estimated and calendars dates
	Description:	Planning and scheduling process requires detail information of the work items (tasks) and level of detail required for the schedule It also requires analysis and check for completeness and contractibility of the schedule The planners identifies or collect work items or tasks information, estimate the how long (time duration) each task will take and identify sequences by investigating the relationships and dependencies between the tasks Time duration is estimated based on the resource usage Sequences of the tasks are identified based on the dependencies and relationship between tasks Calendar dates are then placed and construction (production) schedule is created The schedule is then analysed and checked for completeness and constructibility

CONTEXT SETTING REFERENCE. Scenario 5 1	ITEMD DESCRIBED Plan & Schedule Construction Operation	FORM TYPE: UoB elaboration

USED AT	ANALYST: Genet Tesfagaber, DATE, 15 02 02 PROKJECT: Process description capture NOTE REV:	X	WORKING	REVIEWED:	DATE
			DRAFT:		
			RECOMMENDED:		
			RELEASED:		

UoB NO	**UoB Name:** Carry out Scope Analysis **UoB label:** Carry out Scope Analysis
UoB 4	**Objects:** Project, construction schedule, construction operation, project information, planner, project objectives, activity, task, **Facts:** Scope analysis involves identification of the objectives of the project and level of detail of the work items (tasks) required for the construction schedule based on the purpose of the schedule, (for construction or production or for tendering). Activity, tasks or work items level of detail required is determined at this stage of process **Constraint:** Scope analysis requires project objectives, project information and information about the purpose of the schedule itself **Description:** The planner collects project information and identifies the level of detail of the work items required in the schedule based on the project objectives and purpose of the schedule and the purpose of the schedule itself
UoB NO	**UoB Name:** Identify Construction Task **UoB label:** Identify Construction Task
UoB 5	**Objects:** **Facts:** Identification of the work items or construction tasks is done based on available information Work items may be identified form an existing work items data such as estimating data or designed product items data Where existing work items such as cost estimating work items (tasks) data is used, the tasks require aggregation into construction tasks at appropriate level for scheduling and resources are assigned Where no existing work items or tasks data is available, designed product items and the resources that perform the tasks in realising the designed product item are used to derive the work items and tasks for the scheduling **Constraint:** Identification of work items or tasks require product design data and/or existing work items or tasks such as cost estimating data in the case where project cost estimate is done **Description:** The planner can identify scheduling tasks based on available information type There are two possible information sources for identifying scheduling tasks, tasks can be obtained from cost estimating data or can be derived from design data

CONTEXT SETTING REFERENCE: Scenario 2 1	ITEMD DESCRIBED: carry out scope analysis & identify construction task	FORM TYPE: UoB elaboration

USED AT.	ANALYST Genet Tesfagaber, DATE; 15 02 02 PROKJECT· Process description capture NOTE REV	X	WORKING	REVIEWED	DATE·
			DRAFT:		
			RECOMMENDED		
			RELEASED·		

UoB NO	**UoB Name:** Estimate Duration **UoB label:** Estimate Duration
UoB 6	**Objects:** Time duration, task, resource, resource usage, construction schedule, labour, major material, equipment, planner, **Facts:** Estimating duration process involves determination of a possible time length that a task will take based on the resource usage Resource usage in the construction schedule includes most of labour resources but only major materials and equipment resources The time duration for each task is estimated based on the time length required by a resource to perform the task **Constraint:** Estimating time duration of each task requires resources and resource usage information **Description:** After tasks are identified the planner assigns resources and estimates the time duration for each task based on the resource usage information
UoB NO	**UoB Name:** Define Relationship between Tasks **UoB label:** Define Relationship between Tasks
UoB 7	**Objects:** Construction task, tasks (construction) sequence, relationship, precedence logic, planner, predecessor/successor task, **Facts:** Construction tasks usually happen in sequences Defining relationship between tasks involves creating construction tasks sequences based on the dependency and relationship between tasks. The relationship between construction tasks is identified based on the task dependencies on one other **Constraint:** Defining relationship between tasks requires precedence logic (the inter activity sequencing constraint) **Description:** After identification of a task a planner identifies a predecessor task and defines relationship between the predecessor and the successor tasks The planner creates construction tasks sequences by linking dependant tasks and defines relationship between the tasks based on the precedence logic

CONTEXT SETTING REFERENCE Scenario 2 1	ITEMD DESCRIBED Estimate time Duration and Define Relationship between Tasks	FORM TYPE: UoB elaboration

USED AT.	ANALYST Genet Tesfagaber, DATE, 15 02 02 PROKJECT: Process description capture NOTE REV:	X	WORKING	REVIEWED	DATE.
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			RECOMMENDED		
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UoB NO	**UoB Name:** Complete Schedule **UoB label:** Complete Schedule
UoB 8	**Objects:** Complete schedule, calendar dates, task, time duration, relationship, resource usage, planner, **Facts:** The complete schedule activity involves placing calendar dates (assigning start and end times of the tasks) to tasks based on the estimated time duration for each task and the relationships between them **Constraint:** Completing schedule requires completeness and contractibility check and analysis **Description:** After tasks identified, time duration for each task is estimated based on the resource usage, relationships between tasks defined the planner places calendar dates and complete the schedule and analysis and check for completeness and contractibility is carried out
UoB NO	**UoB Name: Identify** Tasks from Existing Data **UoB label:** Identify Tasks from Existing Data
UoB 9	**Objects:** Cost estimating task, scheduling task, aggregated task, **Facts:** Where available cost estimating tasks can used for scheduling **Constraint:** Cost estimating work items or tasks require aggregation into tasks at the appropriate level for scheduling based on the purpose of the schedule **Description:** Where cost estimating tasks are used for scheduling the planner aggregates the estimating into appropriate level for scheduling

CONTEXT SETTING REFERENCE. Scenario 2 1 & 5 1	ITEMD DESCRIBED: Complete Schedule & Identify Tasks from Existing Data	FORM TYPE: UoB elaboration

USED AT	ANALYST: Genet Tesfagaber, DATE, 15 02 02 PROKJECT· Process description capture NOTE REV.	X	WORKING	REVIEWED·	DATE:
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			RECOMMENDED·		
			RELEASED·		

UoB NO	**UoB Name:** Aggregate Tasks **UoB label:** Aggregate Tasks
UoB 10	**Objects:** Cost estimating data, Cost estimating task, scheduling tasks, **Facts:** Where cost estimating data or information is the basis in the identification of tasks for scheduling, the cost estimating work items or tasks are aggregated into tasks at the appropriate level for scheduling based on the purpose of the schedule **Constraint:** The aggregation of the cost estimating tasks requires information on the level of detail of the cost estimating tasks and the purpose of the schedule **Description:** White space
UoB NO	**UoB Name:** Identify Design Product **UoB label:** Identify Design Product Data
UoB 11	**Objects:** Design product data, design document, scheduling task, resource, **Facts:** Where the design document is the basis for the identification of scheduling tasks, product design data and information that support in the identification of tasks and resource required to perform the tasks are identified and collected **Constraint:** The identification of product design data requires detailed product design document and specification and identification of tasks that realise the designed product and resources required to perform the task **Description:** White space

CONTEXT SETTING REFERENCE	ITEMD DESCRIBED: Aggregate Tasks & Identify Design Product Data	FORM TYPE
Scenario 5 1		UoB elaboration

USED AT:	ANALYST· Genet Tesfagaber, DATE; 15 02 02 PROKJECT· Process description capture NOTE REV:	X	WORKING:	REVIEWED·	DATE
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UoB NO	**UoB Name:** Identify Tasks required **UoB label:** Identify Tasks required
	Objects: Design data, task, product, resource, resource usage,
	Facts: Based on the product's design data tasks that required to realise the product is identified
UoB 12	**Constraint:** Identification of task requires resource and resource usage information
	Description: White space
UoB NO	**UoB Name: Assign** Resource **UoB label:** Assign Resource
	Objects: Resource, task, resources requirement,
	Facts: Resources are identified and assigned to tasks based on the resources required to perform the task
UoB 13	**Constraint:** The assignment of resources to tasks requires resources requirement information
	Description: White space

CONTEXT SETTING REFERENCE. Scenario 5 1	ITEMD DESCRIBED: Identify Tasks required & Assign Resource	FORM TYPE. UoB elaboration

DATE AT:	ANALYST. Genet Tesfagaber Date· PROJECT: NOTES REV·		WORKIGNG DRAFT RECOMNED RELEASED	REVIEWR	DATE·
Object State No.	**Object State Name:**	Design document or tender document			
	Label:	Design document or tender document			
	Transition From Object State	Prepared design (clients work)			
OS 1	**Transition To Object State(s):**	Task			
	Facts:	Design document provides design and construction process information It a basis for design and construction process information			
	Constraints:				
	State Condition:	The design document must include all the information produced during the design process this includes construction process information			
	Exit Condition:	Design document requires check and inspection for completeness in specifying the product and construction process information The specified product needs to be realised			
	Other:				
	Description:				
CONTEXT SETTIGNG REFERENCE Scenario 2 1		ITEM DESCRIBED· Design data		FORM TYPE Object State Elaboration	

DATE AT	ANALYST. Genet Tesfagaber Date: PROJECT· NOTES· REV		WORKING DRAFT RECOMNED RELEASED	REVIEWR:	DATE·
Object State No.	**Object State Name:**	Estimating document/data			
	Label:	Estimating document/data			
	Transition From Object State	Tender document, or design document			
OS 2	**Transition To Object State(s):**	Task			
	Facts:	Estimating data is the items of works or tasks, resources etc used or produced during the estimating process			
	Constraints:				
	State Condition:	The estimating data must include the attributes of the data			
	Exit Condition:	The estimating data requires aggregation into a scheduling task			
	Other:				
	Description:				

CONTEXT SETTIGNG REFERENCE. Scenario 2 1	ITEM DESCRIBED. Estimating document/data	FORM TYPE Object State Elaboration

DATE AT	ANALYST· Genet Tesfagaber Date: PROJECT NOTES REV·	WORKIGNG DRAFT RECOMNED RELEASED	REVIEWR·	DATE.

Object State No.		
OS 3	**Object State Name:**	Task
	Label:	Task
	Transition From Object State	Estimating document/data
	Transition To Object State(s):	Tender/Design document
	Facts:	Task is a work item that can be obtained from BoQ (tender document) or design document, derived from design document Or aggregated from estimated estimating data. It is a work item required to be carried out in order to realise a designed product
	Constraints:	
	State Condition:	A task should represent a significant amount of work with a clear deliverable, but still short of enough to track its progress regularly and identify problems early
	Exit Condition:	Tasks require time duration and resources to carry out the amount of work to be done on the task
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE Scenario 2 1	ITEM DESCRIBED: Task	FORM TYPE Object State Elaboration

DATE AT:	ANALYST. Genet Tesfagaber date. PROJECT: NOTES REV		WORKIGNG	REVIEWR	DATE
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Object State No.		
OS 4	**Object State Name:**	Resources
	Label:	Resources
	Transition From Object State	Task
	Transition To Object State(s):	Time duration
	Facts:	Resources include labour, material, machinery, used to perform a task or construct a product
	Constraints:	
	State Condition:	Resources must detail all attributes
	Exit Condition:	Resources require time duration to perform a task or amount of work in a task
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE· Scenario 2 1	ITEM DESCRIBED: Resources	FORM TYPE. Object State Elaboration

DATE AT:	ANALYST: Genet Tesfagaber Date:		WORKIGNG	REVIEWR:	DATE:
	PROJECT:		DRAFT		
			RECOMNED		
	NOTES: REV:		RELEASED		
Object State No.	Object State Name:	Time duration			
	Label:	Time duration			
	Transition From Object State	Resources			
OS 5	Transition To Object State(s):	Relationship			
	Facts:	Scheduling applications use time duration to calculate the amount of work to be done on the task time duration indicates how long a task will occur or a resources will take to perform a task			
	Constraints:				
	State Condition:	The time duration must indicate the amount of time required, to complete an amount of work in a task			
	Exit Condition:	Time duration requires relationship between tasks and resources in order to define temporal constraints between tasks			
	Other:				
	Description:				

CONTEXT SETTIGNG REFERENCE Scenario 2 1	ITEM DESCRIBED Time duration	FORM TYPE: Object State Elaboration

DATE AT:	ANALYST· Genet Tesfagaber Date PROJECT: NOTES REV:	WORKIGNG	REVIEWR	DATE
		DRAFT		
		RECOMNED		
		RELEASED		

Object State No.		
	Object State Name:	Relationship
	Label:	Relationship
	Transition From Object State	Time duration
OS 6	**Transition To Object State(s):**	Schedule
	Facts:	Relationships are the relationships that hold between tasks based on dependence of one task with another The relationship between tasks is the basis for calculating the start and end times of tasks
	Constraints:	
	State Condition:	The relationship must provide information on how the tasks can be linked based on the relationship
	Exit Condition:	
	Other:	
	Description:	

CONTEXT SETTIGNG REFERENCE Scenario 2 1	ITEM DESCRIBED· Relationship	FORM TYPE. Object State Elaboration

DATE AT·	ANALYST. Genet Tesfagaber Date: PROJECT. NOTES REV		WORKIGNG DRAFT RECOMNED RELEASED	REVIEWR:	DATE
Object State No.	**Object State Name:** **Label:**	Schedule Schedule			
OS 7	**Transition From Object State** **Transition To Object State(s):**	Relationship			
	Facts:	A schedule is a programme consists of a series of interrelated tasks with time duration assigned to it and sequenced based on the relationship and dependencies between the tasks and placed in a calendar dates with start and finish time.			
	Constraints: **State Condition:**	A schedule must detail all the tasks their sequences, dependencies and temporal relationship between tasks, time duration and start and finish times of each task ,			
	Exit Condition: **Other:**				
	Description:				
CONTEXT SETTIGNG REFERENCE: Scenario 2 1	ITEM DESCRIBED· Schedule		FORM TYPE: Object State Elaboration		

Appendix D

Ontology Representations of the IDEF3 Models

```
(doc construction-process " Construction-Process")

(and  (doc construction-process "The Top Level Construction-process schematic")
    (and (subactivity construction-process-1 construction-process)
       (idef-process  construction-process)))

(and (doc  construction-process-1
     "The occurrence of  Construction-Process in the schematic")
    (and (forall ?a
       (=>activation of  ?a construction-process-1)
       (activation of  ?a  construction-process)))
    (and (forall  ?a
        (=>activation of  ?a construction-process-1)
       (activation of  ?a  decomposition-0 1)))

(and (doc decomposition-0 1 "Decomposition of Construction-Process")
    (and (subactivity  produce-and-manage-bldg-proess-1  decomposition-0 1)
         (and (subactivity  produce-and-manage-architectural-design-data -1  decomposition-0.1)
              (and (subactivity  produce-and-manage-structural-design-data -1  decomposition-0 1)
                   (and (subactivity  produce-and-manage-service-design-data –1
decomposition-0 1)
                        (and (subactivity  produce-and-manage-geotechnical-design data -1
                             decomposition-0 1)
                              (and (subactivity  implement-building-1  decomposition-0.1)
                                   (and (subactivity  J1  decomposition-0 1)
                                        (and (subactivity  J2  decomposition-0.1)
                                             (idef-process decompostition-0.1)))))))))))



(and (doc j1 "J1")
    (and (forall  ?j
         (=>(activation-of  ?j  j1)
          (exists ?p
            (=>(activation-of ?p decomposition 0.1)
              (subactivity-occurrence  ?j  ?p)))))
           (and (and_split  j1 decomposition 1 1)
                (and (subactivity  produce-&-manage-building-process  j1)
                     (and (subactivity  produce-&-manage-architectural-design-data  j1)
                          (and (subactivity  produce-&-manage-structural-design-data
j1)
                               (and (subactivity  produce-&-manage-geotechnical-
design-
                                    data  j1)
                                    (and (subactivity  implement-building
j1)))))))))
```

```
(and (doc j2 "J2")
     (and (forall ?j
          (=>(activation-of ?j j2)
           (exists ?p
             (=>(activation-of ?p decomposition 0 1)
               (subactivity-occurrence ?j ?p)))))
               (and (follows j2 implement-building decompostion-1.1)
                (and (and_split j2 decomposition 1.1)
           (and (subactivity produce-&-manage-building-process j2)
                     (and (subactivity produce-&-manage-architectural-design-data j2)
                          (and (subactivity produce-&-manage-structural-design-data j2)
                                    (and (subactivity produce-&-manage-geotechnical-
design-
                                              data j2)))))))))



(and (doc produce-and-manage-bldg-process-1
     " The occurrence of produce-&-manage-bldg-process in the Dec-0 1 schematic")
        (and (forall ?a
            (=> (activation-of ?a produce and manage bldg process-1)
            (activation-of ?a produce and manage bldg process)))
         (and (forall ?a
            (=>(activation-of ?a produce and manage bldg process-1)
            (exists ?p
            (=> (activation-of ?p decomposition-0 1)
            (subactivity-occurrence ?a ?p)))))


         ( forall ?a
            (=>(activation-of ?a produce and manage bldg process-1)
            (activation-of ?a decomposition 101.1))))))


(and (doc decomposition-101.1 "Decomposition of Produce and Manage Bldg process")
     (and (subactivity draw-up-brief-1 decomposition-101 1)
          (and (subactivity no-project -1 decomposition-101.1)
               (and (subactivity draw-up-programme-1 decomposition-101.1)
                    (and (subactivity prepare-for-design-1 decomposition-101.1)
                         (and (subactivity supervise-design-1 decomposition-101 1)
                              (and (subactivity prepare-for-construction-1 decomposition-101.1)
                                   (and (subactivity supervise-construction-1 decomposition-
101 1)
                                        (and (subactivity J1 decomposition-101 1)
                                             (idef-process decompostition-101.1)))))))))))


(and (doc draw-up-brief-1
       "The occurrence of Draw-Up-Brief in the Dec-101.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a draw-up-brief-1)
              (activation-of ?a draw-up-brief)))
        (and forall ?a
          (=>(activation-of ?a draw-up-brief-1)
           (exists ?p
            (=> (activation-of ?p decomposition 101 1)
             (subactivity-occurrence ?a ?p)))))
```

```
        (forall ?a
            (=>(activation-of ?a draw-up-brief-1)
            (activation-of ?a decomposition107.1))))))


(and (doc make-no-change-required-decision -1
       "The occurrence of Make-No-Change-Required-Decision in the Dec-101 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-no-change-required-decision -1)
              (activation-of ?a Dec-101 1 schematics"))))


        (and forall ?a
          (=>(activation-of ?a Dec-101.1 schematics")-1)
           (exists ?p
            (=> (activation-of ?p decomposition 101.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc draw-up-programme-1
       "The occurrence of Draw-Up-Programme in the Dec-101 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a draw-up-programme -1)
              (activation-of ?a draw-up-programme)))
        (and (forall ?a
          (=>(activation-of ?a draw-up-programme -1)
           (exists ?p
            (=> (activation-of ?p decomposition 101.1)
             (subactivity-occurrence ?a ?p)))))
         (forall ?a
            (=>(activation-of ?a draw-up programme-1)
            (activation-of ?a decomposition109 1))))))

(and (doc prepare-for-design-1
       "The occurrence of Prepare-for-Design in the Dec-101.1schematic")
     (and (forall ?a
          (=>(activation-of ?a prepare-for-design -1)
              (activation-of ?a prepare-for-design)))
        (and (forall ?a
          (=>(activation-of ?a prepare-for-design -1)
           (exists ?p
            (=> (activation-of ?p decomposition 101 1)
             (subactivity-occurrence ?a ?p)))))
         (forall ?a
            (=>(activation-of ?a prepare-for-design -1)
            (activation-of ?a decomposition110 1))))))

(and (doc supervise-design-1
       "The occurrence of Supervise-Design in the Dec-101 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a supervise-design -1)
              (activation-of ?a supervise-design)))
        (and (forall ?a
          (=>(activation-of ?a supervise-design -1)
           (exists ?p
            (=> (activation-of ?p decomposition 101 1)
             (subactivity-occurrence ?a ?p)))))
```

```
(forall ?a
        (=>(activation-of ?a supervise design -1)
        (activation-of ?a decomposition111.1))))))


(and (doc prepare-for-construction-1
       "The occurrence of Prepare-for-Construction in the Dec-101 1 schematics")
     (and (forall ?a
          (=>(activation-of ?a prepare-for-construction -1)
              (activation-of ?a prepare-for-construction)))
        (and (forall ?a
          (=>(activation-of ?a prepare-for-construction -1)
           (exists ?p
            (=> (activation-of ?p decomposition 101.1)
             (subactivity-occurrence ?a ?p)))))
         (forall ?a
              (=>(activation-of ?a prepare for construction -1)
              (activation-of ?a decomposition112 1))))))


(and (doc supervise-construction-1
       "The occurrence of Supervise-Construction in the Dec-101 1 schematics")
     (and (forall ?a
          (=>(activation-of ?a supervise construction -1)
              (activation-of ?a supervise construction)))
     (and (forall ?a
          (=>(activation-of ?a supervise construction -1)
           (exists ?p
            (=> (activation-of ?p decomposition 101 1)
             (subactivity-occurrence ?a ?p)))))


        (forall ?a
            (=>(activation-of ?a supervise construction -1)
            (activation-of ?a decomposition113 1))))))


(and (doc j1 "J1")
     (and (forall ?j
          (=>(activation-of ?j j1)
            (exists ?p
              (=>(activation-of ?p decomposition 0.1)
                (subactivity-occurrence ?j ?p)))))
                (and (follows draw-up-brief j1 decompostion-101.1)
                 (and (and_split j1 decomposition 101 1)
                        (and (subactivity make-no-change-required-decision j2)
                                (and (subactivity draw-up-programme j2))))))


(and (doc decomposition-107 1 "Decomposition of Draw-Up-Brief")
     (and (subactivity define-requirement-1 decomposition-107 1)
          (and (subactivity determine-space-acquisition-alternatives-1 decomposition-107 1)
               (and (subactivity prepare-decision-for-programme-1 decomposition-107.1)
                    (idef-process decompostition-0 1)))))
```

```
(and (doc define-requirements-1
     "The occurrence of Define Requirements in the Dec-101.1schematic")
   (and (forall ?a
        (=>(activation-of ?a define-requirements-1)
            (activation-of ?a define-requirements)))
      (forall ?a
        (=>(activation-of ?a define-requirements-1)
         (exists ?p
          (=> (activation-of ?p decomposition 107 1)
           (subactivity-occurrence ?a ?p)))))))


(and (doc determine-space-acquisition-alternatives -1
       "The occurrence of Determine-Space-Acquisition-Alternatives in the Dec-101 1")


     (and (forall ?a
          (=>(activation-of ?a determine-space-acquisition-alternatives -1)
              (activation-of ?a determine-space-acquisition-alternatives)))


        (forall ?a
          (=>(activation-of ?a determine-space-acquisition-alternatives -1)
           (exists ?p
            (=> (activation-of ?p decomposition 107.1)
             (subactivity-occurrence ?a ?p)))))))

(and (doc prepare-decision-for-programme -1
       "The occurrence of Prepare-Decision- for-Programme in the Dec-101 1schematic")
     (and (forall ?a
          (=>(activation-of ?a prepare-decision-for-programme-1)
              (activation-of ?a prepare-decision-for-programme)))

        (forall ?a
          (=>(activation-of ?a prepare-decision-for-programme-1)
           (exists ?p
            (=> (activation-of ?p decomposition 107.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc decomposition-109 1 "Decomposition of Draw-Up-Programme")
     (and (subactivity define-requirements-1 decomposition-109 1)
          (and (subactivity clear-bldg-site-building-permit -1 decomposition-109.1)
               (and (subactivity draw-up-space-programme-&-other-requirements-1 decomposition-
109 1)
                    (and (subactivity plan-schedule-&-mode-of-operation -1 decomposition-109.1)
                         (and (subactivity set-cost-objectives-1 decomposition-109.1)
                              (and (subactivity prepare-investment-dicisioin-1 decomposition-109 1)
                                   (and (subactivity J1 decomposition-109.1)
                                        (and (subactivity J2 decomposition-109 1)
                                             (idef-process decompostition-109 1)))))))))))


(and (doc define-requirements-1
       "The occurrence of Define-Requirements in the Dec-109.1schematic")
     (and (forall ?a
          (=>(activation-of ?a define-requirements -1)
              (activation-of ?a define-requirements)))
```

```
        (forall ?a
          (=>(activation-of ?a define-requirements -1)
           (exists ?p
            (=> (activation-of  ?p decomposition 109 1)
             (subactivity-occurrence  ?a ?p)))))))


(and (doc clear-bldg-site-&-building-permit -1 "The occurrence of Clear-Bldg-Site-&-Building
Permit in
       the Dec-109 1 schematics")
     (and (forall ?a
          (=>(activation-of ?a clear-bldg-site-&-building-permit -1)
              (activation-of ?a clear-bldg-site-&-building-permit)))

        (forall ?a
          (=>(activation-of ?a clear-bldg-site-&-building-permit -1)
           (exists ?p
            (=> (activation-of  ?p decomposition 109 1)
             (subactivity-occurrence  ?a ?p)))))))


(and (doc draw-up-space-programme-&-other-requirements -1
      "The occurrence of Draw-up-Space-Programme-&-Other-Requirements in the Dec-109.1
schematic")
     (and (forall ?a
          (=>(activation-of ?a draw-up-space-programme-&-other-requirements-1)
              (activation-of ?a draw-up-space-programme-&-other-requirements)))

        (forall ?a
          (=>(activation-of ?a draw-up-space-programme-&-other-requirements-1)
           (exists ?p
            (=> (activation-of  ?p decomposition 109.1)
             (subactivity-occurrence  ?a ?p)))))))


(and (doc plan-schedule-&-mode-of-operation -1
       "The occurrence of Plan-Schedule-&-Mode-of-Operation in the Dec-101.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a plan-schedule-&-mode-of-operation-1)
              (activation-of ?a plan-schedule-&-mode-of-operation)))

        (forall ?a
          (=>(activation-of ?a plan-schedule-&-mode-of-operation-1)
           (exists ?p
            (=> (activation-of  ?p decomposition 109 1)
             (subactivity-occurrence  ?a ?p)))))))

(and (doc set-cost-objectives -1
       "The occurrence of Set-Cost-Objectives in the Dec-109 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a set-cost-objectives-1)
              (activation-of ?a set-cost-objectives)))

        (forall ?a
          (=>(activation-of ?a set-cost-objectives-1)
           (exists ?p
            (=> (activation-of  ?p decomposition 109.1)
             (subactivity-occurrence  ?a ?p)))))))
```

```
(and (doc prepare-investment-decision-1
     "The occurrence of Prepare-Investment-Decision in the Dec-109 1 schematic")
     (and forall ?a
          (=>(activation-of ?a prepare-investment-decision -1)
              (activation-of ?a prepare-investment-decision)))

        (forall ?a
          (=>(activation-of ?a prepare-investment-decision -1)
           (exists ?p
            (=> (activation-of ?p decomposition 109.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc j1 "J1")
     (and (forall ?j
          (=>(activation-of ?j j1)
           (exists ?p
             (=>(activation-of ?p decomposition 109 1)
               (subactivity-occurrence ?j ?p)))))
                (and (and_split j1 decomposition 109 1)
                       (and (subactivity define-requirements j1)

                                (and (subactivity clear-building-site-&-building-permit j1))))))


(and (doc j2 "J2")
     (and (forall ?j
          (=>(activation-of ?j j2)
           (exists ?p
             (=>(activation-of ?p decomposition 109.1)
               (subactivity-occurrence ?j ?p)))))
               (and (follows j2 set-cost-objectives decompostion-109.1)
                (and (and_split j2 decomposition 109.1)
                       (and (subactivity draw-up-space-programme-&-other-requirements j2)
                                (and (subactivity plan-schedule-&-mode-of-operation j2)))))))

(and (doc decomposition-110 1 "Decomposition of Prepare for Desing")
    (and (subactivity organise design work-1 decomposition-110 1)
        (and (subactivity select desingers-1 decomposition-110 1)
             (and (subactivity conclude design contract-1 decomposition-110 1)
                  (idef-process decompostition-110 1)))))


(and (doc organise-design-work -1
      "The occurrence of Organise-Design-Work in the Dec-110 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a organise-design-work -1)
              (activation-of ?a organise-design-work)))

        (forall ?a
          (=>(activation-of ?a organise-design-work -1)
           (exists ?p
            (=> (activation-of ?p decomposition 110 1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc select-designers -1
       "The occurrence of Select-Designers in the Dec-110 1")
     (and (forall ?a
          (=>(activation-of ?a select-designers -1)
              (activation-of ?a select-designers)))
        (and forall ?a
          (=>(activation-of ?a select-designers -1)
           (exists ?p
            (=> (activation-of ?p decomposition 110 1)
             (subactivity-occurrence ?a ?p)))))

        (forall ?a
          (=>(activation-of ?a select-designers -1)
           (activation-of ?a decomposition124 1))))))


(and (doc decomposition-124 1 "Decomposition of Select Designers")
    (and (subactivity decide-on-selection-method-1 decomposition-124.1)
         (and (subactivity invite-designers-directly-1 decomposition-124 1)
              (and (subactivity negotiate-with-candidate-designers-1 decomposition-124 1)
                   (and (subactivity invite-designers-to-tender-1 decomposition-124 1)
                        (and (subactivity invite designers for competition-1 decomposition-124.1)
                             (and (subactivity select designer-1 decomposition-124.1)
                                  (and (subactivity J1 decomposition-124 1)
                                       (and (subactivity J2 decomposition-124.1)
                                            (idef-process decompostition-124 1)))))))))


(and (doc make-decision-on-selection-method-1
           "The occurrence of Make-Decision-On-Selection-Method in the Dec-124 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-decision-on-selection-method-1)
              (activation-of ?a make-decision-on-selection-method)))

        (forall ?a
          (=>(activation-of ?a make-decision-on-selection-method-1)
           (exists ?p
            (=> (activation-of ?p decomposition 124.1)
             (subactivity-occurrence ?a ?p)))))


(and (doc invite-designers-directly –1
           "The occurrence of Invite-Designers-Directly in the Dec-124.1schematic")
     (and (forall ?a
          (=>(activation-of ?a invite-designers-directly -1)
              (activation-of ?a invite-designers-directly)))

        (forall ?a
          (=>(activation-of ?a invite-designers-directly -1)
           (exists ?p
            (=> (activation-of ?p decomposition 124 1)
             (subactivity-occurrence ?a ?p)))))
```

```
(and (doc negotiate-with-candidate-designers -1
            "The occurrence of -Negotiate-With-Candidate-Designers in the Dec-124 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a negotiate-with-candidate-designers-1)
              (activation-of ?a negotiate-with-candidate-designers)))
        (forall ?a
          (=>(activation-of ?a negotiate-with-candidate-designers-1)
           (exists ?p
            (=> (activation-of ?p decomposition 124.1)
             (subactivity-occurrence ?a ?p)))))


(and (doc invite-designers-to-tender-1 "The occurrence of Invite-Designers-to-Tender
      in the Dec-124 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a invite-designers-to-tender -1)
              (activation-of ?a invite-designers-to-tender)))

        (forall ?a
          (=>(activation-of ?a invite-designers-to-tender -1)
           (exists ?p
            (=> (activation-of ?p decomposition 124 1)
             (subactivity-occurrence ?a ?p)))))


(and (doc invite-designers-for-competition-1
       "The occurrence of Invite-Designers-for-Competition in the Dec-124 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a invite-designers-for-competition-1)
              (activation-of ?a invite-designers-for-competition)))

        (forall ?a
          (=>(activation-of ?a invite-designers-for-competition-1)
           (exists ?p
            (=> (activation-of ?p decomposition 124 1)
             (subactivity-occurrence ?a ?p)))))


(and (doc select-designer-1
       "The occurrence of select-designer in the Dec-124.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a select-designer -1)
              (activation-of ?a select-designer)))

        (forall ?a
          (=>(activation-of ?a select-designer -1)
           (exists ?p
            (=> (activation-of ?p decomposition 124 1)
             (subactivity-occurrence ?a ?p)))))


(and (doc j1 "J1")
     (and (forall ?j
          (=>(activation-of ?j j1)
           (exists ?p
             (=>(activation-of ?p decomposition 124 1)
               (subactivity-occurrence ?j ?p)))))
```

```
                (and (follows make-decision-on-selection-method j1 decompostion-124 1)
                 (and (and_split  j2  decomposition 124 1)
                      (and (subactivity invite-designers-directly j1)
                           (and (subactivity negotiate-with-candidate-designers j1)
                                (and (subactivity invite-designers-to-tender j1)
                                     (and (subactivity invite-candidate-designers-for-competition
j1)))))))


(and (doc j2 "J2")
     (and (forall ?j
          (=>(activation-of ?j j2)
           (exists ?p
             (=>(activation-of ?p decomposition 124.1)
               (subactivity-occurrence ?j ?p)))))
               (and (follows j2 select-designer-124 1)
                (and (and_split  j2  decomposition 124 1)
                     (and (subactivity invite-designers-directly j1)
                          (and (subactivity negotiate-with-candidate-designers j1)
                               (and (subactivity invite-designers-to-tender j1)
                                    (and (subactivity invite-candidate-designers-for-competition
j1)))))))


(and (doc decomposition-111 1 "Decomposition of Supervise Designer")
     (and (subactivity start-design-1 decomposition-111 1)
          (and (subactivity supervise-design-1 decomposition-111 1)
               (and (subactivity compare-design-solutions-1 decomposition-111 1)
                    (and (subactivity check-&-evaluate-design-1 decomposition-111.1)
                         (and (subactivity get-design-approved-1 decomposition-111 1)
                              (and (subactivity control-acquisition-of-premits-1 decomposition-
111 1)
                                   (and (subactivity J1 decomposition-111 1)
                                        (and (subactivity J2 decomposition-111 1)
                                             (idef-process decompostition-111.1)))))))


(and (doc start-design -1
       "The occurrence of start-design in the Dec-111.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a start-design -1)
              (activation-of ?a start-design)))

        (forall ?a
          (=>(activation-of ?a start-design-1)
           (exists ?p
            (=> (activation-of  ?p decomposition 111 1)
             (subactivity-occurrence ?a ?p)))))


(and (doc supervise-design –1
       "The occurrence of supervise-design in the Dec-111 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a supervise-design-1)
              (activation-of ?a supervise-design)))
```

```
        (forall ?a
          (=>(activation-of ?a supervise-design-1)
           (exists ?p
            (=> (activation-of ?p decomposition 111 1)
             (subactivity-occurrence ?a ?p)))))


(and (doc compare-design-solutions -1
       "The occurrence of compare-design-solutions in the Dec-111 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a compare design solutions -1)
               (activation-of ?a compare design solutions)))

          (forall ?a
            (=>(activation-of ?a compare design solutions -1)
             (exists ?p
              (=> (activation-of ?p decomposition 111 1)
               (subactivity-occurrence ?a ?p)))))


(and (doc check -&-evaluate-design -1
       "The occurrence of check-&-evaluate-design in the Dec-111.1 schematic")
     (and (forall ?a
            (=>(activation-of ?a check-&-evaluate-design -1)
               (activation-of ?a check-&-evaluate-design)))

          (forall ?a
            (=>(activation-of ?a check-&-evaluate-design -1)
             (exists ?p
              (=> (activation-of ?p decomposition 111 1)
               (subactivity-occurrence ?a ?p)))))


(and (doc get-design-approved -1
       "The occurrence of get-design-approved in the Dec-111.1 schematic")
     (and (forall ?a
            (=>(activation-of ?a get-design-approved -1)
               (activation-of ?a get-design-approved)))

          (forall ?a
            (=>(activation-of ?a get-design-approved -1)
             (exists ?p
              (=> (activation-of ?p decomposition 110 1)
               (subactivity-occurrence ?a ?p)))))


(and (doc control-acquisition-of-permits -1
       "The occurrence of control-acquisition-of-permits-in the Dec-111 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a control-acquisition-of-permits-1)
               (activation-of ?a control-acquisition-of-permits)))

          (forall ?a
            (=>(activation-of ?a control-acquisition-of-permits-1)
             (exists ?p
              (=> (activation-of ?p decomposition 110 1)
               (subactivity-occurrence ?a ?p)))))
```

```
(and (doc j1 "J1")
     (and (forall ?j
          (=>(activation-of ?j j1)
           (exists ?p
             (=>(activation-of ?p decomposition 111 1)
               (subactivity-occurrence ?j ?p)))))
           (and (follows start-design j1 decomposition 111 1)
              (and (and_split j1 decomposition 111.1)
                      (and (subactivity supervise-design j1)
                              (and (subactivity compare-design-solutions j1)))))))


(and (doc j2 "J2")
     (and (forall ?j
          (=>(activation-of ?j j2)
           (exists ?p
             (=>(activation-of ?p decomposition 111 1)
               (subactivity-occurrence ?j ?p)))))
           (and (follows j2 check-and-evaluate-design decomposition 111.1)
              (and (and_split j2 decomposition 111 1)
                      (and (subactivity supervise-design j2)
                              (and (subactivity compare-design-solutions j2)))))))


(and (doc decomposition-112 1 "Decomposition of Prepare for Construction")
    (and (subactivity select-mode-of-opeeation-1 decomposition-112 1)
          (and (subactivity prepare-invitation-to-tender-1 decomposition-112 1)
               (and (subactivity prepare-for-selection-of-contractors -1 decomposition-112 1)
                    (and (subactivity make-construction-decision-1 decomposition-112 1)
                         (and (subactivity conclude-contract-1 decomposition-112 1)
                              (and (subactivity manage-procurements-of-client-1 decomposition-
112 1)
                                                  (idef-process decompostition-112 1)))))))


(and (doc select-mode-of-operation -1
       "The occurrence of Select-Mode-of-Operation in the Dec-112 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a select-mode-of-operation -1)
              (activation-of ?a select-mode-of-operation)))

        (forall ?a
          (=>(activation-of ?a select-mode-of-operation -1)
           (exists ?p
            (=> (activation-of ?p decomposition 112.1)
             (subactivity-occurrence ?a ?p)))))


(and (doc prepare-invitation-to-tender -1
       "The occurrence of Prepare-Invitation-to-Tender in the Dec-112.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a prepare-invitation-to-tender-1)
              (activation-of ?a prepare-invitation-to-tender)))
```

```
        (forall ?a
          (=>(activation-of ?a prepare-invitation-to-tender-1)
           (exists ?p
            (=> (activation-of ?p decomposition 112 1)
             (subactivity-occurrence ?a ?p)))))


(and (doc prepare-for-selection-of-contractors-1
       "The occurrence of Prepare-for-Selection-of-Contractors in the Dec-112 1")
     (and (forall ?a
            (=>(activation-of ?a prepare-for-selection-of-contractors-1)
               (activation-of ?a prepare-for-selection-of-contractors)))

          (forall ?a
            (=>(activation-of ?a prepare-for-selection-of-contractors-1)
             (exists ?p
              (=> (activation-of ?p decomposition 112 1)
               (subactivity-occurrence ?a ?p)))))


(and (doc make-construction-decision -1
       "The occurrence of Make-Construction-Decision in the Dec-112 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a make-construction-decision-1)
               (activation-of ?a make-construction-decision)))

          (forall ?a
            (=>(activation-of ?a make-construction-decision-1)
             (exists ?p
              (=> (activation-of ?p decomposition 112 1)
               (subactivity-occurrence ?a ?p)))))


(and (doc conclude-contract-1
       "The occurrence of Conclude-Contract in the Dec-112 1")
     (and (forall ?a
            (=>(activation-of ?a conclude-contract-1)
               (activation-of ?a conclude-contract)))

          (forall ?a
            (=>(activation-of ?a conclude-contract-1)
             (exists ?p
              (=> (activation-of ?p decomposition 112.1)
               (subactivity-occurrence ?a ?p)))))


(and (doc manage-procurements-of-clients-1
       "The occurrence of Manage-Procurements-of-Clients in the Dec-112.1 schematic")
     (and (forall ?a
            (=>(activation-of ?a manage-procurements-of-clients-1)
               (activation-of ?a manage-procurements-of-clients)))

          (forall ?a
            (=>(activation-of ?a manage-procurements-of-clients-1)
             (exists ?p
              (=> (activation-of ?p decomposition 112 1)
               (subactivity-occurrence ?a ?p)))))
```

```
(and (doc decomposition-113.1 "Decomposition of Supervise Construction")
     (and (subactivity supervise-and-control-construction-1 decomposition-113 1)
          (and (subactivity supervise-sucontracting-1 decomposition-113 1)
               (and (subactivity manage-payment -1 decomposition-113 1)
                    (and (subactivity do-additional-work-and-modefications-1 decomposition-113 1)
                         (and (subactivity manage-acquisitions-of-builder-1 decomposition-113 1)
                              (and (subactivity manage-special-cases-1 decomposition-113 1)
                                   (and (subactivity j1 decomposition-113 1)
                                        (idef-process decompostition-113.1)))))))))


(and (doc supervise-and-control-construction -1
       "The occurrence of Supervise-and-Control-Construction in the Dec-113 1 schematic")
     (and (forall  ?a
          (=>(activation-of ?a supervise-and-control-construction -1)
              (activation-of ?a supervise-and-control-construction)))

        (forall  ?a
          (=>(activation-of ?a supervise-and-control-construction -1)
           (exists ?p
            (=> (activation-of  ?p decomposition 113 1)
             (subactivity-occurrence  ?a ?p)))))


(and (doc supervise-subcontracting -1
       "The occurrence of Supervise-Subcontracting in the Dec-113 1 schematic")
     (and (forall  ?a
          (=>(activation-of ?a supervise-subcontracting -1)
              (activation-of ?a supervise-subcontracting)))

        (forall  ?a
          (=>(activation-of ?a supervise-subcontracting -1)
           (exists ?p
            (=> (activation-of  ?p decomposition 113 1)
             (subactivity-occurrence  ?a ?p)))))


(and (doc manage-payment-1
       "The occurrence of Manage-Payment in the Dec-113 1 schematic")
     (and (forall  ?a
          (=>(activation-of ?a manage-payment-1)
              (activation-of ?a manage-payment)))

        (forall  ?a
          (=>(activation-of ?a manage-payment-1)
           (exists ?p
            (=> (activation-of  ?p decomposition 113.1)
             (subactivity-occurrence  ?a ?p)))))


(and (doc do-additional-work-&-modifications-1
       "The occurrence of Do-Additional-Work-&-Modification in the Dec-113 1 schematic")
     (and (forall  ?a
          (=>(activation-of ?a do-additional-work-&-modifications-1)
              (activation-of ?a do-additional-work-&-modifications)))
```

```
        (forall ?a
          (=>(activation-of ?a do-additional-work-&-modifications-1)
           (exists ?p
            (=> (activation-of ?p decomposition 113 1)
             (subactivity-occurrence ?a ?p)))))


(and (doc manage-acquisitions-of-builder-1
       "The occurrence of Manage-Acquisitions-of-Builder in the Dec-113.1 schematic")
     (and (forall ?a
            (=>(activation-of ?a manage-acquisitions-of-builder -1)
               (activation-of ?a manage-acquisitions-of-builder)))

          (forall ?a
            (=>(activation-of ?a manage-acquisitions-of-builder -1)
             (exists ?p
              (=> (activation-of ?p decomposition 113 1)
               (subactivity-occurrence ?a ?p)))))


(and (doc manage-special cases-1
       "The occurrence of Manage-Special-Cases in the Dec-113 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a manage-special cases -1)
               (activation-of ?a manage-special cases)))

          (forall ?a
            (=>(activation-of ?a manage-special cases -1)
             (exists ?p
              (=> (activation-of ?p decomposition 113.1)
               (subactivity-occurrence ?a ?p)))))


(and (doc j1 "J1")
     (and (forall ?j
            (=>(activation-of ?j j1)
             (exists ?p
               (=>(activation-of ?p decomposition 112 1)
                 (subactivity-occurrence ?j ?p)))))
              (and (follows supervise-&-control-construction J1 decomposition112.1)
                 (and (and_split j1 decomposition 112.1)
                        (and (subactivity supervise-subcontracting j1)
                             (and (subactivity manage-payment j1)
                                  (and (subactivity do-additional-work-&-modification j1)
                                       (and (subactivity manage-acquisition-of-builders j1)
                                            (and (subactivity manage-special-cases j1)))))))))))
```

```
(and (doc produce-and-manage-arch-design-data-1
       " The occurrence of Produce and Manage Arch Design Data in the Dec-0.1 schematics")
      (and (forall ?a
            (=> (activation-of  ?a produce-and-manage-arch-design-data-1)
            (activation-of  ?a produce-and-manage-arch-design-data)))
       (and (forall ?a
            (=>(activation-of  ?a produce-and-manage-arch-design-data-1)
            (exists ?p
            (=> activation-of  ?p decomposition-0 1)
            (subactivity-occurecne ?a ?p)))))

           (forall ?a
             (=>(activation-of  ?a produce and manage bldg process-1)
             (activation-of  ?a decomposition 102 1))))))


(and (doc decomposition-102 1 "Decomposition of Produce and Manage Arch Design Data")
    (and (subactivity  draw-up-brief-1  decomposition-102 1)
          (and (subactivity  draw-up-programme-1  decomposition-102.1)
               (and (subactivity  make-overall-design-1  decomposition-102 1)
                    (and (subactivity  make-detail-design-1  decomposition-102 1)
                         (and (subactivity  make-design-during-construction-1  decomposition-
102 1)
                              (and (subactivity  do-tasks-during-use-&-maintenance-1
decomposition-
                                   102.1)
                                   (idef-process decompostition-102 1)))))))


(and (doc draw-up-brief -1
       "The occurrence of Draw up Brief in the Dec-102 1 schematic")
     (and (forall  ?a
          (=>(activation-of  ?a  draw-up-brief -1)
              (activation-of  ?a  draw-up-brief)))
       (and (forall  ?a
          (=>(activation-of  ?a  draw-up-brief -1)
           (exists ?p
            (=> (activation-of   ?p  decomposition 102.1)
             (subactivity-occurrence  ?a ?p)))))

         (forall  ?a
             (=>(activation-of  ?a  draw-up-brief-1)
             (activation-of ?a decomposition113 1))))))


(and (doc draw-up-programme -1
       "The occurrence of Draw Up Programme in the Dec-102 1 schematic")
     (and (forall  ?a
          (=>(activation-of  ?a draw-up-programme -1)
              (activation-of  ?a draw-up-programme)))
       (and (forall  ?a
          (=>(activation-of  ?a draw-up-programme -1)
           (exists ?p
            (=> (activation-of   ?p  decomposition 102 1)
             (subactivity-occurrence  ?a ?p)))))
```

```
        (forall ?a
            (=>(activation-of ?a draw-up-programme -1)
            (activation-of ?a decomposition114 1))))))


(and (doc make-overall-design -1
       "The occurrence of make-overall-design in the Dec-102 1schematic")
     (and (forall ?a
          (=>(activation-of ?a make-overall-design -1)
              (activation-of ?a make-overall-design)))
        (and (forall ?a
          (=>(activation-of ?a make-overall-design -1)
           (exists ?p
            (=> (activation-of ?p decomposition 102 1)
             (subactivity-occurrence ?a ?p)))))

        (forall ?a
            (=>(activation-of ?a make-overall-design -1)
            (activation-of ?a decomposition115 1))))))


(and (doc make-detail-design -1
       "The occurrence of Make-Detail-Design in the Dec-102 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design -1)
              (activation-of ?a make-detail-design)))
        (and (forall ?a
          (=>(activation-of ?a make-detail-design -1)
           (exists ?p
            (=> (activation-of ?p decomposition 102 1)
             (subactivity-occurrence ?a ?p)))))

        (forall ?a
            (=>(activation-of ?a make-detail-design -1)
            (activation-of ?a decomposition116 1))))))


(and (doc make-design-during-construction -1
       "The occurrence of Make Design during Construction in the Dec-102.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-design-during-construction -1)
              (activation-of ?a make-design-during-construction)))
        (and (forall ?a
          (=>(activation-of ?a make-design-during-construction -1)
           (exists ?p
            (=> (activation-of ?p decomposition 102 1)
             (subactivity-occurrence ?a ?p)))))

        (forall ?a
            (=>(activation-of ?a make-design-during-construction -1)
            (activation-of ?a decomposition117 1))))))
```

```
(and (doc do-tasks-during-use-&-maintenance -1
       "The occurrence of Do Tasks During Use & Maintenance in the Dec-102 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a do-tasks-during-use-&-maintenance-1)
                (activation-of ?a do-tasks-during-use-&-maintenance)))
          (and (forall ?a
                 (=>(activation-of ?a do-tasks-during-use-&-maintenance -1)
                  (exists ?p
                   (=> (activation-of ?p decomposition 102 1)
                    (subactivity-occurrence ?a ?p)))))

               (forall ?a
                    (=>(activation-of ?a do-tasks-during-use-&-maintenance -1)
                    (activation-of ?a decomposition118 1))))))


(and (doc decomposition-113.1 "Decomposition of Draw up Brief")
     (and (subactivity analyse-present-situation-1 decomposition-113 1)
          (and (subactivity define-requirements-1 decomposition-113 1)
               (and (subactivity determine-space-acquisition-alternaives-1 decomposition-113 1)
                    (and (subactivity prepare-programme-decision-1 decomposition-113 1)
                     (idef-process decompostition-113 1))))))


  (and (doc analyse-present-situation -1
         "The occurrence of Analyse Present Situation in the Dec-113.1 schematic")
       (and (forall ?a
              (=>(activation-of ?a analyse-present-situation -1)
                  (activation-of ?a analyse-present-situation)))

            (forall ?a
              (=>(activation-of ?a analyse-present-situation -1)
               (exists ?p
                (=> (activation-of ?p decomposition 113 1)
                 (subactivity-occurrence ?a ?p)))))))


  (and (doc define-requirements -1
         "The occurrence of Define Requirements in the Dec-113 1 schematic")
       (and (forall ?a
              (=>(activation-of ?a define-requirements -1)
                  (activation-of ?a define-requirements)))

            (forall ?a
              (=>(activation-of ?a define-requirements -1)
               (exists ?p
                (=> (activation-of ?p decomposition 113 1)
                 (subactivity-occurrence ?a ?p)))))))


  (and (doc determine-space-acquisition-alternatives-1
         "The occurrence of Determine Space Acquisition Alternatives in the Dec-113 1 schematic")
       (and (forall ?a
              (=>(activation-of ?a determine-space-acquisition-alternatives -1)
                  (activation-of ?a determine-space-acquisition-alternatives)))
```

```
        (forall ?a
          (=>(activation-of ?a determine-space-acquisition-alternatives -1)
           (exists ?p
            (=> (activation-of ?p decomposition 113 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc prepare-programme-decision -1
       "The occurrence of Prepare Programme Decision in the Dec-113 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a prepare-programme-decision-1)
               (activation-of ?a prepare-programme-decision)))

          (forall ?a
            (=>(activation-of ?a prepare-programme-decision -1)
             (exists ?p
              (=> (activation-of ?p decomposition 113 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc decomposition-114 1 "Decomposition of Draw up Programme")
     (and (subactivity define-requirements-1 decomposition-114 1)
          (and (subactivity clear-site-&-bldg-permits-1 decomposition-114 1)
               (and (subactivity draw-up-space-programme-&-requirements-1 decomposition-114 1)
                    (and (subactivity plan-schedule-&-mode-of-operation-1 decomposition-114.1)
                         (and (subactivity set-cost-objectives-1 decomposition-114.1)
                              (and (subactivity prepare-investment-decision-1 decomposition-
114 1)
                                   (and (subactivity j1 decomposition-114 1)
                                        (and (subactivity j2 decomposition-114.1)
                                             (idef-process decompostition-114 1)))))))))))


(and (doc define-requirements-1
       "The occurrence of Define Requirements in the Decomposition-114 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a define-requirements -1)
               (activation-of ?a define-requirements)))

          (forall ?a
            (=>(activation-of ?a define-requirements -1)
             (exists ?p
              (=> (activation-of ?p decomposition 114 1)
               (subactivity-occurrence ?a ?p)))))))



(and (doc clear-site-&-bldg-permits -1
       "The occurrence of Clear site & Bldg Permits in the Decomposition-114 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a clear-site-&-bldg-permits-1)
               (activation-of ?a clear-site-&-bldg-permits)))

          (forall ?a
            (=>(activation-of ?a clear-site-&-bldg-permits -1)
             (exists ?p
              (=> (activation-of ?p decomposition 114 1)
               (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc draw-up-space-programme-&-requirements-1
    "The occurrence of Draw Up Space Programme & Requirements in the Decomposition-114.1
schematic")
     (and (forall ?a
          (=>(activation-of ?a draw-up-space-programme-&-requirements-1)
              (activation-of ?a draw-up-space-programme-&-requirements)))

        (forall ?a
          (=>(activation-of ?a draw-up-space-programme-&-requirements-1)
           (exists ?p
            (=> (activation-of ?p decomposition 114 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc plan-schedule-&-mode-of-operation-1
      "The occurrence of Plan Schedule & Mode of Operation in the Decomposition-114 1")
     (and (forall ?a
          (=>(activation-of ?a plan-schedule-&-mode-of-operation-1)
              (activation-of ?a plan-schedule-&-mode-of-operation)))

        (forall ?a
          (=>(activation-of ?a plan-schedule-&-mode-of-operation-1)
           (exists ?p
            (=> (activation-of ?p decomposition 114 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc set-cost-objectives -1
      "The occurrence of Set Cost Objectives in the Decomposition-114 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a set-cost-objectives -1)
              (activation-of ?a set-cost-objectives)))

        (forall ?a
          (=>(activation-of ?a set-cost-objectives -1)
           (exists ?p
            (=> (activation-of ?p decomposition 114 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc prepare-investment-decision -1
      "The occurrence of Prepare Investment Decision in the Decomposition-114 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a prepare-investment-decision -1)
              (activation-of ?a prepare-investment-decision)))

        (forall ?a
          (=>(activation-of ?a prepare-investment-decision-1)
           (exists ?p
            (=> (activation-of ?p decomposition 114 1)
             (subactivity-occurrence ?a ?p)))))))

(and (doc j1 "J1")
     (and (forall ?j
          (=>(activation-of ?j j1)
           (exists ?p
             (=>(activation-of ?p decomposition 114.1)
               (subactivity-occurrence ?j ?p)))))
```

```
            (and (and_split j1 decomposition 114 1)
                    (and (subactivity define-requirements j1)
                            (and (subactivity clear-site-&-bldg-permits j1))))))


(and (doc j2 "J2")
     (and (forall ?j
          (=>(activation-of ?j j2)
            (exists ?p
              (=>(activation-of ?p decomposition 114.1)
                (subactivity-occurrence ?j ?p)))))
            (and (follows j2 sect-cost-objectives decomposition 114 1)
               (and (and_split j2 decomposition 114.1)
                       (and (subactivity draw-up-space-programme-&-requirements j2)
                               (and (subactivity plan-schedule-&-mode-of-operation j2)))))))


(and (doc decomposition-115 1 "Decomposition of Make Overall Design")
     (and (subactivity start-building-design-1 decomposition-115 1)
          (and (subactivity design-basic-mass-alternatives-1 decomposition-115 1)
               (and (subactivity propose-solution-1 decomposition-115 1)
                    (and (subactivity design-scheme-1 decomposition-115 1)
                         (and (subactivity j1 decomposition-115 1)
                                 (idef-process decompostition-115 1)))))))


(and (doc start-building-design-1
       "The occurrence of Start-Building-Design in the Dec-115 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a start-building-design -1)
              (activation-of ?a start-building-design)))
       (and (forall ?a
          (=>(activation-of ?a start-building-design -1)
           (exists ?p
            (=> (activation-of ?p decomposition 115.1)
             (subactivity-occurrence ?a ?p)))))

        (forall ?a
            (=>(activation-of ?a start building design -1)
            (activation-of ?a decomposition129 1))))))



(and (doc design-basic-mass-alternatives -1
       "The occurrence of Design Basic Mass Alternatives in the Dec-115.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a design-basic-mass-alternatives -1)
              (activation-of ?a design-basic-mass-alternatives)))
      (and (forall ?a
          (=>(activation-of ?a design-basic-mass-alternatives -1)
           (exists ?p
            (=> (activation-of ?p decomposition 115.1)
             (subactivity-occurrence ?a ?p)))))

        (forall ?a
            (=>(activation-of ?a design-basic-mass-alternatives -1)
            (activation-of ?a decomposition130.1))))))
```

```
(and (doc propose-solution–1
       "The occurrence of Propose Solution in the Dec-115 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a propose-solution -1)
              (activation-of ?a propose-solution)))
       (and (forall ?a
          (=>(activation-of ?a propose-solution -1)
           (exists ?p
            (=> (activation-of ?p decomposition 115 1)
             (subactivity-occurrence ?a ?p)))))

        (forall ?a
             (=>(activation-of ?a propose solution -1)
             (activation-of ?a decomposition131.1))))))


(and (doc design-scheme-1
       "The occurrence of Design Scheme in the Dec-115.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a design-scheme -1)
              (activation-of ?a design-scheme)))
      (and (forall ?a
          (=>(activation-of ?a design-scheme -1)
         (exists ?p
           (=> (activation-of ?p decomposition 115 1)
            (subactivity-occurrence ?a ?p)))))

        (forall ?a
             (=>(activation-of ?a design scheme -1)
             (activation-of ?a decomposition132 1))))))


(and (doc decomposition-129 1 "Decomposition of Start Building Design")
    (and (subactivity check-design-responsiblities-1 decomposition-129.1)
        (and (subactivity check-input-1 decomposition-129.1)
             (and (subactivity plan-design-schedule-1 decomposition-129 1)
                  (and (subactivity specify-special-requirements-&-needs-1 decomposition-129 1)
                       (and (subactivity check-design-objectives-1 decomposition-129 1)
                            (and (subactivity start-design-work-1 decomposition-129 1)
                                 (and (subactivity j1 decomposition-129.1)
                                      (and (subactivity j2 decomposition-129 1)
                                           (idef-process decompostition-129.1)))))))))))

(and (doc check-design-responsibilities-1
       "The occurrence of Check Design Responsibilities in the Dec-129 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a check-design-responsibilities -1)
              (activation-of ?a check-design-responsibilities)))

       (forall ?a
          (=>(activation-of ?a check-design-responsibilities -1)
           (exists ?p
            (=> (activation-of ?p decomposition 129 1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc check-input -1
       "The occurrence of Check Input in the Dec-129 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a check-input -1)
               (activation-of ?a check-input)))

          (forall ?a
            (=>(activation-of ?a check-input -1)
             (exists ?p
              (=> (activation-of ?p decomposition 129 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc plan-design-schedule -1
       "The occurrence of Plan-Design-Schedule in the Dec-129 1 schematic")
    (and (forall ?a
           (=>(activation-of ?a plan-design-schedule -1)
              (activation-of ?a plan-design-schedule)))
         (and (forall ?a
            (=>(activation-of ?a plan-design-schedule -1)
             (exists ?p
              (=> (activation-of ?p decomposition 129 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc specify-special-requirements-&-needs-1
       "The occurrence of Specify Special Requirements & Needs in the Dec-129 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a specify-special-requirements-&-needs-1)
               (activation-of ?a specify-special-requirements-&-needs)))

          (forall ?a
            (=>(activation-of ?a specify-special-requirements-&-needs-1)
             (exists ?p
              (=> (activation-of ?p decomposition 129 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc check-design-objectives-1
       "The occurrence of Check Design Objectives in the Dec-129 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a check-design-objectives -1)
               (activation-of ?a check-design-objectives)))

          (forall ?a
            (=>(activation-of ?a check-design-objectives -1)
             (exists ?p
              (=> (activation-of ?p decomposition 129 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc start-design-work –1
       "The occurrence of Start Design Work in the Dec-129.1 schematic")
     (and (forall ?a
            (=>(activation-of ?a start-design-work -1)
               (activation-of ?a start-design-work)))
```

```
        ( forall ?a
          (=>(activation-of ?a start-design-work -1)
           (exists ?p
            (=> (activation-of ?p decomposition 129 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc j1 "J1")
     (and (forall ?j
          (=>(activation-of ?j j1)
           (exists ?p
             (=>(activation-of ?p decomposition 129 1)
               (subactivity-occurrence ?j ?p)))))
           (and (and_split j1 decomposition 129 1)
                     (and (subactivity check-design-responsibilities j1)
                          (and (subactivity check-input j1))))))


(and (doc j2 "J2")
     (and (forall ?j
          (=>(activation-of ?j j2)
           (exists ?p
             (=>(activation-of ?p decomposition 129 1)
               (subactivity-occurrence ?j ?p)))))
           (and (follows j2 specify-special-requirements-&-needs 129 1)
               (and (and_split j2 decomposition 129 1)
                     (and (subactivity plan-design schedule j2)
                          (and (subactivity check-input j2)))))))


(and (doc decomposition-130 1 "Decomposition of Design Basic Mass Alternatives")
     (and (subactivity design-site-usage-alternatives-1 decomposition-130 1)
          (and (subactivity design-basic-mass-alternatives-1 decomposition-130 1)
               (and (subactivity estimate-scope-efficiency-cost -1 decomposition-130 1)
                    (and (subactivity analyse-environmental-effects -1 decomposition-130.1)
                         (and (subactivity present-solutions-to-client-1 decomposition-130 1)
                              (idef-process decompostition-130 1)))))))


(and (doc design-site-usage-alternatives-1
       "The occurrence of Design Site Usage Alternatives in the Dec-130 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a design-site-usage-alternatives-1)
             (activation-of ?a design-site-usage-alternatives)))

        (forall ?a
          (=>(activation-of ?a design-site-usage-alternatives-1)
           (exists ?p
            (=> (activation-of ?p decomposition 130.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc design-basic-mass-alternatives-1
       "The occurrence of Design Basic Mass Alternatives in the Dec-130 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a design-basic-mass-alternatives -1)
             (activation-of ?a design-basic-mass-alternatives)))
```

```
        (forall ?a
          (=>(activation-of ?a design-basic-mass-alternatives-1)
           (exists ?p
            (=> (activation-of  ?p  decomposition 130 1)
             (subactivity-occurrence  ?a ?p)))))))


(and (doc estimate-scope-efficiency-cost -1
       "The occurrence of Estimate Scope, Efficiency & Cost in the Dec-130 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a estimate-scope-efficiency-cost-1)
              (activation-of ?a estimate-scope-efficiency-cost)))

        (forall ?a
          (=>(activation-of ?a estimate-scope-efficiency-cost-1)
           (exists ?p
            (=> (activation-of  ?p  decomposition 130 1)
             (subactivity-occurrence  ?a ?p)))))))


(and (doc analyse-environmental-effects-1
       "The occurrence of Analyse Environmental Effects in the Dec-130 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a analyse-environmental-effects -1)
              (activation-of ?a analyse-environmental-effects)))

        (forall ?a
          (=>(activation-of ?a analyse-environmental-effects-1)
           (exists ?p
            (=> (activation-of  ?p  decomposition 130 1)
             (subactivity-occurrence  ?a ?p)))))))


(and (doc present-solutions-to-client-1
       "The occurrence of Present Solutions to Client in the Dec-130 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a present-solutions-to-client-1)
              (activation-of ?a present-solutions-to-client)))

        (forall ?a
          (=>(activation-of ?a present-solutions-to-client-1)
           (exists ?p
            (=> (activation-of  ?p  decomposition 130 1)
             (subactivity-occurrence  ?a ?p)))))))

(and (doc decomposition-131 1 "Decomposition of Start Building Design")
     (and (subactivity check-input-documents-1 decomposition-131.1)
          (and (subactivity make-preliminary-layout-drawings-1 decomposition-131.1)
               (and (subactivity define-architectural-&-technical-solutions-1 decomposition-131.1)
                    (and (subactivity assemble-information-of-proposed-solution-1 decomposition-
131.1)
                         (and (subactivity prepare-application-of-permits-1 decomposition-131.1)
                              (and (subactivity present-solution-for-approval-&-co-ordinate-design
work-1
                                   decomposition-131.1)
                                   (and (subactivity j1 decomposition-131 1)
                                        (and (subactivity j2 decomposition-131 1)
                                             (idef-process decompostition-131.1)))))))))))
```

```
(and (doc check-input-documents-1
       "The occurrence of Check Input Documents in the Dec-131 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a check-input-documents-1)
              (activation-of ?a check-input-documents)))

        (forall ?a
          (=>(activation-of ?a check-input-documents-1)
           (exists ?p
            (=> (activation-of ?p decomposition 131 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc make-preliminary-layout-drawings-1
       "The occurrence of Make Preliminary Layout Drawings in the Dec-131 1 schenatic")
     (and (forall ?a
          (=>(activation-of ?a make-preliminary-layout-drawings-1)
              (activation-of ?a make-preliminary-layout-drawings)))

        (forall ?a
          (=>(activation-of ?a make-preliminary-layout-drawings-1)
           (exists ?p
            (=> (activation-of ?p decomposition 131 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc define-architectural-&-technical-solutions-1
       "The occurrence of Define Architectural & Technical Solutions in the Dec-131 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a define-architectural-&-technical-solutions-1)
              (activation-of ?a define-architectural-&-technical-solutions)))

        (forall ?a
          (=>(activation-of ?a define-architectural-&-technical-solutions-1)
           (exists ?p
            (=> (activation-of ?p decomposition 131 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc assemble-information-of-proposed solution-1
       "The occurrence of Assemble Information of Proposed Solution in the Dec-131 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a assemble-information-of-proposed solution-1)
              (activation-of ?a assemble-information-of-proposed solution)))

        (forall ?a
          (=>(activation-of ?a assemble-information-of-proposed solution-1)
           (exists ?p
            (=> (activation-of ?p decomposition 131.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc prepare-application-of-permits-1
       "The occurrence of Prepare Application of Permits in the Dec-131.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a prepare-application-of-permits-1)
              (activation-of ?a prepare-application-of-permits)))
```

```
 (forall ?a
         (=>(activation-of  ?a prepare-application-of-permits-1)
          (exists ?p
           (=> (activation-of  ?p  decomposition 131 1)
            (subactivity-occurrence  ?a ?p)))))))


(and (doc present-solution-for-approval-&-coordinate-design-work -1
     "The occurrence of Present Solution for Approval & Co-ordinate Design work in the Dec-131 1
       schematic")
      (and (forall  ?a
           (=>(activation-of  ?a present-solution-for-approval-&-coordinate-design-work-1)
               (activation-of  ?a present-solution-for-approval-&-coordinate-design-work)))

         (forall  ?a
           (=>(activation-of  ?a present-solution-for-approval-&-coordinate-design-work-1)
            (exists ?p
             (=> (activation-of  ?p  decomposition 131.1)
              (subactivity-occurrence  ?a ?p)))))))


(and (doc j1 "J1")
     (and (forall  ?j
          (=>(activation-of  ?j  j1)
            (exists ?p
              (=>(activation-of ?p decomposition 131 1)
                (subactivity-occurrence  ?j ?p)))))
                 (and (and_split  j1 decomposition 131.1)
                        (and (subactivity  make-preliminary-layout-drawings  j2)
                               (and (subactivity  define-architectural-&-technical-solution  j2)))))))


(and (doc j2 "J2")
     (and (forall  ?j
          (=>(activation-of  ?j  j2)
            (exists ?p
              (=>(activation-of ?p decomposition 131 1)
                (subactivity-occurrence  ?j ?p)))))
               (and (follows j2 assemble-information-of-proposed-solution   decomposition 131.1)
                  (and (and_split j2 decomposition 131 1)
                         (and (subactivity  make-preliminary-layout-drawings  j2)
                                (and (subactivity  define-architectural-&-technical-solution  j2)))))))


(and (doc decomposition-132 1 "Decomposition of Design Schemes")
    (and (subactivity estimate-feed-back-make-layout-dwgs-&-Environmental-plan -1
decomposition-132 1)
         (and (subactivity make-scheme-design-1 decomposition-132.1)
              (and (subactivity check-technical-systems-&-design-compatibility-1 decomposition-
132.1)
                   (and (subactivity prepare-general-description-1 decomposition-132 1)
                        (and (subactivity do tasks-concerning-building-permits-1 decomposition-
132 1)
                             (and (subactivity make-decision-concerning-further-design-1
decomposition-
                                  132.1)
                                 (and (subactivity  j1  decomposition-132 1)
                                      (idef-process decompostition-132.1)))))))))
```

```
(and (doc estimate-feedback-make-layout-dwgs-&-Environmental-plan-1
      "The occurrence of Estimate-Feed-Back-Make-Layout-Dwgs-&-Environmental-Plan in the
Dec-132 1
            schematic")
     (and (forall ?a
          (=>(activation-of ?a estimate-feedback-make-layout-dwgs-&-Environmental-plan-1)
             (activation-of ?a estimate-feedback-make-layout-dwgs-&-Environmental-plan)))

        (forall ?a
          (=>(activation-of ?a estimate-feed-back-make-layout-dwgs-&-Environmental-plan-1)
           (exists ?p
            (=> (activation-of ?p decomposition 132.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc make-scheme-design-1
       "The occurrence of Make Scheme Design in the Dec-132 1 schematic")
      (and (forall ?a
          (=>(activation-of ?a make-scheme-design -1)
             (activation-of ?a make-scheme-design)))
      (and (forall ?a
          (=>(activation-of ?a make-scheme-design -1)
           (exists ?p
            (=> (activation-of ?p decomposition 132 1)
             (subactivity-occurrence ?a ?p)))))

       (forall ?a
             (=>(activation-of ?a make-scheme-design -1)
             (activation-of ?a decomposition151 1)))
       (forall ?a
             (=>(activation-of ?a make-scheme-design -1)
             (exists ?01
             (exists ?02
             (exists ?03
             (exist ?04
             (=> (and ( instance-of ?01 general-layout-DWG)
                      ( instance-of ?02 environmental-plan)
                      ( instance-of ?03 proposed-solution-feed-back brief)
                      ( instance-of ?04 general-design))
           (and ( input-data ?01 ?a)
                ( input-data ?02 ?a)
                ( controls ?03 ?a)
                ( out-put data ?04 ?a)))))))))


(and (doc check-technical-systems-&-design-compatibility-1
       "The occurrence of Check Technical Systems & Design Compatibility in the Dec-
132.1schematic")
     (and (forall ?a
          (=>(activation-of ?a check-technical-systems-&-design-compatibility-1)
             (activation-of ?a check-technical-systems-&-design-compatibility)))

        (forall ?a
          (=>(activation-of ?a check-technical-systems-&-design-compatibility-1)
           (exists ?p
            (=> (activation-of ?p decomposition 132 1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc prepare-general-description-1
       "The occurrence of Prepare General Description in the Dec-132.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a prepare-general-description-1)
              (activation-of ?a prepare-general-description)))

        (forall ?a
          (=>(activation-of ?a prepare-general-description-1)
           (exists ?p
            (=> (activation-of ?p decomposition 132 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc do-tasks-concerning-building-permits-1
       "The occurrence of Do Tasks Concerning Building Permits in the Dec-132 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a do-tasks-concerning-building-permits -1)
              (activation-of ?a do-tasks-concerning-building-permits)))

        (forall ?a
          (=>(activation-of ?a do-tasks-concerning-building-permits-1)
           (exists ?p
            (=> (activation-of ?p decomposition 132 1)
             (subactivity-occurrence ?a ?p)))))))

(and (doc make-decision-concerning-further-design-1
       "The occurrence of Make Decision Concerning Further Design-in the Dec-132 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-decision-concerning-further-design-1)
              (activation-of ?a make-decision-concerning-further-design)))

        (forall ?a
          (=>(activation-of ?a make-decision-concerning-further-design-1)
           (exists ?p
            (=> (activation-of ?p decomposition 132 1)
             (subactivity-occurrence ?a ?p)))))))

(and (doc j1 "J1")
     (and (forall ?j
          (=>(activation-of ?j j1)
           (exists ?p
             (=>(activation-of ?p decomposition 132 1)
               (subactivity-occurrence ?j ?p)))))
              (and (follows prepare-general-description j1 decomposition 132.1)
                   (and (and_split j1 decomposition 132 1)
                        (and (subactivity make-decision-concerning-further-design j2)
                             (and (subactivity do-tasks-concerning-building-permit j2)))))))

(and (doc decomposition-151.1 "Decomposition of Make Scheme Design")
    (and (subactivity make-general-space-design-1 decomposition-151.1)
        (and (subactivity make-general-façade-design -1 decomposition-151 1)
             (and (subactivity make-general-design-of-repetitive-units-1 decomposition-151 1)
                  (and (subactivity make-general-design-of-fittings-151 1)
                       (and (subactivity make-general-design-essential-sections-1 decomposition-
151 1)
                            (and (subactivity make-general-layout -drawing-1 decomposition-
151 1)
                                 (idef-process decompostition-151.1)))))))))
```

```
(and (doc make-general-space-design-1
       "The occurrence of Make general Space  Design in the Dec-151 1 schematic")
     (and (forall ?a
          (=>(activation-of  ?a make-general-space-design-1)
              (activation-of  ?a make-general-space-design)))
        (and (forall  ?a
          (=>(activation-of  ?a make-general-space-design-1)
           (exists ?p
            (=> (activation-of   ?p  decomposition 151.1)
             (subactivity-occurrence  ?a ?p)))))

         (forall  ?a
              (=>(activation-of  ?a make-general-space-design-1)
              (activation-of  ?a  decomposition156.1))))))

         (forall  ?a
              (=>(activation-of  ?a make-general-space-design-1)
              (exists ?01
              (exists ?02
              (exists ?03
              (=> (and ( instance-of  ?01 space-programme-building-requirement)
                       ( instance-of  ?02 building-requirement)
                       ( instance-of  ?03 general-space-design))
            (and ( input-data  ?01 ?a)
                 ( controls  ?02  ?a)
                 ( out-put data  ?03  ?a)))))))))


(and (doc make-general-façade-design-1
       "The occurrence of Make General Façade Design & Elevations in the Dec-151 1 schematic")
     (and (forall  ?a
          (=>(activation-of  ?a make-general-façade-design-1)
              (activation-of  ?a make-general-façade-design)))
        (and (forall  ?a
          (=>(activation-of  ?a make-general-façade-design -1)
           (exists ?p
            (=> (activation-of   ?p  decomposition 151.1)
             (subactivity-occurrence  ?a ?p)))))

         (forall  ?a
              (=>(activation-of  ?a make-general-façade-design-1)
              (activation-of  ?a  decomposition157.1))))))

         (forall  ?a
              (=>(activation-of  ?a make-general-façade-design-1)
              (exists ?01
              (exists ?02
              (exists ?03
              (=> (and ( instance-of  ?01 space-layout-drawings)
                       ( instance-of  ?02 feedback-briefing-of-proposed-solution)
                       ( instance-of  ?03 general-façade-design))
            (and ( input-data  ?01 ?a)
                 ( controls  ?02  ?a)
                 ( out-put data  ?03  ?a)))))))))
```

```
(and (doc make-general-design-of-repetitive-units-1
       "The occurrence of Make general Design of Repetitive Units in the Dec-151 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a make-general-design-of-repetitive-units-1)
               (activation-of ?a make-general-design-of-repetitive-units)))

          (forall ?a
            (=>(activation-of ?a make-general-design-of-repetitive-units-1)
             (exists ?p
              (=> (activation-of ?p decomposition 151 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc make-general-design-of-fittings -1
       "The occurrence of Make General Design of Fittings in the Dec-151.1schematic")
     (and (forall ?a
            (=>(activation-of ?a make-general-design-of-fittings-1)
               (activation-of ?a make-general-design-of-fittings)))

          (forall ?a
            (=>(activation-of ?a make-general-design-of-fittings-1)
             (exists ?p
              (=> (activation-of ?p decomposition 151 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc make-general-design-essential-sections-1
       "The occurrence of Make General Design Essential Sections in the Dec-151 1")
     (and (forall ?a
            (=>(activation-of ?a make-general-design-essential-sections-1)
               (activation-of ?a make-general-design-essential-sections)))

          (forall ?a
            (=>(activation-of ?a make-general-design-essential-sections -1)
             (exists ?p
              (=> (activation-of ?p decomposition 151.1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc make-general-layout-drawing-1
       "The occurrence of Make General Layout Drawing Sections in the Dec-151 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a make-general-layout-drawing -1)
               (activation-of ?a make-general-layout-drawing)))

          (forall ?a
            (=>(activation-of ?a make-general-layout-drawing -1)
             (exists ?p
              (=> (activation-of ?p decomposition 151 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc decomposition-156 1 "Decomposition of Make Scheme Design")
     (and (subactivity make-preliminary-main-space-layout-1 decomposition-156.1)
          (and (subactivity design-core-spaces-1 decomposition-156 1)
               (and (subactivity determine-circulation-spaces-1 decomposition-156.1)
                    (and (subactivity design-spaces-for-fire-compartment-156 1)
                         (idef-process decompostition-156 1)))))))
```

```
(and (doc define-make-preliminary-space-layout-for-main-us -1
       "The occurrence of Define Make Preliminary Layout of Main Space in the Dec-156 1
schematic")
     (and (forall ?a
          (=>(activation-of ?a define-make-preliminary-space-layout-for-main-us-1)
              (activation-of ?a define-make-preliminary-space-layout-for-main-us)))
        (and (forall ?a
          (=>(activation-of ?a define-make-preliminary-space-layout-for-main-us-1)
           (exists ?p
            (=> (activation-of ?p decomposition 156 1)
             (subactivity-occurrence ?a ?p)))))

         (forall ?a
              (=>(activation-of ?a define-make-preliminary-space-layout-for-main-us -1)
              (activation-of ?a decomposition162.1)))

         (forall ?a
              (=>(activation-of ?a define-make-preliminary-space-layout-for-main-us-1)
              (exists ?01
              (exists ?02
              (exists ?03
              (=> (and ( instance-of ?01 space-programme)
                       ( instance-of ?02 building-requirement)
                       ( instance-of ?03 general-space-for-main-use))
            (and ( input-data ?01 ?a)
                 ( controls ?02 ?a)
                 ( out-put data ?03 ?a)))))))))


(and (doc design-core-spaces-1
       "The occurrence of Design Core Spaces in the Dec-156 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a design-core-spaces-1)
              (activation-of ?a design-core-spaces)))
        (and (forall ?a
          (=>(activation-of ?a design-core-spaces-1)
           (exists ?p
            (=> (activation-of ?p decomposition 156 1)
             (subactivity-occurrence ?a ?p)))))

         (forall ?a
              (=>(activation-of ?a design core spaces -1)
              (activation-of ?a decomposition163 1))))))


(and (doc determine-circulation-spaces-1
       "The occurrence of Determine Circulation Spaces in the Dec-156 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a determine-circulation-spaces-1)
              (activation-of ?a determine-circulation-spaces)))

       (forall ?a
          (=>(activation-of ?a determine-circulation-spaces-1)
           (exists ?p
            (=> (activation-of ?p decomposition 156 1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc design-spaces-for-fire-compartment-1
    "The occurrence of Design Spaces for Fire Compartment in the Dec-156.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a design-spaces-for-fire-compartment-1)
             (activation-of ?a design-spaces-for-fire-compartment)))

        (and (forall ?a
           (=>(activation-of ?a design-spaces-for-fire-compartment-1)
            (exists ?p
             (=> (activation-of ?p decomposition 156.1)
              (subactivity-occurrence ?a ?p)))))

         (forall ?a
             (=>(activation-of ?a design-spaces-for-fire-compartment-1)
             (activation-of ?a decomposition165 1))))))


(and (doc decomposition-162.1 "Make Preliminary Space layout for Main Use")
     (and (subactivity generate-main-spaces-form-programme-1 decomposition-162 1)
          (and (subactivity define-floor-162 1)
               (and (subactivity organise-space-into-floor-1 decomposition-162 1)
                    (and (subactivity determine-main-space-depth-&-circulation-spaces
decomposition -162 1)
                         (and (subactivity check-programme decomposition -162 1)
                              (and (subactivity J1 -162.1)
                                   (and (subactivity J2 -162 1)
                                        (idef-process decompostition-162 1)))))))))


(and (doc generate-main-spaces-form-programme -1
       "The occurrence of Generate Main Spaces Form Programme in the Dec-162 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a generate-main-spaces-form-programme-1)
             (activation-of ?a generate-main-spaces-form-programme)))

     (forall ?a
          (=>(activation-of ?a generate-main-spaces-form-programme-1)
           (exists ?p
            (=> (activation-of ?p decomposition 162.1)
             (subactivity-occurrence ?a ?p)))))

     (forall ?a
          (=>(activation-of ?a generate-main-spaces-form-programme-1)
            (exists ?01
            (exists ?02
            (exists ?03
            (=> (and ( instance-of ?01 building-space-programme)
                     ( instance-of ?02 building-programme)
                     ( instance-of ?03 spaces-generated-for-main-use ))
           (and ( input-data ?01 ?a)
                ( controls ?02 ?a)
                ( out-put data ?03 ?a)))))))))
   (and (forall ?03
            (=>(space-created-for-main-use ?03)
            (exists ?04
            (exists ?05
            (exists ?06
            (exists ?07
```

```
            (=> (and (attribute-shape  ?04  ?03)
                     (attribute-dimension  ?05  ?03)
                     (attribute-location  ?06  ?03)
                     (attribute-count-of-space  ?07  ?03)))))))))))))


(and (doc define-floor-1
       "The occurrence of Define Floor in the Dec-162.1 schematic")
     (and (forall  ?a
          (=>(activation-of  ?a define-floor -1)
             (activation-of  ?a define-floor)))

        (forall  ?a
          (=>(activation-of  ?a define-floor -1)
           (exists ?p
            (=> (activation-of  ?p  decomposition 162 1)
             (subactivity-occurrence  ?a  ?p)))))

       (forall  ?a
          (=>(activation-of  ?a define-floor -1)
          (exists ?01
          (exists ?02
          (exists ?03
          (=> (and ( instance-of  ?01 generated-space)
                   ( instance-of  ?02 building-programme-requirement)
                   ( instance-of  ?03 defined-floor ))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))


(and (doc organise-space-into-floor-1
       "The occurrence of Organise Space into Floor in the Dec-162.1 schematic")
     (and (forall  ?a
          (=>(activation-of  ?a organise-space-into-floor-1)
             (activation-of  ?a organise-space-into-floor)))

        (forall  ?a
          (=>(activation-of  ?a organise-space-into-floor-1)
           (exists ?p
            (=> (activation-of  ?p  decomposition 162.1)
             (subactivity-occurrence  ?a  ?p)))))))

       (forall  ?a
          (=>(activation-of  ?a organise-space-into-floor-1)
          (exists ?01
          (exists ?02
          (exists ?03
          (=> (and ( instance-of  ?01 space-generated)
                   ( instance-of  ?02 building-programme-requirement/structural-grid/shel/core-
position)
                   ( instance-of  ?03 organised-spaces ))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc determine-main-space-depth-&-circulation-paths-1
       "The occurrence of Determine Main Space Depth & Circulation Spaces in the Dec-162.1
schematic")
     (and (forall ?a
          (=>(activation-of ?a determine-main-space-depth-&-circulation-paths-1)
              (activation-of ?a determine-main-space-depth-&-circulation-paths)))

        (forall ?a
          (=>(activation-of ?a determine-main-space-depth-&-circulation-paths-1)
           (exists ?p
            (=> (activation-of ?p decomposition 162.1)
             (subactivity-occurrence ?a ?p)))))))

       (forall ?a
          (=>(activation-of ?a determine-main-space-depth-&-circulation-paths-1)
          (exists ?01
          (exists ?02
          (exists ?03
          (=> (and ( instance-of ?01 spaces-organised)
                   ( instance-of ?02 building-programme-requirement/structural-grid/shel/core-
position)
                   ( instance-of ?03 floor-plan))
           (and ( input-data ?01 ?a)
                ( controls ?02 ?a)
                ( out-put data ?03 ?a)))))))))

(and (doc check-spaces-against-programme -1
       "The occurrence of Check Spaces Against Programme in the Dec-162.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a check-spaces-against-programme-1)
              (activation-of ?a check-spaces-against-programme)))

        (forall ?a
          (=>(activation-of ?a check-spaces-against-programme-1)
           (exists ?p
            (=> (activation-of ?p decomposition 162.1)
             (subactivity-occurrence ?a ?p)))))))

       (forall ?a
          (=>(activation-of ?a check-spaces-against-programme-1)
          (exists ?01
          (exists ?02
          (exists ?03
          (=> (and ( instance-of ?01 floor-plan)
                   ( instance-of ?02 building-space-programme)
                   ( instance-of ?03 checked-spaces)
           (and ( input-data ?01 ?a)
                ( controls ?02 ?a)
                ( out-put data ?03 ?a)))))))))



(and (doc decomposition-163 1 "Design Core Sapces")
     (and (subactivity determine core space requirements -1 decomposition-163 1)
          (and (subactivity determine core spaces' shape and size-1 decomposition 163 1)
               (and (subactivity layout core spaces-1 decomposition-163 1)
                    (idef-process decompostition-163.1)))))
```

```
(and (doc determine-core-space-requirements-1
       "The occurrence of Determine Core Space Requirements in the Dec-1631schematic")
     (and (forall ?a
          (=>(activation-of ?a determine-core-space-requirements-1)
              (activation-of ?a determine-core-space-requirements)))

        (forall ?a
          (=>(activation-of ?a determine-core-space-requirements-1)
           (exists ?p
            (=> (activation-of ?p decomposition 1631)
             (subactivity-occurrence ?a ?p)))))))


(and (doc determine-shape-size-of-core-spaces -1 "The occurrence of Determine Shape Size of Core
Spaces
       in the Dec-1631 schematic")
     (and (forall ?a
          (=>(activation-of ?a determine-shape-size-of-core-spaces-1)
              (activation-of ?a determine-shape-size-of-core-spaces)))

        (forall ?a
          (=>(activation-of ?a determine-shape-size-of-core-spaces-1)
           (exists ?p
            (=> (activation-of ?p decomposition 1631)
             (subactivity-occurrence ?a ?p)))))))


(and (doc layout-core-spaces-1
       "The occurrence of Determine Layout Core Spaces in the Dec-163 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a layout-core-spaces-1)
              (activation-of ?a layout-core-spaces)))

        (forall ?a
          (=>(activation-of ?a layout-core-spaces-1)
           (exists ?p
            (=> (activation-of ?p decomposition 163 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc decomposition-165.1 "determine spaces for fire compartment")
     (and (subactivity identify-main-ancillary-use-spaces -1 decomposition-165 1)
          (and (subactivity check-ancillary-use-spaces-for-main-use-1 decomposition 165 1)
               (and (subactivity identify-single-occupancy-spaces-1 decomposition-165.1)
                    (and (subactivity identify-area-voume-of-spaces-1 decomposition-165 1)
                         (and (subactivity specify-boundaries-as-fine-compartment-boundaries-1
                              decomposition-165 1)
                              (idef-process decompostition-165 1)))))))


(and (doc identify-main-ancillary-use-spaces-1
       "The occurrence of Identify Main/Ancillary Use Spaces in the Dec-165.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a identify-main-ancillary-use-spaces-1)
              (activation-of ?a identify-main-ancillary-use-spaces)))
```

```
        (forall ?a
          (=>(activation-of ?a identify-main-ancillary-use-spaces-1)
           (exists ?p
            (=> (activation-of ?p decomposition 165 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc check-ancillary-use-spaces-for-main-use-1
       "The occurrence of Check Ancillary Use Spaces for Main Use in the Dec-165 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a check-ancillary-use-spaces-for-main-use-1)
               (activation-of ?a check-ancillary-use-spaces-for-main-use)))

          (forall ?a
            (=>(activation-of ?a check-ancillary-use-spaces-for-main-use-1)
             (exists ?p
              (=> (activation-of ?p decomposition 165 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc identify-single-occupancy-spaces-1
       "The occurrence of Identify Single Occupancy Spaces in the Dec-165 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a identify-single-occupancy-spaces -1)
               (activation-of ?a identify-single-occupancy-spaces)))

          (forall ?a
            (=>(activation-of ?a identify-single-occupancy-spaces -1)
             (exists ?p
              (=> (activation-of ?p decomposition 165.1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc identify-area-volume-of-spaces-1
       "The occurrence of Identify Area/Volume of Spaces in the Dec-165 1 schemtic")
     (and (forall ?a
            (=>(activation-of ?a identify-area-volume-of-spaces -1)
               (activation-of ?a identify-area-volume-of-spaces)))

          (forall ?a
            (=>(activation-of ?a identify-area-volume-of-spaces -1)
             (exists ?p
              (=> (activation-of ?p decomposition 165.1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc specify-space-boundaries-as-fine-compartment-boundaries-1
     "The Occurrence of Specify Space Boundaries as Fire Compartment Boundaries in the Dec-156 1
       schmatic")
     (and (forall ?a
            (=>(activation-of ?a specify-space-boundaries-as-fine-compartment-boundaries -1)
               (activation-of ?a specify-space-boundaries-as-fine-compartment-boundaries)))
       (and (forall ?a
            (=>(activation-of ?a specify-space-boundaries-as-fine-compartment-boundaries -1)
             (exists ?p
              (=> (activation-of ?p decomposition 156.1)
               (subactivity-occurrence ?a ?p)))))
```

```
        (forall ?a
            (=>(activation-of ?a specify-space-boundaries-as-fine-compartment-boundaries-1)
            (activation-of ?a decomposition178 1))))))


(and (doc decomposition-178 1 "Specify Space Boundaries as Fire Compartment Boundaries")
     (and (subactivity analyse-fire-compartments-defined-by-single-use-occupancy-1
decomposition-178 1)
          (and (subactivity check-regulation-for-maximum-fire-use-dimensions -1 decomposition
178 1)
               (and (subactivity subdivide-each-fire-compartment-to-meet-constraints-1
decomposition-
                    178 1)
                    (idef-process decompostition-178.1)))))

(and (doc analyse-fire-compartments-defined-by-single-use-occupancy-1
       "The occurrence of Analyse Fire Compartments Defined by Single Use Occupancy in the Dec-
178 1
       schematic")
      (and (forall ?a
           (=>(activation-of ?a analyse-fire-compartments-defined-by-single-use-occupancy -1)
              (activation-of ?a analyse-fire-compartments-defined-by-single-use-occupancy)))

        (forall ?a
          (=>(activation-of ?a analyse-fire-compartments-defined-by-single-use-occupancy -1)
           (exists ?p
            (=> (activation-of ?p decomposition 178.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc check regulation for maximum fire use dimensions -1 "The occurrence of Check
Regulation For
       Maximum Fire Use Dimensions in the Dec-178 1")
      (and (forall ?a
           (=>(activation-of ?a check regulation for maximum fire use dimensions -1)
              (activation-of ?a check regulation for maximum fire use dimensions)))

        (forall ?a
          (=>(activation-of ?a check regulation for maximum fire use dimensions -1)
           (exists ?p
            (=> (activation-of ?p decomposition 178.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc subdivide-each-fire-compartment-to-meet-constraints-1
        "The occurrence of Subdivide Each Fire Compartment To Meet Constraints in the Dec-178 1
          schematic")
      (and (forall ?a
           (=>(activation-of ?a subdivide-each-fire-compartment-to-meet-constraints -1)
              (activation-of ?a subdivide-each-fire-compartment-to-meet-constraints)))

        (forall ?a
          (=>(activation-of ?a subdivide-each-fire-compartment-to-meet-constraints -1)
           (exists ?p
            (=> (activation-of ?p decomposition 178 1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc decomposition-157.1 "Make General Façade Design")
     (and (subactivity determine-bldg-mass -1 decomposition-157 1)
          (and (subactivity determine-façade-structure-relationship-1 decomposition 157 1)
               (and (subactivity determine-fenestration-1 decomposition-157 1)
                    (and (subactivity determine-façade-material-1 decomposition-157 1)
                         (and (subactivity make-design-of-adornments-of-facade-1
                              Decomposition-157 1)
                              (idef-process decompostition-157 1)))))))


(and (doc determine-building-mass -1 "The occurrence of Determine Building Mass in the Dec-157 1
schematic")
     (and (forall ?a
          (=>(activation-of ?a determine-building-mass-1)
              (activation-of ?a determine-building-mass)))

        (forall ?a
          (=>(activation-of ?a determine-building-mass-1)
           (exists ?p
            (=> (activation-of ?p decomposition 157 1)
             (subactivity-occurrence ?a ?p)))))

       (forall ?a
          (=>(activation-of ?a determine-building-mass-1)
            (exists ?01
            (exists ?02
            (exists ?03
            (=> (and ( instance-of ?01 floor-space-plates-created)
                     ( instance-of ?02 proposed-solution/feedback-brief)
                     ( instance-of ?03 building-mass))
           (and ( input-data ?01 ?a)
                ( controls ?02 ?a)
                ( out-put data ?03 ?a))))))))
        (and (forall ?03
             (=>(building-mass ?03)
             (exists ?04
             (exists ?05
             (=> (and (attribute-shape ?04 ?03)
                      (attribute-dimension/volume/area ?05 ?03)))))))))))


(and (doc determine-façade-structure-relationship-1
       "The occurrence of Determine Façade-Structure Relationship in the Dec-157 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a determine-façade-structure-relationship -1)
              (activation-of ?a determine-façade-structure-relationship)))

        (forall ?a
          (=>(activation-of ?a determine-façade-structure-relationship-1)
           (exists ?p
            (=> (activation-of ?p decomposition 157.1)
             (subactivity-occurrence ?a ?p)))))
```

```
(forall ?a
    (=>(activation-of ?a determine-façade-structure-relationship-1)
      (exists ?01
      (exists ?02
      (exists ?03
      (=> (and ( instance-of ?01 structural-design-brief )
               ( instance-of ?02 architect's-design-effects)
               ( instance-of ?03 preliminary-structural-grid))
     (and ( input-data ?01 ?a)
          ( controls ?02 ?a)
          ( out-put data ?03 ?a))))))))
 (and (forall ?03
      (=>(preliminary-structural-grid ?03)
      (exists ?04
      (exists ?05
      (=> (and (attribute-shape ?04 ?03)
               (attribute-dimensions ?05 ?03)))))))))))


(and (doc determine-fenestration-1
      "The occurrence of Determine Fenestration in the Dec-157 1 schematic")
    (and (forall ?a
        (=>(activation-of ?a determine-fenestration-1)
          (activation-of ?a determine-fenestration)))

     (forall ?a
       (=>(activation-of ?a determine-fenestration-1)
       (exists ?p
        (=> (activation-of ?p decomposition 157 1)
         (subactivity-occurrence ?a ?p)))))

     (forall ?a
        (=>(activation-of ?a determine-fenestration-1)
          (exists ?01
          (exists ?02
          (exists ?03
          (=> (and ( instance-of ?01 general-space-design/bldg-mass)
                   ( instance-of ?02 site/building-face-orientation)
                   ( instance-of ?03 fenestration))
         (and ( input-data ?01 ?a)
              ( controls ?02 ?a)
              ( out-put data ?03 ?a))))))))
      (and (forall ?03
          (=>(fenestration ?03)
          (exists ?04
          (exists ?05
          (exists ?06
          (=> (and (attribute-location ?04 ?03)
                   (attribute-shape ?05 ?03)
                   ( attribute- dimensions/size ?06 ?03)))))))))))


(and (doc determine-façade-material-1
      "The occurrence of Determine Façade Material in the Dec-157 1 schematic")
    (and (forall ?a
        (=>(activation-of ?a determine-façade-material -1)
          (activation-of ?a determine-façade-material)))
```

```
        (forall ?a
          (=>(activation-of ?a determine-façade-material -1)
           (exists ?p
            (=> (activation-of  ?p  decomposition 157 1)
             (subactivity-occurrence ?a ?p)))))

       (forall ?a
          (=>(activation-of ?a determine-façade-material-1)
            (exists ?01
            (exists ?02
            (exists ?03
            (=> (and ( instance-of ?01 proposed-solution/building-mass)
                     ( instance-of ?02 regional-style-
                                       regional-construction-method
                                       client's–desire
                                       durability
                                       climate
                                       ease-of-use
                                       cost
                                       availability)
                     ( instance-of ?03 material-of-construction))
           (and ( input-data ?01 ?a)
                ( controls ?02 ?a)
                ( out-put data ?03 ?a))))))))


       (and (forall ?03
             (=>(material-of-construction ?03)
             (exists ?04
             (exists ?05
             (exists ?06
             (=> (and (attribute-????? ?04 ?03)
                      (attribute-????? ?05  ?03)
                      ( attribute- ???? ?06 ?03)))))))))))


(and (doc make-design-of-adornments-1
       "The occurrence of Make Design of Adornments in the Dec-157.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-design-of-adornments -1)
             (activation-of ?a make-design-of-adornments)))

        (forall ?a
          (=>(activation-of ?a make-design-of-adornments -1)
           (exists ?p
            (=> (activation-of  ?p  decomposition 157.1)
             (subactivity-occurrence ?a ?p)))))
```

```
(forall ?a
   (=>(activation-of ?a make-design-of-adornments-1)
      (exists ?01
      (exists ?02
      (exists ?03
      (=> (and ( instance-of ?01 building-mass/proposed-solution)
               ( instance-of ?02 regional-style-)
               ( instance-of ?03 material-of-adornment))
    (and ( input-data ?01 ?a)
         ( controls ?02 ?a)
         ( out-put data ?03 ?a))))))))
 (and (forall ?03
      (=>(material-of-adornment ?03)
      (exists ?04
      (exists ?05
      (exists ?06
      (=> (and (attribute-????? ?04 ?03)
               (attribute-????? ?05 ?03)
               ( attribute- ???? ?06 ?03)))))))))))


(and (doc decomposition-116.1 "Make General Façade Design")
   (and (subactivity evaluate-overall-design-1 decomposition-116 1)
      (and (subactivity make-detail-design-1 decomposition 116 1)
         (and (subactivity check-compatibility-of-detail-design-1 decomposition-116 1)
            (and (subactivity do-additional-tasks-1 decomposition-116.1)
               (and (subactivity design-for-production-1Decomposition-116 1)
                  (idef-process decompostition-116 1)))))))


(and (doc evaluate-overall-design-1
      "The occurrence of Evaluate Overall Design in the Dec-116 1 schematic")
   (and (forall ?a
      (=>(activation-of ?a evaluate overall design -1)
         (activation-of ?a evaluate overall design)))

      (forall ?a
         (=>(activation-of ?a evaluate overall design -1)
          (exists ?p
           (=> (activation-of ?p decomposition 116 1)
            (subactivity-occurrence ?a ?p)))))))


(and (doc make-detail-design-1
      "The Occurrence of Make Detail Design in the Dec-116 1 schematic")
   (and (forall ?a
      (=>(activation-of ?a make-detail-design -1)
         (activation-of ?a make-detail-design)))
     (and (forall ?a
         (=>(activation-of ?a make-detail-design -1)
          (exists ?p
           (=> (activation-of ?p decomposition 116 1)
            (subactivity-occurrence ?a ?p)))))

      (forall ?a
         (=>(activation-of ?a make-detail-design -1)
         (activation-of ?a decomposition188.1))))))
```

```
(and (doc check-compatibility-of-detail-design-1
       "The occurrence of Check Compatibility of Detail Design in the Dec-116 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a check-compatibility-of-detail-design-1)
              (activation-of ?a check-compatibility-of-detail-design)))

        (forall ?a
          (=>(activation-of ?a check-compatibility-of-detail-design-1)
           (exists ?p
            (=> (activation-of ?p decomposition 116 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc do-additional-tasks-1
       "The occurrence of Do Additional Tasks in the Dec-116 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a do-additional-tasks -1)
              (activation-of ?a do-additional-tasks)))

        (forall ?a
          (=>(activation-of ?a do-additional-tasks -1)
           (exists ?p
            (=> (activation-of ?p decomposition 116 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc design-for-production-1
       "The occurrence of Design For Production in the Dec-116 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a design-for-production-1)
              (activation-of ?a design-for-production)))

        (forall ?a
          (=>(activation-of ?a design-for-production-1)
           (exists ?p
            (=> (activation-of ?p decomposition 116 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc decomposition-188.1 "Make Detail Design")
    (and (subactivity make-detail-design-of-spaces -1 decomposition-188 1)
        (and (subactivity make-detail-design-of-facade-1 decomposition 188 1)
            (and (subactivity make-derail-design-of-structural-elements-1decomposition-188 1)
                (and (subactivity make-detail-design-of-roof-1 decomposition-188.1)
                    (and (subactivity make-detail-design-of-surface-structures-&-finsihes-1
                    Decomposition-188 1)
                    (and (subactivity prepare-construction-specifications-1 decomposition-
188.1)
                        (idef-process decompostition-188.1)))))))
```

```
(and (doc make-detail-design-of-spaces-1
     "The Occurrence of Make Detail Design of Spaces in the Dec-188 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-spaces -1)
              (activation-of ?a make-detail-design-of-spaces)))
        (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-spaces -1)
           (exists ?p
            (=> (activation-of ?p decomposition 188 1)
             (subactivity-occurrence ?a ?p)))))

          (forall ?a
              (=>(activation-of ?a make-detail-design-of-spaces -1)
              (activation-of ?a decomposition192 1))))))



(and (doc make-detail-design-of-facade-1
       "The Occurrence of Make Detail Design of Facade in the Dec-188.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-facade-1)
              (activation-of ?a make-detail-design-of-facade)))
        (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-facade -1)
           (exists ?p
            (=> (activation-of ?p decomposition 188 1)
             (subactivity-occurrence ?a ?p)))))

          (forall ?a
              (=>(activation-of ?a make-detail-design-of-facade-1)
              (activation-of ?a decomposition193 1))))))



(and (doc make-detail-design-of-structural-elements-1
       "The occurrence of Assist in Design-of-Structural-elements in the Dec-188 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-structural-elements-1)
              (activation-of ?a make-detail-design-of-structural-elements)))

    (forall ?a
          (=>(activation-of ?a make-detail-design-of-structural-elemenets-1)
           (exists ?p
            (=> (activation-of ?p decomposition 188.1)
             (subactivity-occurrence ?a ?p)))))
      (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-structural-elemenets-1
              (activation-of ?a decomposition-194 1))))))


(and (doc decomposition-194 1 "Make Detail Design of Structural-Elements")
     (and (subactivity make-detail-design-of-beam-1 decomposition-194 1)
          (and (subactivity make-detail-design-of-columns-1 decomposition 194.1)
               (and (subactivity make-derail-design-of-wall-1decomposition-194.1)
                    (and (subactivity make-detail-design-of-slab-1 decomposition-194 1)
                         (and (subactivity make-detail-design-of-foundation-1 decomposition-194.1)
                  (and (subactivity prepare-construction-specifications-1 decomposition-194 1)
                              (idef-process decompostition-194.1)))))))
```

```
(and (doc make-detail-design-of-beam -1
       "The occurrence of Make-Detail-Design-of-Beam in the Dec-194 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-beam -1)
              (activation-of ?a make-detail-design-of-beam)))

       (forall ?a
         (=>(activation-of ?a make-detail-design-of-beam -1)
          (exists ?p
           (=> (activation-of ?p decomposition 194 1)
            (subactivity-occurrence ?a ?p)))))))



(and (doc make-detail-design-of-column-1
       "The occurrence of Make-Detail-Design-of-Column in the Dec-194 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of- column-1)
              (activation-of ?a make-detail-design-of- column)))

       (forall ?a
         (=>(activation-of ?a make-detail-design-of- column-1)
          (exists ?p
           (=> (activation-of ?p decomposition 194 1)
            (subactivity-occurrence ?a ?p)))))))

      (forall ?a
          (=>(activation-of ?a make-detail-design-of- column-1)
            (exists ?01
            (exists ?02
            (exists ?03
            (=> (and ( instance-of ?01 design-form-all-other-disciplines)
                     ( instance-of ?02 over-all-design/code/)
                     ( instance-of ?03 column))
           (and ( input-data ?01 ?a)
                ( controls ?02 ?a)
                ( out-put data ?03 ?a))))))))
       (and (forall ?03
            (=>(column ?03)
            (exists ?04
            (exists ?05
            (exists ?06
            (exists ?07
            (exists ?08
            (=> (and (attribute-type ?04 ?03)
                     (attribute-dimension ?05 ?03)
                     ( attribute-material ?06 ?03)
                     (attribute-finish ?07 ?03)
                     (attribute-fire-rating ?08 ?03)))))))))))
```

```
(and (doc make-detail-design-of-wall -1
       "The occurrence of Make-Detail-Design-of-Wall in the Dec-194 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of- wall-1)
              (activation-of ?a make-detail-design-of- wall)))

        (forall ?a
          (=>(activation-of ?a make-detail-design-of- wall-1)
           (exists ?p
            (=> (activation-of ?p decomposition 194 1)
             (subactivity-occurrence ?a ?p)))))))

       (forall ?a
          (=>(activation-of ?a make-detail-design-of- wall-1)
            (exists ?01
            (exists ?02
            (exists ?03
            (=> (and ( instance-of ?01 design-form-all-other-disciplines)
                     ( instance-of ?02 over-all-design/code/)
                     ( instance-of ?03 wall-element))
          (and ( input-data ?01 ?a)
               ( controls ?02 ?a)
               ( out-put data ?03 ?a))))))))
        (and (forall ?03
            (=>(wall-element ?03)
            (exists ?04
            (exists ?05
            (exists ?06
            (exists ?07
            (exists ?08
            (=> (and (attribute-type ?04 ?03)
                     (attribute-dimension ?05 ?03)
                     ( attribute-material ?06 ?03)
                     (attribute-finish ?07 ?03)
                     (attribute-fire-rating ?08 ?03)))))))))))


(and (doc make-detail-design-of-slab -1
       "The occurrence of Make-Detail-Design-of-Slab in the Dec-194 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-slab-1)
              (activation-of ?a make-detail-design-of-slab)))

        (forall ?a
          (=>(activation-of ?a make-detail-design-of-slab-1)
           (exists ?p
            (=> (activation-of ?p decomposition 194.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc make-detail-design-of-foundation -1
       "The occurrence of Make-Detail-Design-of-Foundation in the Dec-194 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-foundation-1)
              (activation-of ?a make-detail-design-of-foundation)))
```

```
        (forall ?a
          (=>(activation-of ?a make-detail-design-of-foundation-1)
           (exists ?p
            (=> (activation-of ?p decomposition 194 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc make-detail-design-of-roof-1
       "The Occurrence of Make Detail Design of Roof in the Dec-188 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a make-detail-design-of-roof -1)
                (activation-of ?a make-detail-design-of-roof)))
          (and (forall ?a
            (=>(activation-of ?a make-detail-design-of-roof -1)
             (exists ?p
              (=> (activation-of ?p decomposition 188 1)
               (subactivity-occurrence ?a ?p)))))

           (forall ?a
              (=>(activation-of ?a make-detail-design-of-roof -1)
              (activation-of ?a decomposition195 1))))))


(and (doc make-detail-design-of-surface-structures-&-finishes-1
       "The occurrence of Make Detail Design of Surface Structures & Finishes in the Dec-188 1
schematic")
     (and (forall ?a
            (=>(activation-of ?a make-detail-design-of-surface-structures-&-finishes -1)
                (activation-of ?a make-detail-design-of-surface-structures-&-finishes)))

          (forall ?a
            (=>(activation-of ?a make-detail-design-of-surface-structures-&-finishes -1)
             (exists ?p
              (=> (activation-of ?p decomposition 188.1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc prepare-construction-specifications-1
       "The occurrence of Prepare Construction Specifications in the Dec-188 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a prepare-construction-specifications -1)
                (activation-of ?a prepare-construction-specifications)))

          (forall ?a
            (=>(activation-of ?a prepare-construction-specifications -1)
             (exists ?p
              (=> (activation-of ?p decomposition 188 1)
               (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc decomposition-192 1 "Make Detail Design of Spaces")
     (and (subactivity delineate-defined-spaces-1 decomposition-192 1)
          (and (subactivity determine-partition-types-1 decomposition 192.1)
               (and (subactivity layout-partition-types-1 decomposition-192 1)
                    (and (subactivity carry-out-egress analysis-1 decomposition-192 1)
                         (and (subactivity place-opening-to-internal-enclosing-structures -1
                                   Decomposition-192 1)
                              (and (subactivity designate-spaces-openings-enclosing-&-
complimentary-
                                        structures-1 decomposition-192 1)
                                   (and (subactivity make-detail-design-of-space-items-1
decomposition-
                                             192 1)
                                        (and (subactivity J1-1 decomposition-192 1)
                                             (and (subactivity J2 -1 decomposition-192.1)
                                                  (and (subactivity J3-1 decomposition-192 1)
                                                       (and (subactivity J4-1 decomposition-192 1)
                                                            (and (subactivity J5-1 decomposition-
192 1)
                                                                 (idef-process decompostition-
192.1)))))))))))))


(and (doc delineate-defined-spaces-1
       "The occurrence of Delineate Defined Spaces in the Dec-192 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a delineate-defined-spaces-1)
              (activation-of ?a delineate-defined-spaces)))

        (forall ?a
          (=>(activation-of ?a delineate-defined-spaces-1)
           (exists ?p
            (=> (activation-of ?p decomposition 192 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc determine-partition-types-1
       "The occurrence of Determine Partition Types in the Dec-192.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a determine-partition-types -1)
              (activation-of ?a determine-partition-types)))

        (forall ?a
          (=>(activation-of ?a determine-partition-types -1)
           (exists ?p
            (=> (activation-of ?p decomposition 192.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc layout-partition-types-1
       "The occurrence of Layout Partition Types in the Dec-192 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a layout-partition-types-1)
              (activation-of ?a layout-partition-types)))
```

```
        (forall ?a
          (=>(activation-of ?a layout-partition-types-1)
           (exists ?p
            (=> (activation-of ?p decomposition 192 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc carry-out-egress-analysis-1
       "The occurrence of Carry Out Egress Analysis in the Dec-192 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a carry-out-egress-analysis -1)
               (activation-of ?a carry-out-egress-analysis)))

          (forall ?a
            (=>(activation-of ?a carry-out-egress-analysis -1)
             (exists ?p
              (=> (activation-of ?p decomposition 192 1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc place-opening-to-internal-enclosing-structures-1
    "The occurrence of Place Opening to Internal Enclosing Structures in the Dec-192 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a place-opening-to-internal-enclosing-structures -1)
               (activation-of ?a place-opening-to-internal-enclosing-structures)))

          (forall ?a
            (=>(activation-of ?a place-opening-to-internal-enclosing-structures -1)
             (exists ?p
              (=> (activation-of ?p decomposition 192.1)
               (subactivity-occurrence ?a ?p)))))))


(and (doc designate-spaces-openings-enclosing-&-complimentary-structures-1
    "The occurrence of Designate Spaces, Openings, Enclosing & Complimentary Structures in the
     Dec-192 1 schematic")
     (and (forall ?a
            (=>(activation-of ?a designate-spaces-openings-enclosing-&-complimentary-structures-1)
               (activation-of ?a designate-spaces-openings-enclosing-&-complimentary-structures)))

          (forall ?a
            (=>(activation-of ?a designate-spaces-openings-enclosing-&-complimentary-structures-1)
             (exists ?p
              (=> (activation-of ?p decomposition 192 1)
               (subactivity-occurrence ?a ?p)))))))

(and (doc place-opening-to-internal-enclosing-structures-1
    "The occurrence of Place Opening to Internal Enclosing Structures in the
     Dec-192.1 schmatic")
     (and (forall ?a
            (=>(activation-of ?a place-opening-to-internal-enclosing-structures -1)
               (activation-of ?a place-opening-to-internal-enclosing-structures)))

          (forall ?a
            (=>(activation-of ?a place-opening-to-internal-enclosing-structures -1)
             (exists ?p
              (=> (activation-of ?p decomposition 192.1)
               (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc make-detail-design-of-space-items -1
"The Occurrence of Make Detail Design of Space Items in the Dec-188.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-space-items-1)
              (activation-of ?a make-detail-design-of-space-items)))
        (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-space-items-1)
           (exists ?p
            (=> (activation-of ?p decomposition 188 1)
             (subactivity-occurrence ?a ?p)))))

         (forall ?a
              (=>(activation-of ?a make-detail-design-of-space-items-1)
              (activation-of ?a decomposition204 1)))

(and (doc decomposition-204 1 "Make Detail Design of Spaces Items")
     (and (subactivity make-detail-design-of-partition-structures-1 decomposition-204 1)
          (and (subactivity make-detail-design-of-complimentary-structures-to-internal-openings-1
                 decomposition 204 1)
               (and (subactivity make-detail-design-of-items-&-fittings-on-space -1 decomposition-
204 1)
                    (and (subactivity  make-detail-design-of-space-floor-structures-1
decomposition-204 1)
                         (idef-process decompostition-204 1))))))



(and (doc make-detail-design-of-partition-structures-1
     "The occurrence of Make Detail Design of Partition Structures in the Dec204.1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-partition-structures-1)
              (activation-of ?a make-detail-design-of-partition-structures)))

        (forall ?a
          (=>(activation-of ?a make-detail-design-of-partition-structures-1)
           (exists ?p
            (=> (activation-of ?p decomposition 204.1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc make-detail-design-of-complimentary-structure-to internal openings -1
     "make Detail Design of Complimentary Structures to Internal Openings in the Dec204.1
schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-complimentary-structure-to internal openings -
1)
              (activation-of ?a make-detail-design-of-complimentary-structure-to internal
openings)))

        (forall ?a
          (=>(activation-of ?a make-detail-design-of-complimentary-structure-to internal openings -
1)
           (exists ?p
            (=> (activation-of ?p decomposition 204.1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc make-detail-design-of-items-&-fittings-on-space-1
     " Make Detail Design of Items & Fittings on Space in the Dec204 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-items-&-fittings-on-space -1)
              (activation-of ?a make-detail-design-of-items-&-fittings-on-space)))

        (forall ?a
          (=>(activation-of ?a make-detail-design-of-items-&-fittings-on-space -1)
           (exists ?p
            (=> (activation-of ?p decomposition 204 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc make-detail-design-of-space-floor-structures-1
     " Make Detail Design of Space Floor Structures in the Dec204 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-space-floor-structures -1)
              (activation-of ?a make-detail-design-of-space-floor-structures)))

        (forall ?a
          (=>(activation-of ?a make-detail-design-of-space-floor-structures -1)
           (exists ?p
            (=> (activation-of ?p decomposition 204 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc decomposition-193.1 "Make Detail Design of Facade")
     (and (subactivity make-detail-design-of-external-enclosing-structues-193 1)
          (and (subactivity make-detail-design-of-projecting-façade-structures-1 decomposition
193.1)
               (and (subactivity make-detail-design-of-complimentary-structures-1
                    decomposition-193.1)
                    (and (subactivity make-detail-design-of-adornments-1 decomposition-193 1)
                         (idef-process decompostition-193 1))))))


(and (doc make-detail-design-of-external-enclosing-structureswall-1
     " Make Detail Design of External Enclosing Structure/wall in the Dec 193 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-external-enclosing-structure/wall-1)
              (activation-of ?a make-detail-design-of-external-enclosing-structure/wall)))

        (forall ?a
          (=>(activation-of ?a make-detail-design-of-external-enclosing-structure/wall-1)
           (exists ?p
            (=> (activation-of ?p decomposition 193.1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(forall ?a
        (=>(activation-of ?a make-detail-design-of-external-enclosing-structure/wall-1)
        (exists ?01
        (exists ?02
        (exists ?03
        (=> (and ( instance-of ?01 general-façade-design)
                 ( instance-of ?02 contractor-instruction)
                 ( instance-of ?03 façade/external-wall-type))
     (and ( input-data ?01 ?a)
          ( controls ?02 ?a)
          ( out-put data ?03 ?a))))))))
 (and (forall ?03
        (=>(exteranl-wall ?03)
        (exists ?04
        (exists ?05
        (exists ?06
        (ezists ?07
        (exists ?08
        (=> (and (attribute-type ?04 ?03)
                 (attribute-thickness/dimension ?05 ?03)
                 ( attribute-material-of-construction ?06 ?03)
                 (attribute-fire-rating ?07 ?03)
                 (attribute-other-property ?08 ?03)))))))))))


(and (doc make-detail-design-of-projecting-façade-structures-1
     " Make Detail Design of Projecting Façade Structures in the Dec 193 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-projecting-façade-structures-1)
             (activation-of ?a make-detail-design-of-projecting-façade-structures)))

       (forall ?a
         (=>(activation-of ?a make-detail-design-of-projecting-façade-structures-1)
          (exists ?p
           (=> (activation-of ?p decomposition 193 1)
            (subactivity-occurrence ?a ?p)))))))


(and (doc make-detail-design-of-complimentary-structures-1
     " Make Detail Design of Complimentary Structures in the Dec 193 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-complimentary-structures-1)
             (activation-of ?a make-detail-design-of-complimentary-structures)))

       (forall ?a
         (=>(activation-of ?a make-detail-design-of-complimentary-structures-1)
         (exists ?p
         (=> (activation-of ?p decomposition 193 1)
         (subactivity-occurrence ?a ?p)))))))
```

```
(forall ?a
    (=>(activation-of ?a make-detail-design-of-complimentary-structures-1)
      (exists ?01
      (exists ?02
      (exists ?03
      (=> (and ( instance-of ?01 general-façade-design)
               ( instance-of ?02 overall design/environment/manufacturers specification)
               ( instance-of ?03 complimentary-structures))
     (and ( input-data ?01 ?a)
          ( controls ?02 ?a)
          ( out-put data ?03 ?a))))))))
 (and (forall ?03
      (=>(complimentary-structure ?03)
      (exists ?04
      (exists ?05
      (exists ?06
      (exists ?07
      (exists ?08
      (exists ?09
      (exists ?10
      (exists ?11
      (exists ?12
      (exists ?13
      (=> (and (attribute-type ?04 ?03)
               (attribute-dimension ?05 ?03)
               ( attribute-material ?06 ?03)
               (frame ?07 ?03)
               (hard-ware ?08 ?03)
               (attribute-finish ?08 ?03)
               (attribute-swing ?09 ?03)
               (attribute-fire-rating ?010 ?03)
               ( glazing ?11 ?03)
              (sill ?12 ?03)
              ( head ?13 ?03))))))))))))))))))


(and (doc make-detail-design-of-adornments-1
    " Make Detail Design of Adornments in the Dec 193.1 schematic")
    (and (forall ?a
         (=>(activation-of ?a make-detail-design-of-adornments -1)
           (activation-of ?a make-detail-design-of-adornments)))

      (forall ?a
        (=>(activation-of ?a make-detail-design-of-adornments -1)
        (exists ?p
         (=> (activation-of ?p decomposition 193.1)
          (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc decomposition-195 1 "Make Detail Design of Roof Structure")
     (and (subactivity layout roof-1 decomposition-195 1)
          (and (subactivity layout roof clear story windows-1 decomposition 195 1)
               (and (subactivity layout space for services & other programmes-1 decomposition-
195 1)
                    (and (subactivity design drainage -1 decomposition-195 1)
                         (and (subactivity make detail design of roof structural elements &
assemblies-1
                              Decomposition- 195 1)
                              (and (subactivity J1-1 decomposition-195 1)
                                   (idef-process decompostition-195 ))))))))


(and (doc layout-roof -1
     "Layout Roof in the Dec 195 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a layout-roof -1)
              (activation-of ?a layout-roof)))

        (forall ?a
          (=>(activation-of ?a layout-roof -1)
           (exists ?p
            (=> (activation-of ?p decomposition 195 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc layout-roof-clear-story-windows -1
     "Layout Roof Clear Story Windows in the Dec 195 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a layout-roof-clear-story-windows -1)
              (activation-of ?a layout-roof-clear-story-windows)))

        (forall ?a
          (=>(activation-of ?a layout-roof-clear-story-windows-1)
           (exists ?p
            (=> (activation-of ?p decomposition 195 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc layout-space-for-services-&-other-programmes -1
     "Layout Space for Services & Other Programmes in the Dec 195 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a layout-space-for-services-&-other-programmes -1)
              (activation-of ?a layout-space-for-services-&-other-programmes)))

        (forall ?a
          (=>(activation-of ?a layout-space-for-services-&-other-programmes-1)
           (exists ?p
            (=> (activation-of ?p decomposition 195 1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(and (doc design-drainage -1
     "Design Drainage in the Dec 195 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a design-drainage -1)
              (activation-of ?a design-drainage)))

        (forall ?a
          (=>(activation-of ?a design-drainage -1)
           (exists ?p
            (=> (activation-of ?p decomposition 195 1)
             (subactivity-occurrence ?a ?p)))))))


(and (doc make-detail-design-of-roof-structural-elements-&-assemblies -1
     " the occurrence of make detail design of roof structural elements & assemblies in the Dec 195 1
       schemtic")
     (and (forall ?a
          (=>(activation-of ?a make-detail-design-of-roof-structural-elements-&-assemblies-1)
              (activation-of ?a make-detail-design-of-roof-structural-elements-&-assemblies)))

        (forall ?a
          (=>(activation-of ?a make-detail-design-of-roof-structural-elements-&-assemblies-1)
           (exists ?p
            (=> (activation-of ?p decomposition 195 1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(doc pre-tender procedure "Pre-Tender Procedure")

(and (doc pre-tender procedure "The Top Level Pre-Tender Procedure schematic")
     (and (subactivity pre-tender procedure-1 pre-tender procedure)
          (idef-process pre-tender procedure)))

(and (doc pre-tender procedure-1 "The occurrence of Pre-Tender Procedure in the schematic")
     (and (forall ?a
          (=>activation of ?a pre-tender procedure-1)
          (activation of ?a pre-tender procedure)))
     (and (forall ?a
          (=>activation of ?a pre-tender procedure-1)
          (activation of ?a decomposition-1.1)))
     (and (forall ?a
          (=>activation of ?a pre-tender procedure-1)
               (exists ?01
               (exists ?02
               (exists ?03
               (=> (and ( instance-of ?01 tender-document)
                        ( instance-of ?02 condition-of-tender)
                        ( instance-of ?03 tender-file))
          (and ( input-data ?01 ?a)
               ( controls ?02 ?a)
               ( out-put data ?03 ?a))))))))
     (and (forall ?03
               (=>(tender-file ?03)
               (exists ?04
               (exists ?05
               (exists ?06
               (exists ?07
               (=> (and (---------- ?04 ?03)
                        (---------- ?05 ?03)
                        ( ---------- ?06 ?03)
                        (---------- ?07 ?03)))))))))))


(and (doc decomposition-1.1 "Decomposition of Pre-Tender Procedure")
     (and (subactivity review tender invitation-1 decomposition-1.1)
          (and (subactivity make decision to tender-1 decomposition-1.1)
               (and (subactivity decline invitation to tender-1 decomposition-1 1)
                    (and (subactivity accept invitation to tender-1 decomposition-1.1)
                         (and (subactivity estimate tender–1 decomposition-1.1)
                              (and (subactivity plan tender-1 decomposition-1.1)
                                   (and (subactivity build up complete estimate-1 decomposition-
1 1)
                                        (and (subactivity finalise tender decomposition -1.1)
                                          (and (subactivity J1 decomposition-1.1)
                                               (and (subactivity J2 decomposition-1 1)
                                                    (and (subactivity J3 decomposition-1.1)
                                                         (idef-process decompostition-1.1)))))))))))))
```

```
(and (doc review tender invitation -1
     "the occurrence of review tender invitation in the Dec 8 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a review tender invitation -1)
              (activation-of ?a review tender invitation)))

        (forall ?a
          (=>(activation-of ?a review tender invitation-1)
           (exists ?p
            (=> (activation-of ?p decomposition 8 1)
             (subactivity-occurrence ?a ?p)))))))

       (forall ?a
          (=>(activation-of ?a review tender invitation-1)
            (exists ?01
            (exists ?02
            (=> (and ( instance-of ?01 invitation-to-tender)
                     ( instance-of ?02 tender-review))
           (and ( input-data ?01 ?a)
                ( out-put data ?03 ?a))))))))
      (and (forall ?03
            (=>(tender-file ?03)
            (exists ?04
            (exists ?05
            (=> (and (---------- ?04 ?03)
                     (---------- ?05 ?03)))))))))))


(and (doc make decision to tender-1
     "the occurrence of make decision to tender in the Dec 8 1 schematic")
     (and (forall ?a
          (=>(activation-of ?a make decision to tender -1)
              (activation-of ?a make decision to tender)))
        (forall ?a
          (=>(activation-of ?a make decision to tender -1)
           (exists ?p
            (=> (activation-of ?p decomposition 8.1)
             (subactivity-occurrence ?a ?p)))))))
```

```
(forall ?a
    (=>(activation-of ?a make decision to tender-1)
(and (doc pre-tender procedure-1 "The occurrence of Pre-Tender Procedure in the schematic")
(and (forall ?a
   (=>activation of ?a pre-tender procedure-1)
   (activation of ?a pre-tender procedure)))
(and (forall ?a
    (=>activation of ?a pre-tender procedure-1)
   (activation of ?a decomposition-1 1)))
(and (forall ?a
    (=>activation of ?a pre-tender procedure-1)
       (exists ?01
       (exists ?02
       (exists ?03
       (=> (and ( instance-of ?01 tender-invitation-review)
                ( instance-of ?02 work-load
                                  type-of-work
                                  location-of-proposed-work
                                  expected-competition )
                ( instance-of ?03 letter-of-acceptance-or-decline))
     (and ( input-data ?01 ?a)
          ( controls ?02 ?a)
          ( out-put data ?03 ?a)))))))))))


(and (doc decline invitation to tender -1
    "the occurrence of decline invitation to tender in the Dec 8 1 schematic")
    (and (forall ?a
        (=>(activation-of ?a decline invitation to tender -1)
            (activation-of ?a decline invitation to tender)))
      (forall ?a
        (=>(activation-of ?a decline invitation to tender -1)
         (exists ?p
          (=> (activation-of ?p decomposition 8 1)
           (subactivity-occurrence ?a ?p)))))))

     (forall ?a
        (=>(activation-of ?a decline invitation to tender -1)
           (exists ?01
          (exists ?02
          (exists ?03
          (=> (and ( instance-of ?01 statement-of-decision-to-tender)
                   ( instance-of ?02 tender-invitation-condition )
                   ( instance-of ?03 letter-of-decline))
        (and ( input-data ?01 ?a)
             ( controls ?02 ?a)
             ( out-put data ?03 ?a)))))))))))

(and (doc accept invitation to tnder -1
    "the occurrence of accept invitation to tender in the Dec 8.1 schematic")
    (and (forall ?a
        (=>(activation-of ?a accept invitation to tender -1)
            (activation-of ?a accept invitation to tender)))
      (forall ?a
        (=>(activation-of ?a accept invitation to tender -1)
         (exists ?p
          (=> (activation-of ?p decomposition 8 1)
           (subactivity-occurrence ?a ?p)))))))
```

```
        (forall ?a
          (=>(activation-of ?a accept invitation to tender -1)
            (exists ?01
            (exists ?02
            (exists ?03
            (=> (and ( instance-of ?01 statement-of-decision-to-tender)
                     ( instance-of ?02 tender-invitation-condition )
                     ( instance-of ?03 letter-of-acceptance))
          (and ( input-data ?01 ?a)
               ( controls ?02 ?a)
               ( out-put data ?03 ?a)))))))))))

(and (doc estimate tender -1 " The occurrence of Estimate Tender in the Dec-1.1 schematic")
      (and (forall ?a
             (=> (activation-of ?a estimate tender -1)
             (activation-of ?a estimate tender)))
           (forall ?a
             (=>(activation-of ?a estimate tender -1)
             (exists ?p
             (=> activation-of ?p decomposition-1 1)
             (subactivity-occurecne ?a ?p))
       (and forall ?a
             (=>(activation-of ?a estimate tender -1)
             (activation-of ?a decomposition 8 1))))))))
      (and forall ?a
             (=>(activation-of ?a estimate tender -1)
      (exists ?01
             (exists ?02
             (exists ?03
             (=> (and ( instance-of ?01 tender-document
                                        tender-summary-sheet)
                      ( instance-of ?02 condition-of-tender/form-form-of-contract)
                      ( instance-of ?03 unit-rates/quotations))
           (and ( input-data ?01 ?a)
                ( controls ?02 ?a)
                ( out-put data ?03 ?a)))))))))))
```

```
(and (doc plan tender –1
" The occurrence of plan tender in the Dec-1 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a plan tender -1)
            (activation-of  ?a plan tender)))
           (forall ?a
            (=>(activation-of  ?a plan tender -1)
            (exists ?p
            (=> activation-of  ?p decomposition-1 1)
            (subactivity-occurecne  ?a ?p))
       (and forall ?a
            (=>(activation-of  ?a estimate tender -1)
            (activation-of  ?a decomposition 9 1))))))))
      (and forall ?a
            (=>(activation-of  ?a estimate tender -1)
            (exists ?01
            (exists ?02
            (exists ?03
            (=> (and ( instance-of  ?01 tender-document
                                        tender-summary-sheet)
                     ( instance-of  ?02 condition-of-tender/instruction)
                     ( instance-of  ?03 primary-schedule
                                        quotation))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))


(and (doc build up complete estimate –1
" The occurrence of build up complete estimate in the Dec-1 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a build up complete estimate -1)
            (activation-of  ?a build up complete estimate)))
           (forall ?a
            (=>(activation-of  ?a build up complete estimate -1)
            (exists ?p
            (=> activation-of  ?p decomposition-1.1)
            (subactivity-occurecne  ?a ?p))
       (and forall ?a
            (=>(activation-of  ?a build up complete estimate-1)
            (activation-of  ?a decomposition 10 1))))))))
      (and forall ?a
            (=>(activation-of  ?a build up complete estimate-1)

               (exists ?01
               (exists ?02
               (exists ?03
            (=> (and ( instance-of  ?01 BoQs
                                        unite-rates
                                        primary-schedule
                                        quotations)
                     ( instance-of  ?02 condition-of-tender/instruction)
                     ( instance-of  ?03 complete-estimate))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc finalise tender –1
" The occurrence of finalise tender in the Dec-1 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a finalise tender -1)
            (activation-of  ?a finalise tender)))
           (forall ?a
            (=>(activation-of  ?a finalise tender -1)
            (exists ?p
            (=> activation-of  ?p decomposition-1 1)
            (subactivity-occurecne  ?a ?p)))))))

      (forall ?a
            (=>(activation-of  ?a finalise tender -1)
               (exists ?01
               (exists ?02
               (exists ?03
            (=> (and ( instance-of  ?01 completed-estimate
                                        negotited-savings-&-expected-margins-on-subs )
                     ( instance-of  ?02 condition-of-tender/instruction)
                     ( instance-of  ?03 tender-file))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
               ( out-put data  ?03  ?a)))))))))))


(and (doc j1 "J1")
     (and (forall  ?j
          (=>(activation-of  ?j  j1)
           (exists ?p
             (=>(activation-of ?p decomposition 1.1)
               (subactivity-occurrence  ?j  ?p)))))
               (and (follows make decision to tender  j1 decompostion-1 1)
                (and (xor_split  j1 decomposition 1.1)
                       (and (subactivity  decline invitation to tender  j1)
                              (and (subactivity  accept invitation to tender  j1)))))))))


(and (doc j2 "J2")
     (and (forall  ?j
          (=>(activation-of  ?j  j2)
           (exists ?p
             (=>(activation-of ?p decomposition 1.1)
               (subactivity-occurrence  ?j  ?p)))))


               (and (follows accept invitation to tender  j2 decompostion-1.1)
                (and (and_split  j2 decomposition 1 1)
                       (and (subactivity  estimate tender  j2)
                              (and (subactivity  plan tender  j2)))))))))


(and (doc j3 "J3")
     (and (forall  ?j
          (=>(activation-of  ?j  j3)
           (exists ?p
             (=>(activation-of ?p decomposition 1 1)
               (subactivity-occurrence  ?j  ?p)))))
```

```
                (and (follows j3 build up complete estimate decompostion-1 1)
                 (and (and_split j3 decomposition 1 1)
                        (and (subactivity estimate tender j3)
                               (and (subactivity plan tender j3)))))))))


(and (doc decomposition-8 1 "Decomposition of Estimate Tender")
     (and (subactivity examine document-1 decomposition-8 1)
          (and (subactivity collect relevant inforamation-1 decomposition-8 1)
               (and (subactivity collate quotations-1 decomposition-8 1)
                    (and (subactivity establish all-in-rates-1 decomposition-8 1)
                         (and (subactivity build up unit rates-1 decomposition-8 1)
                                (idef-process decompostition-8 1)))))))))


(and (doc examine document -1
 " The occurrence of examine document in the Dec-8 1 schematic")
       (and (forall ?a
              (=> (activation-of ?a examine document -1)
              (activation-of ?a examine document)))
             (forall ?a
              (=>(activation-of ?a examine document -1)
              (exists ?p
              (=> activation-of ?p decomposition-8 1)
              (subactivity-occurecne ?a ?p)))))))

        (forall ?a
              (=>(activation-of ?a examine document -1)
                 (exists ?01
                 (exists ?02
                 (exists ?03
              (=> (and ( instance-of ?01 tender-document
                                          tender-summary-sheet )
                       ( instance-of ?02 condition-of-tender/instruction)
                       ( instance-of ?03 tender-enquiry-abstract))
             (and ( input-data ?01 ?a)
                  ( controls ?02 ?a)
                  ( out-put data ?03 ?a)))))))))))


(and (doc collect relevant information -1
 " The occurrence of collect relevant information in the Dec-8 1 schematic")
       (and (forall ?a
              (=> (activation-of ?a collect relevant information -1)
              (activation-of ?a collect relevant information)))
             (forall ?a
              (=>(activation-of ?a collect relevant information -1)
              (exists ?p
              (=> activation-of ?p decomposition-8.1)
              (subactivity-occurecne ?a ?p)))))))
```

```
      (forall ?a
            (=>(activation-of  ?a collect relevant information -1)
               (exists ?01
               (exists ?02
               (exists ?03
            (=> (and ( instance-of  ?01 tender-enquiry-abstract/quotations/insurance-premium)
                     ( instance-of  ?02 condition-of-tender/instruction)
                     ( instance-of  ?03 quotations/direct-work-abstracts))
          (and ( input-data  ?01 ?a)
               ( controls  ?02  ?a)
               ( out-put data  ?03  ?a)))))))))))

(and (doc collate quotations -1
" The occurrence of collate quotations in the Dec-8 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a collate quotations -1)
            (activation-of  ?a collate quotations)))

          (forall ?a
            (=>(activation-of  ?a collate quotations -1)
            (exists ?p
            (=> activation-of  ?p decomposition-8.1)
            (subactivity-occurecne  ?a ?p)))))))

          (forall ?a
            (=>(activation-of  ?a collate quotations -1)
               (exists ?01
               (exists ?02
               (exists ?03
            (=> (and ( instance-of  ?01 quotations/trade-file)
                     ( instance-of  ?02 condition-of-tender/instruction)
                     ( instance-of  ?03 comparison-sheet/quotations))
          (and ( input-data  ?01 ?a)
               ( controls  ?02  ?a)
               ( out-put data  ?03  ?a)))))))))))


(and (doc establish all-in-rates -1
" The occurrence of establish all-in-rates in the Dec-8.1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a establish all-in-rates -1)
            (activation-of  ?a establish all-in-rates)))

          (forall ?a
            (=>(activation-of  ?a establish all-in-rates -1)
            (exists ?p
            (=> activation-of  ?p decomposition-8.1)
            (subactivity-occurecne  ?a ?p)))))))
```

```
      (forall ?a
            (=>(activation-of  ?a establish all-in-rates -1)
               (exists ?01
               (exists ?02
               (exists ?03
            (=> (and ( instance-of  ?01 quotations
                                        comparison-sheet
                                        direct-work-abstracts)
                     ( instance-of  ?02 condition-of-tender/instruction)
                     ( instance-of  ?03 all-in-rates/quotations))
          (and ( input-data  ?01 ?a)
               ( controls  ?02  ?a)
               ( out-put data  ?03  ?a)))))))))))


(and (doc build up unit rates –1
 " The occurrence of build up unit rates in the Dec-8 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a  build up unit rates -1)
            (activation-of  ?a  build up unit rates)))
          (forall ?a
            (=>(activation-of  ?a  build up unit rates -1)
            (exists ?p
            (=> activation-of  ?p  decomposition-8 1)
            (subactivity-occurecne  ?a  ?p)))))))


      (forall ?a
            (=>(activation-of  ?a  build up unit rates -1)
               (exists ?01
               (exists ?02
               (exists ?03
            (=> (and ( instance-of  ?01 all-in-rates)
                     ( instance-of  ?02 condition-of-tender/instruction)
                     ( instance-of  ?03 unit-rate))
          (and ( input-data  ?01 ?a)
               ( controls  ?02  ?a)
               ( out-put data  ?03  ?a)))))))))))


(and (doc decomposition-9.1 "Decomposition of Plan-Tender")
     (and (subactivity  extract information-1  decomposition-9 1)
          (and (subactivity  collect necessary information-1  decomposition-9.1)
               (and (subactivity  resource bill of quanities-1  decomposition-9 1)
                    (and (subactivity  draft pre-tender programme-1  decomposition-9.1)
                         (and (subactivity  produce method statement–1  decomposition-9.1)
                              (and (subactivity  produce preliminary schedule-1 decomposition-9.1)
                                   (and (subactivity  J1  decomposition-9 1)
                                        (and (subactivity  J2  decomposition-9 1)
                                             (idef-process decompostition-9 1)))))))))
```

```
(and (doc extract information –1
" The occurrence of extract information in the Dec-9 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a extract information -1)
            (activation-of  ?a extract information)))

           (forall ?a
             (=>(activation-of  ?a extract information -1)
             (exists ?p
             (=> activation-of  ?p  decomposition-9.1)
             (subactivity-occurecne  ?a  ?p)))))))

          (forall ?a
             (=>(activation-of  ?a extract information -1)
                (exists ?01
                (exists ?02
                (exists ?03
             (=> (and ( instance-of  ?01 tender-document
                                         tender-summary-sheet)
                      ( instance-of  ?02 preamble/specification)
                      ( instance-of  ?03 bulk-quantities
                                         plant-requirement-list
                                         scaffolds-requirements-schedule))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))


(and (doc collect necessary information –1
" The occurrence of collect necessary information in the Dec-9 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a collect necessary information -1)
            (activation-of  ?a collect necessary information)))

           (forall ?a
             (=>(activation-of  ?a collect necessary information -1)
             (exists ?p
             (=> activation-of  ?p  decomposition-9.1)
             (subactivity-occurecne  ?a  ?p)))))))


           (forall ?a
             (=>(activation-of  ?a collect necessary information -1)
                (exists ?01
                (exists ?02
                (exists ?03
             (=> (and ( instance-of  ?01 scaffolds-schedule
                                         plant-requirement
                                         temporary-work)
                      ( instance-of  ?02 condition-of-tender/instructions)
                      ( instance-of  ?03 temporary-work-details quantities))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc resource-principal-activities–1
 " The occurrence of resource bill of quantities in the Dec-9 1 schematic")
      (and (forall ?a
             (=> (activation-of  ?a resource bill of quantities -1)
             (activation-of  ?a resource bill of quantities)))
           (forall ?a
             (=>(activation-of  ?a resource bill of quantities -1)
             (exists ?p
             (=> activation-of  ?p  decomposition-9 1)
             (subactivity-occurecne  ?a  ?p)))))))


      (forall ?a
             (=>(activation-of  ?a resource bill of quantities -1)
                (exists ?01
                (exists ?02
                (exists ?03
             (=> (and ( instance-of  ?01 bulk-quantities
                                         temporary-work-details
                                         s/c names)
                      ( instance-of  ?02 construction-method-selected)
                      ( instance-of  ?03 principal-activities
                                         selected-method))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))


(and (doc draft pre-tender programme –1
 " The occurrence of draft pre-tender programme in the Dec-9.1 schematic")
      (and (forall ?a
             (=> (activation-of  ?a draft pre-tender programme -1)
             (activation-of  ?a draft pre-tender programme)))
           (forall ?a
             (=>(activation-of  ?a draft pre-tender programme -1)
             (exists ?p
             (=> activation-of  ?p  decomposition-9.1)
             (subactivity-occurecne  ?a  ?p)))))))

      (forall ?a
             (=>(activation-of  ?a draft pre-tender programme -1)
                (exists ?01
                (exists ?02
                (exists ?03
             (=> (and ( instance-of  ?01 principal-activities)
                      ( instance-of  ?02 method-logic)
                      ( instance-of  ?03 programmed-duration))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc produce method statement -1
 " The occurrence of produce method statement in the Dec-9 1 schematic")
      (and (forall ?a
             (=> (activation-of  ?a produce method statement -1)
             (activation-of  ?a produce method statement)))

           (forall ?a
             (=>(activation-of  ?a produce method statement -1)
             (exists ?p
             (=> activation-of  ?p  decomposition-9 1)
             (subactivity-occurecne  ?a  ?p)))))))

           (forall ?a
             (=>(activation-of  ?a produce method statement -1)
                (exists ?01
                (exists ?02
                (exists ?03
             (=> (and ( instance-of  ?01 selected-method )
                      ( instance-of  ?02 recommendations)
                      ( instance-of  ?03 method-statement
                                         methods/logic))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))


(and (doc produce preliminary schedule -1
 " The occurrence of produce preliminary schedule in the Dec-9 1 schematic")
      (and (forall ?a
             (=> (activation-of  ?a produce preliminary schedule -1)
             (activation-of  ?a produce preliminary schedule)))
           (forall ?a
             (=>(activation-of  ?a produce preliminary schedule -1)
             (exists ?p
             (=> activation-of  ?p  decomposition-9.1)
             (subactivity-occurecne  ?a  ?p)))))))

           (forall ?a
             (=>(activation-of  ?a produce preliminary schedule -1)
                (exists ?01
                (exists ?02
                (exists ?03
             (=> (and ( instance-of  ?01 programmed-duration
                                         method-statement
                                         draft-site-organisation-structures
                                         area-managers-reprogramme-&-preliminary-schdule)
                      ( instance-of  ?02 recommendations)
                      ( instance-of  ?03 primary-schedule))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc j1 "J1")
     (and (forall ?j
          (=>(activation-of ?j j1)
           (exists ?p
             (=>(activation-of ?p decomposition 9 1)
               (subactivity-occurrence ?j ?p)))))
               (and (follows resource bill of quantities j1 decompostion-9 1)
                (and (xor_split j1 decomposition 9 1)
                       (and (subactivity draft pre-tender programme j1)
                              (and (subactivity produce method statement j1)))))))))


(and (doc j2 "J2")
     (and (forall ?j
          (=>(activation-of ?j j2)
           (exists ?p
             (=>(activation-of ?p decomposition 9 1)
               (subactivity-occurrence ?j ?p)))))
               (and (follows j2 produce preliminary schedule decompostion-9 1)
                (and (and_split j2 decomposition 9 1)
                       (and (subactivity draft pre-tender programme j2)
                              (and (subactivity produce method statement j2)))))))))


(and (doc decomposition-10 1 "Decomposition of Build up Complete Estimate")
     (and (subactivity co-ordinate tender-1 decomposition-10 1)
          (and (subactivity price bill of qunitities-1 decomposition-10 1)
               (and (subactivity price preliminary scheduel-1 decomposition-10.1)
                    (and (subactivity make arithmetic check -1 decomposition-10 1)
                         (and (subactivity review late quotations–1 decomposition-10 1)
                              (and (subactivity summarise estimate-1 decomposition-10 1)
                                   (and (subactivity J1 decomposition-10 1)
                                        (and (subactivity J2 decomposition-10.1)
                                             (and (subactivity J3 decomposition-10 1)
                                                  (idef-process decompostition-
10 1)))))))))


(and (doc co-ordinate tender –1
" The occurrence of co-ordinate tender in the Dec-10.1 schematic")
      (and (forall ?a
           (=> (activation-of ?a co-ordinate tender -1)
           (activation-of ?a co-ordinate tender)))
          (forall ?a
           (=>(activation-of ?a co-ordinate tender -1)
           (exists ?p
           (=> activation-of ?p decomposition-10 1)
           (subactivity-occurecne ?a ?p)))))))
```

```
(forall ?a
      (=>(activation-of  ?a co-ordinate tender -1)
         (exists ?01
         (exists ?02
         (exists ?03
      (=> (and ( instance-of  ?01 quotations
                                  unit-rates
                                  preliminary-schedule)
               ( instance-of  ?02 conditions-of-contract)
               ( instance-of  ?03 quotations
                                  unit-rates
                                  preliminary-schedule))
     (and ( input-data  ?01 ?a)
          ( controls  ?02  ?a)
          ( out-put data  ?03  ?a)))))))))))


(and (doc price bill of quantities –1
" The occurrence of price bill of quantities in the Dec-10 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a price bill of quantities -1)
            (activation-of  ?a price bill of quantities)))

           (forall ?a
            (=>(activation-of  ?a price bill of quantities -1)
            (exists ?p
            (=> activation-of  ?p  decomposition-10 1)
            (subactivity-occurecne  ?a  ?p)))))))

           (forall ?a
            (=>(activation-of  ?a price bill of quantities -1)
               (exists ?01
               (exists ?02
               (exists ?03
            (=> (and ( instance-of  ?01 unit-rates/quotations)
                     ( instance-of  ?02 conditions-of-contract)
                     ( instance-of  ?03 measured-rates
                                  build-up-&_extension))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))



(and (doc price preliminary schedule –1
" The occurrence of price preliminary schedule in the Dec-10 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a price preliminary schedule -1)
            (activation-of  ?a price preliminary schedule)))
           (forall ?a
            (=>(activation-of  ?a price preliminary schedule -1)
            (exists ?p
            (=> activation-of  ?p  decomposition-10 1)
            (subactivity-occurecne  ?a  ?p)))))))
```

```
(forall ?a
      (=>(activation-of  ?a price preliminary schedule -1)
         (exists ?01
         (exists ?02
         (exists ?03
      (=> (and ( instance-of  ?01 primary-schedule/quotations)
               ( instance-of  ?02 conditions-of-contract)
               ( instance-of  ?03 priced-preliminaries
                                  build-up-&-extensions-&-work-sheet))
     (and ( input-data  ?01 ?a)
          ( controls  ?02  ?a)
          ( out-put data  ?03  ?a)))))))))))


(and (doc make arithmetic check –1
" The occurrence of make arithmetic check in the Dec-10 1 schematic")
      (and (forall ?a
           (=> (activation-of  ?a make arithmetic check -1)
           (activation-of  ?a make arithmetic check)))

         (forall ?a
           (=>(activation-of  ?a make arithmetic check -1)
           (exists ?p
           (=> activation-of  ?p  decomposition-10.1)
           (subactivity-occurecne  ?a  ?p)))))))

          (forall ?a
           (=>(activation-of  ?a make arithmetic check -1)
              (exists ?01
              (exists ?02
              (exists ?03
           (=> (and ( instance-of  ?01 build-up-&-extensions-&-work-sheet
                                  build-up-&-extensions)
                    ( instance-of  ?02 conditions-of-contract)
                    ( instance-of  ?03 verified-build-up-&-extensions-&-work-sheet
                                  verified-build-up-&-extensions-&-work-sheet))
          (and ( input-data  ?01 ?a)
               ( controls  ?02  ?a)
               ( out-put data  ?03  ?a)))))))))))



(and (doc summarise estimate –1
" The occurrence of summarise estimate in the Dec-10 1 schematic")
      (and (forall ?a
           (=> (activation-of  ?a summarise estimate -1)
           (activation-of  ?a summarise estimate)))

          (forall ?a
           (=>(activation-of  ?a summarise estimate -1)
           (exists ?p
           (=> activation-of  ?p  decomposition-10 1)
           (subactivity-occurecne  ?a  ?p)))))))
```

```
        (forall ?a
           (=>(activation-of  ?a summarise estimate -1)
              (exists ?01
              (exists ?02
              (exists ?03
           (=> (and ( instance-of  ?01 measured-rates
                                       priced–preliminaries
                                       build-ups-extensions-&-work-sheets)
                    ( instance-of  ?02 conditions-of-contract)
                    ( instance-of  ?03 completed-estimate))
            (and ( input-data  ?01 ?a)
                 ( controls  ?02  ?a)
                 ( out-put data  ?03  ?a)))))))))))


(and (doc review late quotations –1
 " The occurrence of review late quotations in the Dec-10 1 schematic")
      (and (forall ?a
              (=> (activation-of  ?a review late quotations -1)
              (activation-of  ?a review late quotations)))

           (forall ?a
              (=>(activation-of  ?a review late quotations -1)
              (exists ?p
              (=> activation-of  ?p  decomposition-10 1)
              (subactivity-occurecne  ?a  ?p)))))))

            (forall ?a
              (=>(activation-of  ?a review late quotations -1)
                 (exists ?01
                 (exists ?02
                 (exists ?03
              (=> (and ( instance-of  ?01 trade-file/late-quotations)
                       ( instance-of  ?02 conditions-of-contract)
                       ( instance-of  ?03 competitive-late-quotations))
             (and ( input-data  ?01 ?a)
                  ( controls  ?02  ?a)
                  ( out-put data  ?03  ?a)))))))))))


(and (doc j1 "J1")
     (and (forall  ?j
          (=>(activation-of  ?j  j1)
           (exists ?p
             (=>(activation-of ?p decomposition 10 1)
               (subactivity-occurrence  ?j  ?p)))))
               (and (follows co-ordinate tender  j1  decompostion-10.1)
                (and (and_split  j1 decomposition 10.1)
                       (and (subactivity  price bill of quantities  j1)
                              (and (subactivity  price preliminary schedule  j1)))))))))
```

```
(and (doc j2 "J2")
     (and (forall ?j
          (=>(activation-of ?j j2)
           (exists ?p
             (=>(activation-of ?p decomposition 10 1)
               (subactivity-occurrence ?j ?p)))))
            (and (and_split j2 decomposition 10 1)
                   (and (subactivity price bill of quantities j2)
                          (and (subactivity price preliminary schedule j2)
                               (and (subactivity make arithmetic check j2)
                                      (and (subactivity review late quotations j2)))))))))


(and (doc j3 "J3")
     (and (forall ?j
          (=>(activation-of ?j j3)
           (exists ?p
             (=>(activation-of ?p decomposition 10 1)
               (subactivity-occurrence ?j ?p)))))
               (and (follows j3 summarise estimate decompostion-10 1)
                (and (and_split j3 decomposition 10 1)
                       (and (subactivity make arithmetic check j3)
                              (and (subactivity review late quotations j3)))))))))
```

```
(doc plan & schedule construction operation "Plan & Schedule Construction Operation")


(and  (doc schedule construction operation
"The Top Level scheduling construction operation process schematic")
     (and (subactivity schedule construction operation-1 schedule construction operation)
        (idef-process pre-tender procedure)))


(and (doc schedule construction operation -1 "The occurrence of Schedule Construction Operation in
the
     schematic")
(and (forall ?a
         (=>activation of  ?a schedule construction operation -1)
         (activation of  ?a  schedule construction operation)))

     (forall  ?a
          (=>activation of  ?a  schedule construction operation -1)
         (activation of  ?a  decomposition-2.1)))
      (and (forall  ?a
          (=>activation of  ?a  schedule construction operation -1)
          (exists ?01
          (exists ?02
          (exists ?03
           (=> (and ( instance-of  ?01 drawing-document-or-estimating-data)
                    ( instance-of  ?02 ----------)
                    ( instance-of  ?03 production schedule))
            (and ( input-data  ?01 ?a)
                 ( controls  ?02  ?a)
                 ( out-put data  ?03  ?a)))))))))


(and (doc decomposition-2 1 "Decomposition of Schedule Construction Operation")
     (and (subactivity analysis scope -1  decomposition-2.1)
          (and (subactivity  identify construction task-1  decomposition-2.1)
               (and (subactivity  assign resources to tasks-1  decomposition-2 1)
                    (and (subactivity  estimate duration-1  decomposition-2 1)
                         (and (subactivity  define relatioship-1  decomposition-2.1)
                              (and (subactivity  complete schedule-1  decomposition-2.1)
                                   (and (subactivity  J1  decomposition-2 1)
                                        (and (subactivity  J2  decomposition-2 1)
                                             (idef-process decompostition-2 1)))))))))


(and (doc analysis scope -1
 " The occurrence of analysis scope in the Dec-2 1 schematic")
       (and (forall ?a
              (=> (activation-of  ?a analysis scope -1)
              (activation-of  ?a analysis scope)))

             (forall ?a
               (=>(activation-of  ?a analysis scope -1)
               (exists ?p
               (=> activation-of  ?p  decomposition-2.1)
               (subactivity-occurecne  ?a  ?p)))))))
```

```
(forall ?a
      (=>(activation-of  ?a analysis scope -1)
    (exists ?01
    (exists ?02
    (exists ?03
     (=> (and ( instance-of  ?01 project-information)
              ( instance-of  ?02 purpose-of-schedule)
              ( instance-of  ?03 level-of-detail-required))
      (and ( input-data  ?01 ?a)
           ( controls  ?02  ?a)
           ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc identify scheduling-items-1 " The occurrence of identify Scheduling-Items in the Dec-2 1
schematic")
      (and (forall ?a
           (=> (activation-of  ?a identify scheduling-items-1)
           (activation-of  ?a identify scheduling-items)))

        (forall ?a
           (=>(activation-of  ?a identify scheduling-items-1)
           (exists ?p
           (=> activation-of  ?p decomposition-2 1)
           (subactivity-occurecne  ?a ?p))

         (forall ?a
           (=>(activation-of  ?a identify scheduling-items-1)
           (activation-of  ?a decomposition 5 1)))))))

       (and forall ?a
           (=>(activation-of  ?a identify scheduling-items-1)
         (exists ?01
         (exists ?02
         (exists ?03
          (=> (and ( instance-of  ?01 design-document/estimating-data)
                   ( instance-of  ?02 project information)
                   ( instance-of  ?03 tasks-resources))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc identify-tasks-1
     " The occurrence of Identify Tasks in the Dec-2.1 schematic")
      (and (forall ?a
           (=> (activation-of  ?a identify-tasks-1)
           (activation-of  ?a identify-tasks)))

        (forall ?a
           (=>(activation-of  ?a identify-tasks-1)
           (exists ?p
           (=> activation-of  ?p  decomposition-2.1)
           (subactivity-occurecne  ?a  ?p)))))))
```

```
(forall ?a
      (=>(activation-of  ?a identify-tasks-1)
   (exists ?01
   (exists ?02
   (exists ?03
    (=> (and ( instance-of  ?01 scheduling-elements)
             ( instance-of  ?02 ----------)
             ( instance-of  ?03 shedding-tasks))
     (and ( input-data  ?01 ?a)
          ( controls  ?02  ?a)
           ( out-put data  ?03  ?a)))))))))))


(and (doc assign-resources-to-tasks-1
 " The occurrence of Assign Resources to Tasks in the Dec-2 1 schematic")
      (and (forall ?a
           (=> (activation-of  ?a assign-resources-to-tasks-1)
           (activation-of  ?a assign-resources-to-tasks)))

           (forall ?a
             (=>(activation-of  ?a assign-resources-to-tasks-1)
             (exists ?p
             (=> activation-of  ?p  decomposition-2 1)
             (subactivity-occurecne  ?a  ?p)))))))

         (forall ?a
             (=>(activation-of  ?a assign-resources-to-tasks-1)
          (exists ?01
          (exists ?02
          (exists ?03
           (=> (and ( instance-of  ?01 scheduling-elements)
                    ( instance-of  ?02 ----------)
                    ( instance-of  ?03 resources-of-tasks))
            (and ( input-data  ?01 ?a)
                 ( controls  ?02  ?a)
                  ( out-put data  ?03  ?a)))))))))))


(and (doc estimate-duration-of-tasks -1
 " The occurrence of Estimate Duration in the Dec-2 1 schematic")
      (and (forall ?a
           (=> (activation-of  ?a estimate-duration-of-tasks-1)
           (activation-of  ?a estimate-duration-of-tasks)))
          (forall ?a
            (=>(activation-of  ?a estimate-duration-of-tasks-1)
            (exists ?p
            (=> activation-of  ?p  decomposition-2.1)
            (subactivity-occurecne  ?a  ?p)))))))
```

```
(forall ?a
      (=>(activation-of  ?a estimate-duration-of-tasks-1)
     (exists ?01
    (exists ?02
    (exists ?03
     (=> (and ( instance-of  ?01 production-task
                                  resource-use)
              ( instance-of  ?02 resources-use)
              ( instance-of  ?03 time-duration))
      (and ( input-data  ?01 ?a)
           ( controls  ?02  ?a)
            ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc define-production-sequences-1 " The occurrence of Define-Production-Sequence in the
Dec-2 1
      schematic")
      (and (forall ?a
            (=> (activation-of  ?a define-production-sequences -1)
            (activation-of  ?a define-production-sequences)))

       (forall ?a
            (=>(activation-of  ?a define-production-sequences -1)
            (exists ?p
            (=> activation-of  ?p decomposition-2 1)
            (subactivity-occurecne  ?a ?p))

       (forall ?a
            (=>(activation-of  ?a define-production-sequences -1)
            (activation-of  ?a decomposition 7 1))))))))
      (and (forall ?a
            (=>(activation-of  ?a define-production-sequences -1)
           (exists ?01
           (exists ?02
           (exists ?03
            (=> (and ( instance-of  ?01 production-tasks)
                     ( instance-of  ?02 tasks-relationship)
                     ( instance-of  ?03 production-tasks-sequence))
             (and ( input-data  ?01 ?a)
                  ( controls  ?02  ?a)
                   ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc complete-schedule–1
 " The occurrence of complete schedule in the Dec-2 1 schematic")
      (and (forall ?a
            (=> (activation-of  ?a complete-schedule-1)
            (activation-of  ?a complete-schedule)))
           (forall ?a
            (=>(activation-of  ?a complete-schedule-1)
            (exists ?p
            (=> activation-of  ?p  decomposition-2.1)
            (subactivity-occurecne  ?a  ?p)))))))
```

```
(forall ?a
    (=>(activation-of  ?a complete-schedule-1)
 (exists ?01
 (exists ?02
 (exists ?03
  (=> (and ( instance-of  ?01 scheduling-tasks
                              tasks-time-duration
                              relationship-between-tasks
                               tasks-dependency
                                calendar-dates)
          ( instance-of  ?02 ----------)
          ( instance-of  ?03 production-schedule))
   (and ( input-data  ?01 ?a)
        ( controls  ?02  ?a)
        ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc j1 "J1")
     (and (forall  ?j
          (=>(activation-of  ?j  j1)
           (exists ?p
             (=>(activation-of ?p decomposition 2.1)
               (subactivity-occurrence  ?j  ?p)))))
                 (and (follows scheduling-items  j1  decomposition 2 1)
                    (and (and_split  j1 decomposition 2.1)
                      (and (subactivity  identify-task  j2)
                              (and (subactivity  assign-resource  j2)))))))))
```

```
(and (doc j2 "J2")
     (and (forall  ?j
          (=>(activation-of  ?j  j2)
           (exists ?p
             (=>(activation-of ?p decomposition 2 1)
               (subactivity-occurrence  ?j  ?p)))))
               (and (follows j2 identity-scheduling-tasks decompostion-2 1)
                (and (and_split  j2 decomposition 2 1)
                       (and (subactivity identify-task j2)
                              (and (subactivity assign-resource j2)))))))))
```

```
(and (doc decomposition-5.1 "Decomposition of Identify Construction Task")
     (and (subactivity analyse-estimating-data-1  decomposition-5 1)
          (and (subactivity aggregate-estimating-tasks-&-resrources-1  decomposition-5.1)
               (and (subactivity analyse-design-document-1  decomposition-5 1)
                    (and (subactivity identiry-tasks-required-to-realise-product-1  decomposition-
5 1)
                         (and (subactivity  identify-resources-required-to-perform-task-1
decomposition-5 1)
                              (and (subactivity identity-scheduling-tasks-1  decomposition-5.1)
                                   (and (subactivity  J1  decomposition-5 1)
                                        (idef-process decompostition-5 1)))))))))
```

```
(and (doc analyse-estimating-data–1
 " The occurrence of Analyse-Estimating-Data in the Dec-5 1schematic")
      (and (forall ?a
             (=> (activation-of  ?a analyse-estimating-data-1)
             (activation-of  ?a analyse-estimating-data)))

           (forall ?a
             (=>(activation-of  ?a analyse-estimating-data-1)
             (exists ?p
             (=> activation-of  ?p  decomposition-5 1)
             (subactivity-occurecne  ?a  ?p)))))

         (forall ?a
             (=>(activation-of  ?a analyse-estimating-data-1)
           (exists ?01
           (exists ?02
           (exists ?03
            (=> (and ( instance-of  ?01 estimating-document)
                     ( instance-of  ?02 ----------)
                     ( instance-of  ?03 estimating-data))
             (and ( input-data  ?01 ?a)
                  ( controls  ?02  ?a)
                  ( out-put data  ?03  ?a)))))))))))


(and (doc aggregate-estimating-tasks-&-resources –1
 " The occurrence of Aggregate-Estimating-Tasks-&-Resources in the Dec-5 1schematic")
      (and (forall ?a
             (=> (activation-of  ?a aggregate-estimating-tasks-&-resources-1)
             (activation-of  ?a aggregate-estimating-tasks-&-resources)))

           (forall ?a
             (=>(activation-of  ?a aggregate-estimating-tasks-&-resources-1)
             (exists ?p
             (=> activation-of  ?p  decomposition-5 1)
             (subactivity-occurecne  ?a  ?p)))))


      (forall ?a
             (=>(activation-of  ?a aggregate-estimating-tasks-&-resources-1)
          (exists ?01
         (exists ?02
         (exists ?03
          (=> (and ( instance-of  ?01 estimating-data)
                   ( instance-of  ?02 ----------)
                   ( instance-of  ?03 aggregated-tasks-&-resources))
           (and ( input-data  ?01 ?a)
                ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))
```

```
(and (doc analyse-design-document –1
 " The occurrence of Analyse-Design-Document in the Dec-5 1schematic")
      (and (forall ?a
             (=> (activation-of  ?a analyse-design-document-1)
             (activation-of  ?a analyse-design-document)))

           (forall ?a
             (=>(activation-of  ?a analyse-design-document-1)
             (exists ?p
             (=> activation-of  ?p  decomposition-5 1)
             (subactivity-occurecne  ?a  ?p)))))

          (forall ?a
             (=>(activation-of  ?a analyse-design-document-1)
           (exists ?01
          (exists ?02
          (exists ?03
           (=> (and ( instance-of  ?01 design-document)
                    ( instance-of  ?02 ----------)
                    ( instance-of  ?03 product-design-data))
            (and ( input-data  ?01 ?a)
                 ( controls  ?02  ?a)
                  ( out-put data  ?03  ?a)))))))))


(and (doc identify-tasks-required-to-realise-product–1
 " The occurrence of Identify-Tasks-Required-to-Realise-Product in the Dec-5 1schematic")
      (and (forall ?a
             (=> (activation-of  ?a identify-tasks-required-to-realise-product-1)
             (activation-of  ?a identify-tasks-required-to-realise-product)))
           (forall ?a
             (=>(activation-of  ?a identify-tasks-required-to-realise-product-1)
             (exists ?p
             (=> activation-of  ?p  decomposition-5.1)
             (subactivity-occurecne  ?a  ?p)))))

       (forall ?a
             (=>(activation-of  ?a identify-tasks-required-to-realise-product-1)
          (exists ?01
          (exists ?02
          (exists ?03
           (=> (and ( instance-of  ?01 product-data)
                    ( instance-of  ?02 ----------)
                    ( instance-of  ?03 tasks))
            (and ( input-data  ?01 ?a)
                 ( controls  ?02  ?a)
                  ( out-put data  ?03  ?a)))))))))
```

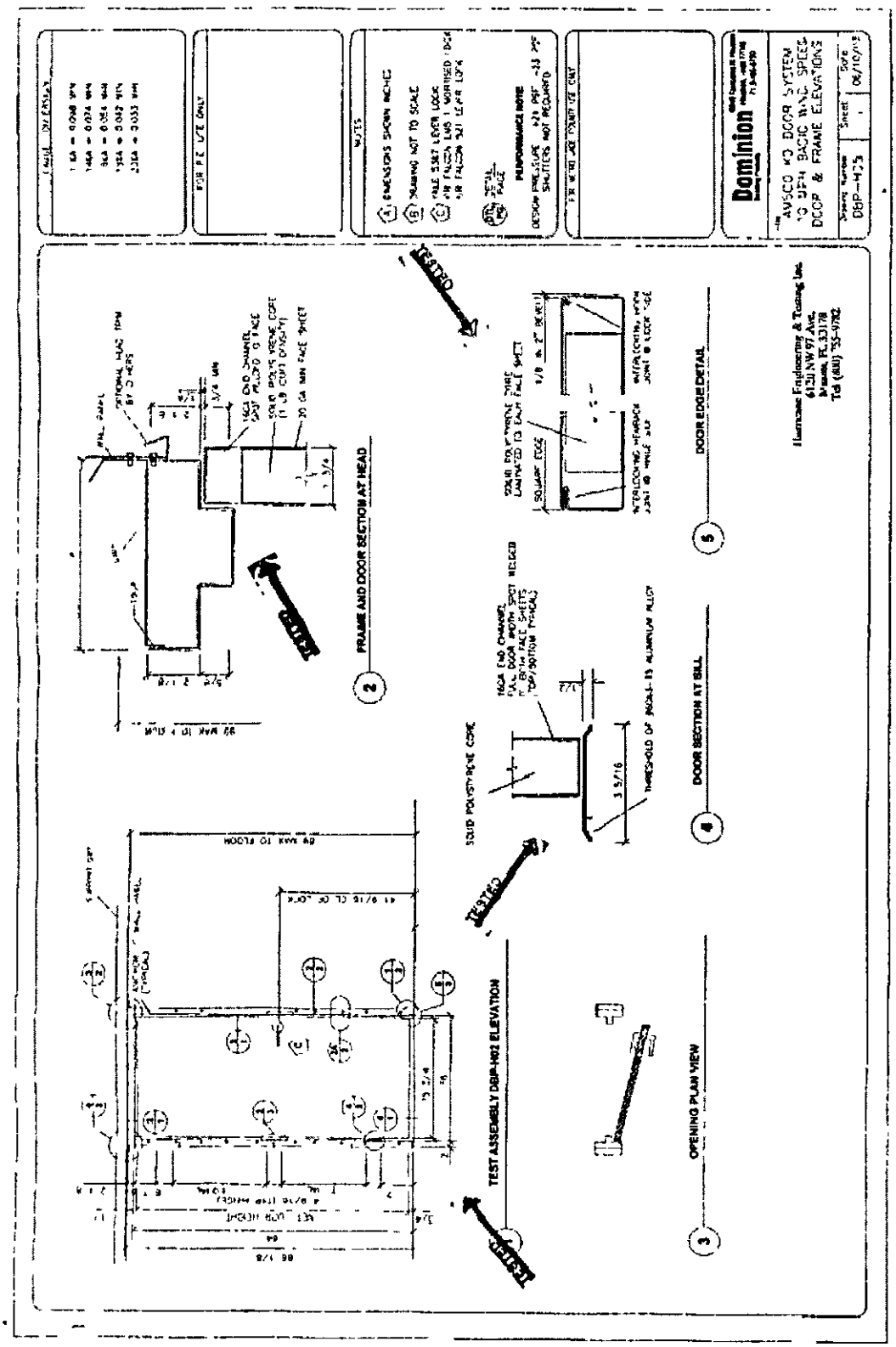
```
(and (doc identify-resources-required-to-perform-task –1
 " The occurrence of Identify-Resources-Required-to-Perform-Task in the Dec-5 1schematic")
      (and (forall ?a
             (=> (activation-of  ?a identify-resources-required-to-perform-task-1)
             (activation-of  ?a identify-resources-required-to-perform-task)))

           (forall ?a
             (=>(activation-of  ?a identify-resources-required-to-perform-task-1)
             (exists ?p
             (=> activation-of  ?p  decomposition-5 1)
             (subactivity-occurecne  ?a  ?p)))))

          (forall ?a
             (=>(activation-of  ?a identify-resources-required-to-perform-task-1)
           (exists ?01
          (exists ?02
          (exists ?03
           (=> (and ( instance-of  ?01 tasks-&-product)
                    ( instance-of  ?02 ----------)
                    ( instance-of  ?03 resources))
            (and ( input-data  ?01 ?a)
                 ( controls  ?02  ?a)
                 ( out-put data  ?03  ?a)))))))))))


(and (doc identity-scheduling-tasks–1
 " The occurrence of Identity-Scheduling-Tasks in the Dec-5 1schematic")
      (and (forall ?a
             (=> (activation-of  ?a identity-scheduling-tasks-1)
             (activation-of  ?a identity-scheduling-tasks)))
           (forall ?a
             (=>(activation-of  ?a identity-scheduling-tasks-1)
             (exists ?p
             (=> activation-of  ?p  decomposition-5 1)
             (subactivity-occurecne  ?a  ?p)))))
       (forall ?a
             (=>(activation-of  ?a identity-scheduling-tasks-1)
          (exists ?01
          (exists ?02
          (exists ?03
           (=> (and ( instance-of  ?01 aggregated-estimating-data-or-tasks-&-resources-of-product)
                    ( instance-of  ?02 ----------)
                    ( instance-of  ?03 scheduling-tasks-&-resources))
            (and ( input-data  ?01 ?a)
                 ( controls  ?02  ?a)
                 ( out-put data  ?03  ?a)))))))))))


(and (doc j1 "J1")
     (and (forall  ?j
          (=>(activation-of  ?j  j1)
           (exists ?p
             (=>(activation-of ?p decomposition 5 1)
               (subactivity-occurrence  ?j  ?p)))))
                (and (xor_split  j1 decomposition 5 1)
                       (and (subactivity  analyse-estimating-data  j1)
                              (and (subactivity  analyse-design-document  j1)))))))))
```

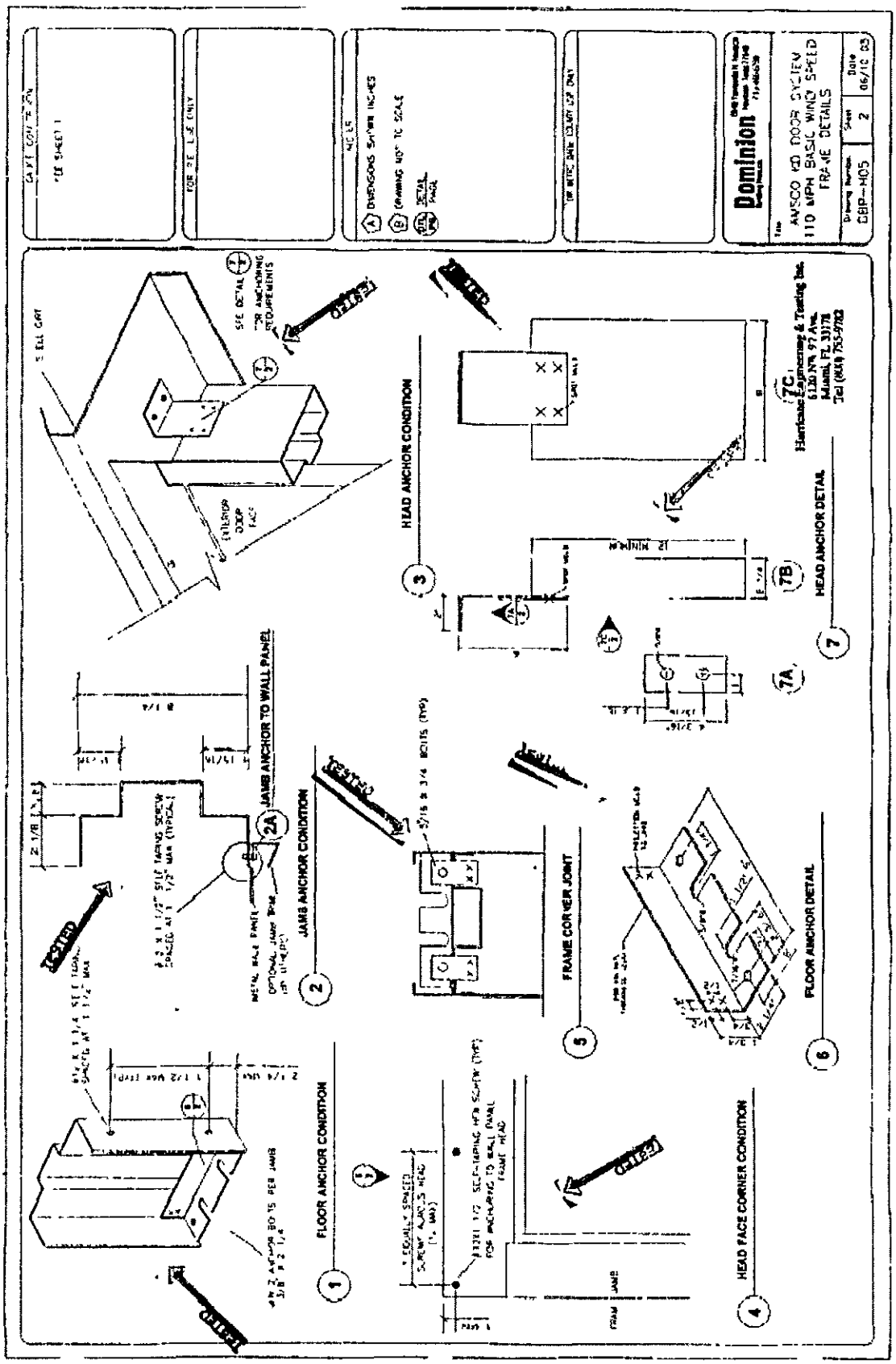
```
(and (doc j2 "J2")
     (and (forall ?j
          (=>(activation-of ?j j2)
           (exists ?p
             (=>(activation-of ?p decomposition 5 1)
               (subactivity-occurrence ?j ?p)))))
               (and (follows j2 identity-scheduling-tasks decompostion-5 1)
                (and (xor_split j2 decomposition 5 1)
                       (and (subactivity aggregate-estimating-tasks-&-resources j2)
                            (and (subactivity identify-resources-required-to-perform-tasks
j2)))))))))


(and (doc decomposition-9 1 "Decomposition of define construction sequence")
     (and (subactivity select-task -1 decomposition-8 1)
          (and (subactivity define-predessor-task-1 decomposition-8 1)
               (and (subactivity define-relation-between-tasks-1 decomposition-8 1)
                    (idef-process decompostition-8 1)))))))


(and (doc select task –1
 " The occurrence of Select Task in the Dec-8. schematic")
       (and (forall ?a
              (=> (activation-of ?a select task -1)
              (activation-of ?a select task)))

             (forall ?a
              (=>(activation-of ?a select task -1)
              (exists ?p
              (=> activation-of ?p decomposition-8 1)
              (subactivity-occurecne ?a ?p)))))))

        (forall ?a
              (=>(activation-of ?a select task -1)
             (exists ?01
            (exists ?02
            (exists ?03
             (=> (and ( instance-of ?01 scheduling-items)
                      ( instance-of ?02 ----------)
                      ( instance-of ?03 task))
              (and ( input-data ?01 ?a)
                   ( controls ?02 ?a)
                    ( out-put data ?03 ?a)))))))))))


(and (doc define predecessor –1
 " The occurrence of Define Predecessor in the Dec-8.1 schematic")
       (and (forall ?a
              (=> (activation-of ?a define predecessor -1)
              (activation-of ?a define predecessor)))

             (forall ?a
              (=>(activation-of ?a define predecessor -1)
              (exists ?p
              (=> activation-of ?p decomposition-8 1)
              (subactivity-occurecne ?a ?p)))))))
```

```
(forall ?a
      (=>(activation-of  ?a define predecessor -1)
   (exists ?01
  (exists ?02
  (exists ?03
   (=> (and ( instance-of  ?01 scheduling-items)
            ( instance-of  ?02 ----------)
            ( instance-of  ?03  predecessor-task))
    (and ( input-data  ?01 ?a)
         ( controls  ?02  ?a)
          ( out-put data  ?03  ?a)))))))))))


(and (doc define relation -1
" The occurrence of Define Relation in the Dec-8.1schematic")
     (and (forall ?a
            (=> (activation-of  ?a define relation -1)
            (activation-of  ?a define relation)))
           (forall ?a
            (=>(activation-of  ?a define relation -1)
            (exists ?p
            (=> activation-of  ?p  decomposition-8 1)
            (subactivity-occurecne  ?a  ?p)))))))

     (forall ?a
           (=>(activation-of  ?a define relation -1)
        (exists ?01
        (exists ?02
        (exists ?03
         (=> (and ( instance-of  ?01 scheduling-items)
                  ( instance-of  ?02 ----------)
                  ( instance-of  ?03  tasks-dependency))
          (and ( input-data  ?01 ?a)
               ( controls  ?02  ?a)
                ( out-put data  ?03  ?a)))))))))))
```

Appendix E

Drawing Representations of the Case Study Project


Dominion
AWSCO HO DOOR SYSTEM
TO DFH BASIC WIND SPEED
DOOR & FRAME ELEVATIONS
DBP-HO3
NOTES
PERFORMANCE NOTE
FRAME AND DOOR SECTION AT HEAD
DOOR EDGE DETAIL
DOOR SECTION AT SILL
OPENING PLAN VIEW
TEST ASSEMBLY DBP-HO2 ELEVATION
TESTED
Hurricane Engineering & Testing Inc.
6130 NW 99 Ave.
Miami, FL 33178
Tel (305) 715-9782


Dominion
ANSCO HD DOOR SYSTEM
110 MPH BASIC WIND SPEED
FRAME DETAILS
DBP-H05
HEAD ANCHOR CONDITION
JAMB ANCHOR CONDITION
FLOOR ANCHOR CONDITION
FRAME CORNER JOINT
FLOOR ANCHOR DETAIL
HEAD FACE CORNER CONDITION
HEAD ANCHOR DETAIL
JAMB ANCHOR TO WALL PANEL
Hurricane Engineering & Testing Inc.