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Assessment of Life Cycle Information Exchanges (LCie)

Understanding the Value-Added Benefit of a COBie Process

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October 2013

Prepared under CRADA-07-CERL-02 under the supervision of

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Construction Engineering
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Abstract

The Construction Operations Building information exchange (COBie) standard defines a minimum set of information needed to capture electronic construction handover information. COBie, however, does not define the specific processes used to create such information. Some designers and contractors may choose to capture the data by mirroring current document-based processes, transcribing information from required paper documents into a COBie-formatted file following beneficial occupancy. Other designers and contractors may choose to capture this information as data, as the work progresses, using COBie-centered project extranets. This report examines the costs and benefits of each approach, and compares them by analyzing differences in each business process that uses COBie information. The results indicate that a significant benefit may be achieved through the elimination of the non-value-added activities related to the handling, routing, transforming, checking, copying, and transmitting documents containing COBie data.

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Preface

This study was conducted for the US Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL) and the National Institute of Building Sciences (NIBS) by Kristine Fallon Associates, Inc., under CRADA-07-CERL-02, "Cooperative Research and Development Agreement Between US Army Engineer Research and Development Center–Construction Engineering Laboratory and National Institute Of Building Sciences." The CRADA supports Research, Development, Test, and Evaluation (RDT&E) Program Element 622784 T41, "Military Facilities Engineering Technology"; Project 157249, "Life-Cycle Model For Mission Ready Sustainable Facilities (LCM)." The ERDC-CERL project manager was Dr. E. William East (CEERD-CF-N), and the NIBS project manager was Dana "Deke" Smith.

The work was supervised and monitored by the Engineering Processes Branch (CF-N) of the Facilities Division (CF), ERDC-CERL. At the time of publication, Donald K. Hicks was Chief, CEERD-CF-N; L. Michael Golish was Chief, CEERD-CF; and Martin J. Savoie was the Technical Director for Adaptive and Resilient Installations. The Deputy Director of ERDC-CERL was Dr. Kirankumar Topudurti and the Director was Dr. Ilker Adiguzel.

The authors of this report would like to thank the Chicago Transit Authority and the University of Chicago for their contributions to this research. Both organizations provided access to real-world data used in developing the COBie Calculator.

COL Jeffrey R. Eckstein was the Commander of ERDC, and Dr. Jeffery P. Holland was the Director.

Unit Conversion Factors

Multiply	By	To Obtain
feet	0.3048	meters
gallons (U.S. liquid)	3.785412 E-03	cubic meters
mils	0.0254	millimeters
pounds (mass)	0.45359237	kilograms
square feet	0.09290304	square meters
yards	0.9144	meters

1 Introduction

1.1 Background

For years, traditional computer-aided design (CAD) products have had the capability of providing three-dimensional (3D) geometry and assigning attributes to rooms and equipment. The innovative aspect of Building Information Modeling (BIM) is that it creates a computable building description. The ability to use a single computable building description for multiple purposes — e.g., structural analysis, energy analysis, drawing production, clash detection — not only speeds project design and construction, it also improves the quality and coordination of the various analyses and documents produced.

In traditional practice, the drawings, or even the BIM, form one description of the building, the design specifications another, and the product data submitted during construction, a third. During design and construction, a great deal of time is spent by the project team coordinating and validating these multiple descriptions, both internally — coordination of drawings and schedules — and with each other.

During the operations and maintenance phase, facility personnel often create derivative documents to suit the needs of their particular responsibilities. As each group's activities lead to changes in the building configuration, these changes may be noted on the group's "local" documents but never transferred to those maintained by other groups. If a major renovation is required, a design consultant must first measure and inventory the building to create a new set of drawings reflecting all changes. There is constant activity searching for, validating, copying, reformatting, and recreating information.

In 2004, a report published by the National Institute of Standards and Technology (NIST) compared this scenario with one in which, "individuals and systems would be able to identify and access information seamlessly, as well as comprehend and integrate information across multiple systems" (Gallaher et al. 2004). The report defined this seamless interchange as "interoperability". The authors of the report quantified the value of capital facilities set in place in the United States in 2002 to be $374 billion. They estimated that the 2002 cost of lack of interoperability was $15.8 billion.

The fact that BIM technology creates computable, or machine-readable, building descriptions is not quite sufficient to achieve interoperability. In order for the building information to be interoperable, it must also conform to a common data model, or schema, that defines the class libraries – the object definitions, classifications, properties and usage. The value of a common data model cannot be overstated. Once the common class libraries are implemented, it becomes possible to automate the checking of a BIM for both its conformance to the data model and for its content.

A good case study is provided by the Southern Company, an Atlanta-based energy company serving the Southeast (Power 2012). Southern Company created a complete data-centric design strategy to ensure consistent and accurate asset information transmission from design through operations and maintenance. Central to this effort was the implementation of consistent class libraries across the entire organization.

The Southern Company automated data validation. For each project milestone, they established the fields of information required about each object type and were able to automate validation and rejection of non-conforming submissions. They were also able to report on variances, which was particularly useful late in projects when design changes can have major impact. This allowed the team to identify, for example, an equipment substitution that changed power requirements.

Finally, their solution understood relationships among data elements and was able to associate the data elements with other elements and with documents.

The Southern Company effort, which involved developing the class libraries and the data streams from authoring applications, as well as the data quality rules and variance reports, took five years and cost $1.7 million. However, it is conservatively estimated to be saving over $2 million per year per 100 employees in time spent in electronic document searches. It is important to note that Southern Company already had a document management system in place and that these savings result from greater precision in document searches resulting from both data normalization and the relationships between data elements. In addition, savings by the commissioning team of 45 persons are estimated to be $2 million over 2 years, thanks to access to quality, normalized data.

Although the Southern Company's results are impressive, the 5 year, $1.7 million effort cannot be replicated by many owners. However, similar results can be achieved through the adoption of open standards. In the United States, these standards are contained in the National BIM Standard – United States™, or NBIMS (National Institute of Building Sciences 2012a).

For NBIMS, *Industry Foundation Classes (IFC) for Data Sharing in the Contruction and Facility-Management Industries* (ISO 16739:2013), provide a facility data model that is comprehensive, internationally recognized, and implemented in many of the software tools used in the capital facilities industry. This gives organizations the option of adopting, rather than inventing, a proven data model and model views. Open standards support not only internal processes, where the owner can customize the software, but also those that require data exchanges with outside partners.

Developing the "data streams" from BIM applications involves defining the information that must be passed from upstream activities to inform and enable downstream activities. These are called *exchange requirements*. A Model View Definition (MVD) formally defines a subset of the IFC entities and attributes that is needed to satisfy one or many exchange requirements. One such MVD, already developed, is the Facility Management Handover view (Espedokken 2012).

The Construction to Operations Building Information Exchange (East 2013), or COBie, is built upon the IFC Facility Management Handover MVD (East et al. 2013). COBie defines an incremental approach to capturing information about managed or maintained assets, such as space and equipment data, as it is created during design, construction, and commissioning. Designers provide floor space and equipment types. Contractors provide make, model, and serial numbers of installed equipment. COBie-compliant BIM authoring tools export the information in COBie format.

COBie also supports the association of data elements with "Zones" and "Systems." It supports the tracking of both issues and documents related to the elements, i.e., spaces and equipment.

COBie format data may be provided in three interoperable formats. The first two formats—the STEP Physical File Format and the ifcXML format—are based on the Industry Foundation Class model. The third format is a

SpreadsheetML. These formats were designed for software-to-software exchanges; although, the spreadsheet form of COBie has the benefit of allowing human interpretation and editing.

1.2 Objectives

The purpose of this project is to document the business case for standards-based interoperability. The COBie Calculator tool was developed to allow organizations to estimate their savings, based on their specific facility parameters and cost factors, if they were able to achieve such "interoperability" of space and equipment data—the two major categories of facility information that must be transferred from the project team to operations and maintenance. The savings derive from three basic innovations:

1. The ability to programmatically check the space and equipment data for completeness, conformance to data standards, and conformance to requirements. This improves the information quality and substantially reduces validation costs.
2. The substitution of electronic distribution, review processes, and approvals for paper-based processes in design and construction. This reduces copying, reformatting, and handling costs but does not address data quality or reduce rework.
3. The use of a standard, structured data format for moving space and equipment information through the project process and into facility management without data loss or need for data manipulation. This reduces searching, reformatting, and recreating costs.

1.3 Approach

COBie is designed to support an aggregation and flow of information from design systems to construction systems to facility-management systems, without any reformatting required.

In order for this information to flow "seamlessly," an automated workflow is required to transfer the COBie data based on certain trigger events. Many of these trigger events are approvals based on a review. Such reviews occur multiple times during the planning, design, and construction of a facility. The ability to automate the checking of a COBie file for content and completeness further exploits the interoperability of the data to reduce costs in these highly iterative work processes.

Software products exist for workflow automation and for automated checking of structured data, such as a COBie file. There are also BIM authoring products that export COBie data and facility management systems that import it. The purpose of the COBie Calculator is to quantify the potential for cost savings in a scenario of true interoperability.

Only the costs associated with the documentation, specification, and fulfillment of managed asset requirements (space and maintained equipment) are considered in this Calculator. However, the methodology used in developing the COBie Calculator could be readily applied to estimate cost savings associated with other types of standards-based information exchanges throughout the facility life cycle.

1.3.1 How savings are achieved

Chapter 2 describes the facility life cycle processes and current methodology for the contracted exchanges required (East and Nisbet 2012). During these processes, there are activities that add value: updating facility standards to align with new technology, studying design options to determine the best and most cost-effective solution, researching building products to develop a high-performance specification, and so forth. However, these activities are often accompanied by many non-value-added tasks, such as reformatting documents, converting digital information to a different file format, copying paper documents, creating and logging transmittals, mailing hard copies, and transferring review comments to multiple document copies, to name a few. Another group of necessary but non-value-added activities involves the detection of errors after the fact. This very time-consuming checking takes place primarily during design and submittal reviews. To streamline the facility life cycle processes, the goal is not to reduce the time or funding allocated to value-added activities, but to eliminate or minimize the time and costs associated with non-value-added ones.

Chapter 3 explores the potential for process improvement upon implementing the three basic innovations described above:

1. automated checking
2. elimination of paper and the use of a managed collaboration system
3. the use of COBie for moving space and equipment information through the project process and into facility management.

Cost variables are assigned to each life-cycle process tasks that could be eliminated, automated, or streamlined through the use of COBie in conjunction with a managed collaboration system. “Current” values for these cost variables are then estimated based on a paper-based life cycle process.

Chapter 4 applies new values to the cost variables identified in Chapter 3, based on the future, improved life-cycle processes. These improvements lead to complete elimination of some tasks, automation of other tasks, and streamlining of additional tasks, thus reducing non-value added efforts and expenses, errors, and process cycle times. The resulting opportunities for savings can be classified as follows:

1. VALIDATION savings from the ability to programmatically check the space and equipment data
2. COPYING savings from reliance on electronic documents and data as the project record
3. HANDLING savings from the adoption of managed project collaboration and management systems
4. SEARCHING savings from the ability to electronically compare information
5. REFORMATTING savings from adoption of a single, open standard data format for information relating to managed assets
6. RECREATING savings from the use of a standard, structured data format for moving space and equipment information through the project process and into facility management.

The technology components exist today to achieve savings in all of these areas. Many organizations are already using managed electronic collaboration systems and loading contractor-provided data into their facility management systems. The COBie Calculator is designed to allow organizations to estimate their potential savings on a very granular level. Users of the Calculator can choose to remove Current Process costs that have already been eliminated and to pursue all or some potential savings areas.

Chapter 5 describes the COBie Calculator and how to use it. An overview of the Calculator’s layout is provided as well as a detailed description of the information contained in each tab. Some of the tabs require the user to input data. Other tabs display the Calculator’s results. Users of the Calculator should not attempt to alter the data these tabs. An example is also presented to illustrate how the Calculator works.

Chapter 6 provides example project analyses, and Chapter 7 explores the relative importance of the various cost variables on the final outcome.

Chapter 8 provides an example building program analysis.

1.3.2 Industry-wide implementation

The ultimate vision is that the capital facilities industry as a whole will transition to the use of standard structured data instead of paper or e-paper documents. Changes needed to support this transition include the following:

- Software vendors serving the capital facilities industry must provide comprehensive support of computable building descriptions in standard formats, including both import and export capabilities.
- Manufacturers must provide a standard set of information about each product type in a standard format.
- Authorities Having Jurisdiction (AHJ), such as code officials, must accept electronic documents, signatures, and professional stamps.
- Owners must adjust their contract terms, deliverable requirements and review processes to maximize the technology-driven savings.
- Designers and Contractors must develop the technical capabilities to provide these highly structured electronic deliverables and like owners adjust their work processes to take advantage of the potential savings.

2 Current LCie Process Descriptions

2.1 Prior Research

A number of published and unpublished studies have contributed to an understanding of current life cycle processes in the capital facilities industry, the tasks involved in each process, the actors performing the tasks, and the cost factors associated with the tasks, as well as opportunities for cost savings and reduced execution times through use of structured information exchanges such as COBie.

The paper titled *A Life-Cycle Model for Contracted Information Exchange* (East et al. 2010) discussed transforming paper-based deliverables into usable building information by eliminating current, document-centric information exchanges and utilizing more efficient COBie based exchanges. The report also emphasized that since contracting procedures are not changed, the COBie based life cycle model provides a cost effective method for delivering as-built and as-maintained BIM data.

In the article titled *Value-added Analysis of the Construction Submittal Process* (East and Love 2011) three main information exchanges were identified and analyzed based on the value-added methodology proposed by William Trischler (1996). By assigning tasks to the most common project delivery methods and reviewing those tasks based on time required to complete, the authors of the report were able to demonstrate a clear time savings by eliminating the non-value added tasks from a process. Such approaches are beginning to be applied in construction planning such as Lean Construction.

The paper titled, *Analysis of Life-Cycle Information Exchange* (East and Nisbet 2010) provided a cost model within an application called the COBie2 Calculator that allowed the cost of traditional information exchanges to be compared against those utilizing open data standards. Data from a medical clinic that was completed around the time of the report was utilized to compare the potential savings associated with moving from a document centric information exchange to one utilizing a COBie workflow.

2.2 Authoritative sources for current life cycle processes

Current design and construction processes are well-defined in the capital facilities industry. The business process diagram in Appendix A shows the overall life cycle process. Many of the data exchanges are stipulated in legally binding documents, such as contracts and project specifications. Predesign and post-construction activities are more organization-specific. In the case of the Department of Defense (DoD), there are standard procedures for planning and project definition. Post-construction, facility operations and management activities are less standardized.

Three military departments are contained within the Department of Defense: The Department of the Army, the Department of the Navy, and the Department of the Air Force. Buildings associated with these three departments amount to over 545,700 throughout the United States and world (Department of Defense 2008). Each of these departments utilizes both Unified Facilities Criteria (UFC) and Unified Facilities Guide Specifications (UFGS) as the basis for developing projects from planning through construction. These specific guides are discussed below and compared to the industry standard documents that define facility life cycle project requirements outside of the government realm.

Facility life cycle processes described below are derived from 4 major sources:

- **AIA B101-2007** – Published by the American Institute of Architects (AIA), B101 is the flagship 2007 owner-architect agreement upon which other AIA standard owner-architect agreements are based. B101 describes and explains the traditional architectural design services to be provided on a project. Five design phases are defined: Schematic Design, Design Development, Construction Documents, Bidding or Negotiation, and Construction Administration, and deliverables are associated with each phase. Since this AIA document's use is intended for a wide range of clients and project types, deliverable requirements are not highly specific.
- **CSI MasterFormat** – Construction Specifications Institute's (CSI) MasterFormat (2004) is the widely accepted standard for organizing project specifications during design for post-design phase activities. Specifically, specification section 01 33 00 Submittal Procedures provides direction regarding what submittals and how many copies of each are required during the pre-construction phase of the project.

- **Unified Facilities Criteria (UFC)** – Unified Facilities Criteria (UFC) (National Institute of Building Sciences 2012b) documents provide planning, design, construction, sustainment, restoration, and modernization criteria, and apply to the military departments, the defense agencies, and the DoD field activities. In contrast to the AIA B101 document, these documents provide specific design criteria for several building types. Submission requirements for each design milestone are also provided.
- **Unified Facilities Guide Specifications (UFGS)** – Unified Facilities Guide Specifications (UFGS) (NIBS 2012c) are a joint effort of the U.S. Army Corps of Engineers (USACE), the Naval Facilities Engineering Command (NAVFAC), the Air Force Civil Engineer Support Agency (HQ AFCESA), the Air Force Center for Engineering and the Environment (HQ AFCEE) and the National Aeronautics and Space Administration (NASA). UFGS are for use in specifying construction for the military services. UFGS is very closely based on CSI MasterFormat specifications. Regarding the submittal procedures section, the section names and numbers for both UFGS and MasterFormat are identical; however, submittal requirements vary based on the government's specific needs.

For a side by side comparison of AIA/CSI requirements versus UFC/UFGS submission requirements, refer to the chart provided in Appendix B. This chart outlines the standard submittals for each project phase from predesign through operations and maintenance.

2.3 Modes of information exchange in current processes

2.3.1 Document-Centric, Paper-Based, Physical Exchange

This paper-based method requires manually copying and handling paper documents—reproducing, sorting, filing, logging and shipping. Typically, numerous copies of each required submission must be distributed to team members in order to meet contractual requirements. Currently, UFC documents indicate there are four design phase submissions. Although electronic deliverables are noted in the guidelines, hard copies are typically requested by the reviewing parties. The Current Process documented in this report assumes 6 copies for each submission.

Cost factors associated with this exchange include both labor and out-of-pocket costs related to copying and handling these documents. In addi-

tion, the physical handling and delivery time means there is a delay in making information available to the intended recipients. This type of exchange is considered the baseline, or "Current Process."

2.3.2 Document-Centric, File-Based, E-mail Exchange

The file-based e-mail method of exchange eliminates the physical paper from the initial distribution process, but does not remove the labor associated with manually sorting, filing and logging the electronic documents. Although information is being sent electronically, it still requires logging of the exchange by both the initiating party and the recipient. Although electronic copies are transmitted, documents are often printed for review. Mailing costs are eliminated with this process, but printing and reproduction costs are often shifted from the sender to the recipient. Sorting, filing and logging tasks are still necessary.

2.3.3 Document-Centric, File-Based, Managed Exchange

This method provides a managed data exchange by an electronic collaboration system, accessible to both the sender and the recipient that automates the clerical steps of filing and logging. The data managed are electronic documents.

This type of exchange reduces both costs and lag time. Delivery costs are eliminated since all information is transferred electronically. Although documents must be uploaded to the system and directed to intended recipients, transmitting and logging the documents is automated, with resulting labor savings. User actions (forward, view, approve, and so forth) are automatically recorded and instantly visible to authorized team members. A single, authoritative version of all project documents is stored in one location for everyone's use/review throughout the project duration. Nevertheless, the electronic documents are typically printed to perform reviews.

This approach is compared to both the baseline Current Process and the Expected Process in Chapter 6.

2.4 Current life cycle processes

The processes discussed below provide information on how projects are typically completed from inception through construction. Each process contains an information exchange, which is a deliverable that must be

completed. Each of the processes below is based on UFC and UFGS requirements.

Although current UFC requirements state that deliverables during the Design life cycle processes are to be submitted electronically, project managers report that paper deliverables are also required in order to complete the review process. Therefore, the Current Processes described below assume paper deliverables. The diagrams in Appendix C detail the discreet tasks and information exchanges required to complete each process and highlight potential opportunities for savings, which will be further discussed in Chapter 4.

2.4.1 Study and define needs

Life Cycle Process:	Study and Define Needs
Diagram:	Figure 18 in Appendix C
Actor(s):	Owner
Description:	Standard facility information must be available in order to determine the basic requirements for a potential project. The Owner identifies the need and either develops technical criteria for the facility if none exist or utilizes existing technical criteria if available. If it does exist, this information must be checked for relevancy every five years to remain consistent with overall needs.
Information Content:	▪ Facility Program
Contracted Exchange/Deliverable:	Facility Criteria

2.4.2 Develop design criteria

Life Cycle Process:	Develop Design Criteria
Diagram:	Figure 19 in Appendix C
Actor(s):	Owner
Description:	Specification information for equipment based on facility criteria is generated early in the planning process by the Owner. This information must be checked for relevancy every five years to remain consistent with overall needs.
Information Content:	▪ Type Data ▪ Product Data
Contracted Exchange/Deliverable:	Discipline Specification

2.4.3 Study technical feasibility

Life Cycle Process:	Study Technical Feasibility
Diagram:	Figure 20 in Appendix C
Actor(s):	Owner and Architect or Planner
Description:	The *Feasibility Study* allows the Owner to evaluate different options (typically three) based on the identified requirements before finalizing specific information about a project. The Architect or Planner develops the study based on the information contained in the Facility Criteria and Discipline Specification information exchanges.
Information Content:	Feasibility Study Options
Contracted Exchange/Deliverable:	Feasibility Study

2.4.4 Communicate results decisions

Life Cycle Process:	Communicate Results Decisions
Diagram:	Figure 21 in Appendix C
Actor(s):	Owner
Description:	Initial criteria about a project must be established in order to evaluate the project feasibility. The Owner evaluates the Facility Criteria, Discipline Specifications, and Feasibility Study to determine whether or not to move forward with the project.
Information Content:	▪ Detailed Project Scope ▪ Preliminary Budgetary Cost Information ▪ Site Location & Approval ▪ Economic Analysis ▪ Facility Planning Data
Contracted Exchange/Deliverable:	Project Definition

2.4.5 Develop program – space program

Life Cycle Process:	Develop Program – Space Program
Diagram:	Figure 22 in Appendix C
Actor(s):	Owner's Representative and Architect or Planner
Description:	Once the Project Definition has been established and approved, further development of the project requirements can occur. The Architect or Planner evaluates information contained in the Project Definition information exchange to identify space needs based on the facility type. Space requirements, based on facility type, are located online in electronic document format and must be downloaded. These documents are typically printed by the end user. If no standard facility space criteria exist, it must be created by referencing similar facility types.
Information Content:	▪ Facility Space Requirements
Contracted Exchange/Deliverable:	Space Program

2.4.6 Develop program – product program

Life Cycle Process:	Develop Program – Product Program
Diagram:	Figure 23 in Appendix C
Actor(s):	Owner's Representative and Architect or Planner
Description:	The Architect or Planner evaluates information contained in the Project Definition information exchange to identify product needs based on the facility type. Requirements for products based on facility type are located online in electronic document format and must be downloaded. These documents are typically printed by the end user. If no standard facility product criteria exist, it must be created by referencing similar facility types.
Information Content:	▪ Facility Product Requirements
Contracted Exchange/Deliverable:	Product Program

2.4.7 Prepare invitation to bid and receive proposals (pre-design)

Life Cycle Process:	Prepare Invitation to Bid and Receive Proposals (Pre-Design)
Diagram:	in Appendix C
Actor(s):	Owner's Representative and Architect
Description:	Once the major criteria have been determined, the Owner's Representative prepares and distributes a *Request for Proposal (RFP)*.
Information Content:	▪ Project Definition ▪ Space Program ▪ Product Program
Contracted Exchange/Deliverable:	Request for Proposal (RFP)

2.4.8 Explore concepts – design early

Life Cycle Process:	Explore Concepts – Design Early
Diagram:	Figure 25 in Appendix C
Actor(s):	Owner's Representative, Architect and Consultants
Description:	The Architect utilizes the specific information produced during pre-design to develop a solution that reflects the requirements stated in the Project Definition, Space Program, and Product Program. Currently, the owner requires 6 hard copies to be submitted for each review cycle. The Architect performs a QA/QC check before submitting to the Owner's Representative. After receiving the submission, the Owner's Representative validates the documents (reviews) and provides comments to the Architect. The Architect and Consultants are then required to update the documents based on the comments. After revisions are made, the Architect resubmits.
Information Content:	▪ Concept Design Drawings ▪ Cost Estimate ▪ Calculations
Contracted Exchange/Deliverable:	Design Early

2.4.9 Develop design – design schematic

Life Cycle Process:	Develop Design – Design Schematic
Diagram:	Figure 26 in Appendix C
Actor(s):	Owner's Representative, Architect and Consultants
Description:	The Architect further develops the approved Design Early deliverable documents to produce the Design Schematic documents. Currently, the owner requires 6 hard copies to be submitted for each review cycle. The Architect performs a QA/QC check before submitting to the Owner's Representative. After receiving the submission, the Owner's Representative validates the documents and provides comments to the Architect. The Architect and Consultants are then required to update the documents based on the comments. After revisions are made, the Architect resubmits.
Information Content:	▪ Basis of Design Narrative ▪ Design Schematic Drawings ▪ Energy Analysis ▪ Life Cycle Cost Analysis ▪ Cost Estimate ▪ Geotechnical Report ▪ Calculations ▪ Environmental Report
Contracted Exchange/Deliverable:	Design Schematic

2.4.10 Develop design – product type template, product type candidate

Life Cycle Process:	Develop Design – Product Type Template, Product Template
Diagram:	Figure 26 in Appendix C
Actor(s):	Specifier
Description:	As the design progresses, performance characteristics and suitable products for the building systems are identified. System types and equipment are identified by the Specifier based on the facility requirements. Six copies are required to be submit-

	ted for review. Some products are defined in more detail by identifying manufacturers and model numbers which meet requirements (Basis of Design). In these cases, 3 qualifying products should be listed.
Information Content:	▪ Outline Specifications
Contracted Exchange/Deliverable:	Product Type Template

2.4.11 Develop design – design coordinated

Life Cycle Process:	Develop Design – Design Coordinated
Diagram:	Figure 27 in Appendix C
Actor(s):	Owner's Representative, Architect and Consultants
Description:	The Architect further develops the approved Design Schematic deliverable documents to produce the Design Coordinated documents. In addition, the building systems are coordinated to eliminate spatial interferences. This is the major coordination submittal before the final delivery package. The owner requires 6 hard copies to be submitted for each review cycle. Due to the higher level of coordination and increase in number of interested reviewing parties, more copies are sometimes needed. The Architect performs a QA/QC check before submitting to the Owner's Representative. After receiving the submission, the Owner's Representative validates the documents and provides comments to the Architect. The Architect and Consultants are then required to update the documents based on the comments. After revisions are made, the Architect resubmits.
Information Content:	▪ Basis of Design Narrative ▪ Design Coordinated Drawings ▪ Energy Analysis ▪ Life Cycle cost Analysis ▪ Cost Estimate ▪ Geotechnical Report ▪ Calculations

	▪ Environmental Report ▪ Project Information Form
Contracted Exchange/Deliverable:	Design Coordinated

2.4.12 Develop design – product type candidate

Life Cycle Process:	Develop Design – Product Type Candidate
Diagram:	Figure 27 in Appendix C
Actor(s):	Specifier
Description:	The performance requirements of building systems and equipment are further refined and documented by the Specifier during this phase. Any equipment, products, or systems not selected previously are identified. Specific manufacturers and model numbers are noted. Three qualifying products are identified. Six copies are submitted for each review cycle.
Information Content:	▪ Specifications ▪ Submittal Register
Contracted Exchange/Deliverable:	Product Type Candidate

2.4.13 Finalize design – design final

Life Cycle Process:	Finalize Design – Design Final
Diagram:	Figure 28 in Appendix C
Actor(s):	Owner's Representative, Architect and Consultants
Description:	The Design Final package is the final set of contract documents ready for bid solicitation by the Owner. This final design deliverable does not require another review by the Owner's Representative.
Information Content:	▪ Basis of Design Narrative ▪ Design Final Drawings ▪ Energy Analysis ▪ Life Cycle cost Analysis ▪ Cost Estimate

	▪ Geotechnical Report ▪ Calculations ▪ Environmental Report ▪ Project Information Form ▪ Quality Control Data ▪ Color Documentation Binder ▪ Code Compliance Certification
Contracted Exchange/Deliverable:	Design Final

2.4.14 Finalize design – product type candidate

Life Cycle Process:	Finalize Design – Product Type Candidate
Diagram:	Figure 28 in Appendix C
Actor(s):	Specifier
Description:	At this phase of the project all equipment and system types must be identified by the Specifier. Product information from the Design Coordinated phase is incorporated into to this phase. Three (3) qualifying products for each type required must be listed.
Information Content:	▪ Specifications ▪ Submittal Register
Contracted Exchange/Deliverable:	Product Type Candidate

2.4.15 Prepare invitation to bid and receive proposals (post-design)

Life Cycle Process:	Prepare Invitation to Bid and Receive Proposals (Post-Design)
Diagram:	Figure 29 in Appendix C
Actor(s):	Owner's Representative
Description:	Once the design is complete, the Owner packages the Design Final Documents information together with other owner-supplied information (e.g., contractual terms) and creates a *Request for Proposals (RFP)* Package. This becomes the official bid set.

Information Content:	▪ Final Design Documents ▪ Specifications
Contracted Exchange/Deliverable:	Request for Proposal (RFP)

2.4.16 Respond to pre-proposal inquiries

Life Cycle Process:	Respond to Pre-Proposal Inquiries
Diagram:	Figure 30 in Appendix C
Actor(s):	Owner's Representative, Architect and Contractor
Description:	Before finalizing a bid proposal, the Contractor typically requests additional information or clarification of some bid documents.
Information Content:	▪ Clarification Request
Contracted Exchange/Deliverable:	Inquiry Issue (Clarification)

2.4.17 Develop pre-construction plan

Life Cycle Process:	Develop Pre-Construction Plan
Diagram:	Figure 31 in AppendixC
Actor(s):	Contractor
Description:	The Contractor is required to develop a Pre-Construction Plan that describes how the Contractor will make provisions for managing the construction of the facility. This is sent as a submittal package. Refer to the Submittal Package exchange for detailed requirements related to transmitting and handling Pre-Construction Plan submittals.
Information Content:	▪ Equipment Lists ▪ Certificates of Insurance ▪ Surety Bonds ▪ List of Proposed Subcontractors ▪ List of Proposed Producers ▪ Construction Progress Schedule ▪ Network Analysis Schedule ▪ Submittal Register ▪ Schedule of Prices ▪ Health and Safety Plans

	▪ Work Plan ▪ Quality Control plan ▪ Environmental Protection Plan
Contracted Exchange/Deliverable:	Pre-Construction Plan

2.4.18 Identify discrepancies

Life Cycle Process:	Identify Discrepancies
Diagram:	Figure 32 in Appendix C
Actor(s):	Owner's Representative, Architect and Contractor
Description:	The Contractor submits a Request for Information (RFI) to ask for clarification during the construction process. These questions may be due to but not restricted to ambiguities or contradictions in the drawings or to site conditions.
Information Content:	▪ Request for Information
Contracted Exchange/Deliverable:	Inquiry Issue (RFI)

2.4.19 Prepare submittal information – product type selection

Life Cycle Process:	Prepare Submittal Information - Product Type Selection
Diagram:	Figure 33 in Appendix C
Actor(s):	Contractor, Sub-Contractors
Description:	The Contractor and Sub-Contractors gather information for products identified in the Design Final documents and prepare submittals. Refer to the Submittal Package exchange for detailed requirements related to transmitting and handling Product Type Selection submittals.
Information Content:	▪ Product Data ▪ Samples ▪ Design Data ▪ Test Reports ▪ Certificates ▪ Manufacturer's Instructions ▪ Manufacturer's Field Reports

	▪ Operations and Maintenance Data
Contracted Exchange/Deliverable:	Product Type Selection

2.4.20 Prepare submittal information – system layout

Life Cycle Process:	Prepare Submittal Information - System Layout
Diagram:	Figure 34 in Appendix C
Actor(s):	Contractor, Sub-Contractors
Description:	The Contractor and Sub-Contractors review information for products identified in the Design Final documents and prepare shop drawings. Refer to the Submittal Package exchange for detailed requirements related to transmitting and handling System Layout submittals.
Information Content:	▪ Shop Drawings
Contracted Exchange/Deliverable:	System Layout

2.4.21 Organize submittal information

Life Cycle Process:	Organize Submittal Information
Diagram:	Figure 35 in Appendix C
Actor(s):	Owner's Representative, Architect and Contractor
Description:	The Contractor organizes the required submittal information and creates Submittal Packages to be reviewed by the Owner's Representative and/or Architect. Six hard copies are required to be submitted for review.
Information Content:	▪ Pre-Construction Plan ▪ Product Type Selection ▪ System Layout (Refer to the Information Content for each of these individual items for a complete list of included information.)
Contracted Exchange/Deliverable:	Submittal Package

2.4.22 Perform submittal review – submittal issue

Life Cycle Process:	Perform Submittal Review
Diagram:	Figure 36 in Appendix C
Actor(s):	Architect, Consultants and Contractor
Description:	The Architect and/or Sub-Consultants validate the submittals provided by the Contractor and provide comments. Six hard copies are required.
Information Content:	▪ Marked-Up Submittal Package ▪ Submittal Review Comments
Contracted Exchange/Deliverable:	Submittal Issue

2.4.23 Provide resources

Life Cycle Process:	Provide Resources
Diagram:	Figure 37 in Appendix C
Actor(s):	Contractor
Description:	The Contractor contacts a Supplier to order equipment and materials. The Supplier then provides a price quote to the Contractor for the equipment and/or materials. The Contractor verifies the specifications of the equipment and/or materials in the quote against approved submittal documentation and then submits them to the Owner's Representative and/or Architect for approval.
Information Content:	▪ Purchase Order
Contracted Exchange/Deliverable:	Purchase Order

2.4.24 Execute construction activities

Life Cycle Process:	Execute Construction Activities
Diagram:	Figure 38 in Appendix C
Actor(s):	Contractor

Description:	The Contractor installs the building equipment, materials, and systems using the design final drawings, approved shop drawings, product data, and manufacturer's instructions.
Information Content:	▪ Design Final Drawings and Product Type Candidate ▪ Approved Shop Drawings ▪ Manufacturer's Instructions
Contracted Exchange/Deliverable:	Product Installation

2.4.25 Perform equipment testing

Life Cycle Process:	Perform Equipment Testing
Diagram:	Figure 39 in Appendix C
Actor(s):	Contractor
Description:	After the Contractor completes the installation process, the equipment/systems must be tested by activating the equipment. This testing must be completed with the Owner's Representative and Manufacturer's representative present.
Information Content:	▪ Equipment Start-Up Test Results
Contracted Exchange/Deliverable:	Equipment Start-Up Report

2.4.26 Inspect and approve work

Life Cycle Process:	Inspect and Approve Work
Diagram:	Figure 40 in Appendix C
Actor(s):	Architect and Contractor
Description:	When the Contractor has completed installation of equipment or systems, a notification is sent to the Architect indicating the installed item is ready for inspection/observation. The Architect conducts regular inspections of the installed construction work. The findings of the inspections including any deficiencies with the installation of the con-

	struction work are documented in a report. If deficiencies are identified in the inspection report, the Contractor corrects them and then requests a re-inspection.
Information Content:	▪ Observation Field Report
Contracted Exchange/Deliverable:	Product Inspection

2.4.27 Define, record and certify discrepancies

Life Cycle Process:	Define, Record and Certify Discrepancies
Diagram:	Figure 41 in Appendix C
Actor(s):	Architect and Contractor
Description:	The Architect creates a final punchlist based upon a survey of the completed construction work. The Contractor corrects the deficiencies identified in the punchlist. The Architect verifies that the Contractor has corrected the deficiencies in the punchlist by performing a final walkthrough.
Information Content:	▪ All Issues Observed from Previous Product Inspections ▪ Final Walkthrough Observation Field Report
Contracted Exchange/Deliverable:	Punchlist Issue

2.4.28 Closeout

Life Cycle Process:	Closeout
Diagram:	in Appendix C
Actor(s):	Owner and Contractor
Description:	The Contractor gathers all as-built information related to the project and forwards the information to the Owner. Four copies are typically required.
Information Content:	▪ Operations and Maintenance Manuals ▪ Record of Designated Equipment and Materials Data Files

	▪ Commissioning Report ▪ Record Specifications ▪ Record (As-Built) Drawings ▪ Final Approved Shop Drawings
Contracted Exchange/Deliverable:	Turnover Package

3 COBie Calculator Cost Model

Each of the life cycle processes discussed in Chapter 2 can be further divided into tasks. As mentioned in Chapter 1, each task can be classified as a value-added task or a non-value-added task. In reducing the costs of the facility life cycle processes, the goal is not to reduce the time or funding allocated to value-added tasks, but to eliminate or minimize the time and costs associated with non-value-added ones.

To do this, cost variables are assigned to tasks that could be eliminated, automated, or streamlined through the use of COBie in conjunction with a managed collaboration system. For example, the Design Final process has a task called Send Final Documents. This task has cost variables associated with the number of transmittals, the mailing cost per transmittal, the time needed to prepare a transmittal, and the Architect Drafter's hourly rate. The Calculator also associates a Review Cycle variable with tasks that can be eliminated, automated or streamlined where applicable. For example, the Design Early process associates this variable with the tasks that come subsequently after the Architect logs receipt of the Owner/Owners Representative comments.

In the Calculator, costs were only applied to the Owner and parties that have a direct contractual agreement with the Owner. Additional savings will accrue in the next layer of relationships (e.g. sub-contractors); however, these are not addressed in this version of the Calculator. For example, subcontractors and designers must identify products that meet specifications.. They would accrue similar savings in this process, but these savings are not included in the Calculator.

Only tasks that benefit from either the use of standard, structured data about managed assets and/or complete reliance on electronic documentation and communication have been considered in the COBie Calculator.

3.1 Major cost categories

Over 200 process specific variables are identified in the COBie Calculator. These variables can be grouped into several major cost categories:

- *Number of Pages:* Costs related to the number of pages in a document-drawings, specifications, submittals, etc.
- *Number of Sets:* Costs associated with the number of required sets of a document.
- *Number of Objects:* Costs related to the number of spaces and equipment.
- *Labor Rates:* Rates for the different project team members. These rates can be direct or marked up.
- *Time:* Costs related to the time needed to perform an action: logging, preparing, documenting, organizing, searching, etc.
- *Mailing:* Costs associated with mailing, messengering, or otherwise delivering documents from one project team member to another.

3.1.1 Owner specific costs

Some of the cost variables are specific to the owner. These variables, regardless of the exchange or project, are consistent. The owner specific costs are:

- Avg. *Number of Pages in Facility Criteria*
- *Avg. Number of Pages in Discipline Specification*
- *Avg. Number of Pages in Project Definition*
- *Avg. Number of P*ages in Front Matter

3.1.2 Project specific costs

There are some costs that are specific to the project, regardless of the exchange or project team members involved. These are:

- Number of Unique Product Types
- Number of Tagged Components (Pieces of Equipment)
- Number of Space Types per Building
- Time to Log

3.1.3 Process specific costs

The remaining cost variables are specific to each LCie process. A list of the applicable variables for each LCie process can be found in the tables of the Contracted Exchanges (Deliverables) and How Savings Occur section in Chapter 4.

While some of the variables may have the same name as others, the value of the variable changes based on the exchange and project team members involved. For example, the average number of transmittals required to send the final design documents from the Architect to the Owner's Representative in the Design Final exchange is different than the average number of transmittals required to send the RFP package from the Owner's Representative to the Contractor in the Request for Proposal exchange, even though the cost variable to capture the number of transmittals in both of these cases is called Avg. Number of Transmittals.

Because of this, the Calculator requires input for 210 process specific variables. The definitions for all of the variables, as well as their estimated values for the current paper-based LCie processes, can be found in Appendix E. Appendix F shows all the tabs of the Calculator. The Current Assumption tab shows the LCie number of the processes (under the Tab Reference column) in which a variable is used.

Not all actors are involved in every process. For example the Contractor is not active during the Design Schematic process. Refer to the LCie diagrams in Appendix C to understand which processes and therefore which process variables are relevant to each role.

4 Expected LCie Processes

The Expected Process is a scenario of full standards based interoperability where:

- All building information modeling tools used in design and construction both import and export COBie data
- The systems used in facility/maintenance management import and export COBie data
- Project communications and information turnover at closeout are handled in a project collaboration system with automated workflow
- Software tools are available to check the COBie data for conformance to the specification and for completeness, and also to compare the contents of two COBie files: one file that specifies the space and equipment requirements and the other that describes the project team-proposed spatial configuration and manufacturer product specifications

4.1 Opportunities for savings

As previously mentioned in Chapter 1, the opportunities for savings can be classified as follows:

1. VALIDATION savings from the ability to programmatically check the space and equipment data for completeness, conformance to standards and conformance to requirements.
2. COPYING savings from reliance on electronic documents and data as the project record.
3. HANDLING savings from the adoption of managed project collaboration and management systems for transmittal and automated logging of project documents.
4. SEARCHING savings from the ability to electronically compare product data to product specifications.
5. REFORMATTING savings from adoption of a single, open standard data format for information relating to managed assets.
6. RECREATING savings from the use of a standard, structured data format for moving space and equipment information through the project process and into facility management, eliminating the need for data re-entry. In addition, rework is a form of recreation.

Savings can be achieved in non-value added tasks to different degrees. Some tasks can be completely eliminated, while others can be automated or streamlined. An appropriate "Reduction Factor" is applied to each variable discussed in Chapter 3 whose costs can be reduced by using an electronic collaboration system and/or a structured data format. This reduction factor is a percent reduction of a variable's "Current" Process value, resulting in a variable's "Expected" Process value.

The estimated variable values for the Expected LCie Processes can be found in Appendix E. The process diagrams in Appendix C indicate which tasks are expected to be eliminated, automated, and streamlined. Appendix D groups the tasks into one of three categories (eliminated, automated, or streamlined) and describes the assumptions used to justify that categorization.

Of the 25 life cycle processes studied, 19 (76%) would obtain a savings from the expected approach, these include:

- Facility Criteria
- Discipline Specification
- Feasibility Study
- Project Definition
- Space Program
- Product Program
- Request for Proposal
- Design Early
- Design Schematic
- Design Coordinated
- Design Final
- Request for Proposal
- Inquiry Issue
- Inquiry Issue (RFI)
- Submittal Package
- Submittal Issue
- Product Installation
- Product Inspection
- Turnover Package

The six processes that do not obtain savings are:

- Develop Pre-Construction Plan
- Prepare Submittal Information- Product Type Selection
- Prepare Submittal Information- System Layout
- Provide Resources
- Perform Equipment Testing
- Define, Record and Certify Discrepancies

For completeness purposes, these processes are included in the following section; however, their potential savings is listed as "None" and they do not have any process specific variables.

Although the Calculator only computes savings to the Owner/Owner's Representative, Architect, and Contractor, other parties who will benefit from the Expected Process are included in the tables below.

4.2 Contracted exchanges (deliverables) and how savings occur

4.2.1 Study and define needs

Contracted Exchange/Deliverable:	010 Facility Criteria
Diagram:	Figure 18 in Appendix C
Beneficiaries:	Owner
Information Content:	▪ Facility Program
Potential Savings:	Copying: ▪ Reproduction savings from reliance on electronic documents and the elimination of paper
Process Specific Variables:	**010.02.40 Copy Facility Criteria** ▪ Avg. Number of Pages in Facility Criteria ▪ Avg. Number of Sets Required ▪ Avg. In-house Reproduction Time per Set

4.2.2 Develop design criteria

Contracted Exchange/Deliverable:	020 Discipline Specification
Diagram:	Figure 19 in Appendix C
Beneficiaries:	Owner

Information Content:	▪ Type Data ▪ Product Data
Potential Savings:	Copying: ▪ Reproduction savings from reliance on electronic documents and the elimination of paper
Process Specific Variables:	**020.02.40 Copy Discipline Specification** ▪ Avg. Number of Pages in Discipline Specification ▪ Avg. Number of Sets Required ▪ Avg. In-house Reproduction Time per Set

4.2.3 Study technical feasibility

Contracted Exchange/Deliverable:	030 Feasibility Study
Diagram:	Figure 20 in Appendix C
Beneficiaries:	Owner and Architect or Planner
Information Content:	▪ Feasibility Study Options
Potential Savings:	Copying: ▪ Reproduction savings from reliance on electronic documents and the elimination of paper Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents.

Process Specific Variables:	**030.04 Copy Feasibility Study and 030.14 Copy Revised Feasibility Study** ▪ Avg. Number of Options ▪ Avg. Number of Sheets per Option ▪ Avg. Number of Letter-Sized Pages in Design Narrative per Option ▪ Avg. Number of Pre-Design Submittal Sets Required ▪ Avg. In-house Reproduction Time per Set **030.05 Send Feasibility Study and 030.15 Send Revised Feasibility Study** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **030.06 Log Transmittal Feasibility Study and 030.16 Log Transmittal of Revised Feasibility Study** ▪ Avg. Number of Transmittals ▪ Time to Log **030.08 Log Receipt Feasibility Study** ▪ Avg. Number of Transmittals ▪ Time to Log **030.10.20 Send Comments to Planner** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **030.10.21 Log Transmittal of Feasibility Study Comments** ▪ Avg. Number of Transmittals ▪ Time to Log **030.12 Log Receipt of Review Comments** ▪ Avg. Number of Transmittals ▪ Time to Log

4.2.4 Communicate results decision

Contracted Ex-	040 Project Definition

change/Deliverable:	
Diagram:	Figure 21 in Appendix C
Beneficiaries:	Owner
Information Content:	▪ Detailed Project Scope ▪ Preliminary Budgetary Cost Information ▪ Site Location & Approval ▪ Economic Analysis ▪ Facility Planning Data
Potential Savings:	Copying: ▪ Reproduction savings from reliance on electronic documents and the elimination of paper
Process Specific Variables:	**040.03.30 Copy Project Definition** ▪ Avg. Number of Pages in Project Definition ▪ Avg. Number of Sets Required ▪ Avg. In-house Reproduction Time per Set

4.2.5 Develop program – space program

Contracted Exchange/Deliverable:	050 Space Program
Diagram:	Figure 22 in Appendix C
Beneficiaries:	Owner's Representative and Architect or Planner
Information Content:	▪ Facility space requirements
Potential Savings:	Recreating: ▪ Design professionals typically re-enter the Owner's space requirements into the system they use for space programming. COBie-formatted data permits data to be transferred directly from the Owner to the Architect or Planner's system Reformatting: ▪ Requirements associated with each space are typically gathered and then documented on Room Data Sheets. COBie format would either eliminate the need to produce room data sheets or support automation of their production

	Validating: ▪ The Architect/Planner sends the Space Program to the Owner's Representative for review. Currently, this is done by comparing 2 documents. Use of COBie format would permit automated checking. ▪ If the Architect/Planner could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated. Copying: ▪ Reproduction savings from reliance on electronic documents and the elimination of paper Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents
Process Specific Variables:	**050.03 Search for Space Program Criteria as Necessary** ▪ Number of Space Types per Building ▪ Avg. Time Spent Searching for Space Program Criteria **050.04 Reformat Space Program Criteria into Room Data Sheets** ▪ Number of Space Types per Building Avg. Time Spent Reformatting Space Program Criteria into Room Data Sheets **050.05 Send Copies of Space Program** ▪ Avg. Number of Pages in Space Program ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Number of Pre-Design Submittal Sets Required

	▪ Avg. Time to Prepare a Transmittal **050.06 Log Transmittal of Space Program** ▪ Avg. Number of Transmittals ▪ Time to Log **050.08 Log Receipt of Space Program** ▪ Avg. Number of Transmittals ▪ Time to Log **050.09 Validate Space Program** ▪ Avg. Time for Owners Rep to Validate Space Program **050.10.10 Send Comments** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal ▪ Avg. Number of Re-Submit Cycles **050.10.20 Log Transmittal of Space Program Comments** ▪ Avg. Number of Transmittals ▪ Time to Log ▪ Avg. Number of Re-Submit Cycles **050.12 Log Receipt of Space Program Comments** ▪ Avg. Number of Transmittals ▪ Time to Log ▪ Avg. Number of Re-Submit Cycles **050.13 Re - Search for Space Program Criteria as Necessary** ▪ Avg. Percentage of Errors in Space Program ▪ Number of Space Types per Building ▪ Avg. Time Spent Searching for Space Program Criteria ▪ Avg. Number of Re-Submit Cycles **050.14 Send Revised Copies of Space Program** *Reference variables in section 050.05 Send Copies of Space Program. Include the following:* ▪ Avg. Number of Re-Submit Cycles

	050.15 Log Transmittal of Revised Space Program *Reference variables in section 050.06 Log Transmittal of Space Program. Include the following:* ▪ Avg. Number of Re-Submit Cycles

4.2.6 Develop program – product program

Contracted Exchange/Deliverable:	060 Product Program
Diagram:	Figure 23 in Appendix C
Beneficiaries:	Owner's Representative and Architect or Planner
Information Content:	▪ Facility product requirements
Potential Savings:	Recreating: ▪ Design professionals typically re-enter the Owner's product standards into the system they use for design. COBie-formatted product standards would permit direct transfer from the Owner to the Architect or Planner's system ▪ If the Owner's Representative returns the Product Program because it does not meet the Owner's product requirements, the Architect/Planner must recreate the Product Program. Validating: ▪ The Architect/Planner sends the Product Program to the Owner's Representative for review. Currently, this is done by comparing 2 documents. Use of COBie format would permit automated checking. ▪ If the Architect/Planner could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated. Copying: ▪ Reproduction savings from reliance on electronic documents and the elimination of paper

	Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents
Process Specific Variables:	**060.03 Search for Product Program Criteria as Necessary** ▪ Number of Unique Product Types ▪ Avg. Time Spent Searching for Product Program Criteria **060.04 Send Copies of Product Program to Owner for Review** ▪ Avg. Number of Pages in Product Program ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Number of Pre-Design Submittal Sets Required ▪ Avg. Time to Prepare a Transmittal **060.05 Log Transmittal of Product Program** ▪ Avg. Number of Transmittals ▪ Time to Log **060.07 Log Receipt Product Program** ▪ Avg. Number of Transmittals ▪ Time to Log **060.08 Validate Product Program** Avg. Time for Owners Rep to Validate Product Program **060.09.10 Send Comments** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal ▪ Avg. Number of Re-Submit Cycles **060.09.20 Log Transmittal of Product Program**

	Comments ▪ Avg. Number of Transmittals ▪ Time to Log ▪ Avg. Number of Re-Submit Cycles **060.11 Log Receipt of Product Program Comments** ▪ Avg. Number of Transmittals ▪ Time to Log ▪ Avg. Number of Re-Submit Cycles **060.12 Re - Search for Product Program Criteria as Necessary** ▪ Avg. Percentage of Errors in Product Program ▪ Number of Unique Product Types ▪ Avg. Time Spent Searching for Product Program Criteria ▪ Avg. Number of Re-Submit Cycles **060.13 Send Revised Copies of Product Program** *Reference variables in section 060.04 Send Copies of Product Program to Owner for Review. Include the following:* ▪ Avg. Number of Re-Submit Cycles **060.14 Log Transmittal of Revised Product Program** *Reference variables in section 060.05 Log Transmittal of Product Program. Include the following:* ▪ Avg. Number of Re-Submit Cycles

4.2.7 Prepare invitation to bid and receive proposal (pre-design)

Contracted Exchange/Deliverable:	070 Request for Proposal (RFP for Design Services)
Diagram:	in Appendix C
Beneficiaries:	Owner's Representative, Architect and Architect's Consultants
Information Content:	▪ Project Definition ▪ Space Program

	▪ Product Program
Potential Savings:	Copying: ▪ Reproduction savings from reliance on electronic documents and the elimination of paper in both soliciting and submitting proposals Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. A managed electronic collaboration system with a "bidding" module can handle distribution of Requests for Proposal, receiving questions, issuing addenda and receiving and securing the proposals submitted by design firms.
Process Specific Variables:	**070.02 Send Copies of Request for Proposal (RFP) Package** ▪ Avg. Number of Pages in Space Program ▪ Avg. Number of Pages in Product Program ▪ Avg. Number of Pages in Project Definition ▪ Avg. Number of Pages in Front Matter ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Number of RFP Submittal Sets Required ▪ Avg. Time to Prepare a Transmittal **070.04 Log Receipt of Request for Proposal (RFP) Package** ▪ Time to Log **070.07 Copy Proposal** ▪ Avg. Number of Letter-Sized Pages in Proposal ▪ Avg. Number of Drawing Sheets in Proposal ▪ Avg. Number of Pre-Design Submittal Sets Required ▪ Avg. In-house Reproduction Time per Set **070.08 Send Proposal** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal

	▪ Avg. Time to Prepare a Transmittal

4.2.8 Explore concepts – design early

Contracted Exchange/Deliverable:	080 Design Early
Diagram:	Figure 25 in Appendix C
Beneficiaries:	Owner's Representative, Architect and Architect's Consultants
Information Content:	▪ Concept Design Drawings ▪ Cost Estimate ▪ Calculations
Potential Savings:	Reformatting: ▪ Although the Owner's requirements might be provided as e-documents, the design team typically reformats the information to be compatible with their design systems. COBie-formatted requirements data permits direct transfer from the Owner to the design consultants' systems. Recreating: ▪ If the Owner's Representative rejects the Concept Design because it does not meet the Owner's space requirements, the Architect must recreate the Concept Design. Validating: ▪ COBie would permit the Architect to automate checking of his Concept Design against the Owner's space requirements, saving the Architect time and potentially eliminating a rework/re-review cycle. ▪ The Architect sends the Design Early documents to the Owner's Representative for review. Currently, this review is done manually. Use of COBie format would permit automated checking of space program at this phase. Copying: ▪ Reproduction savings from reliance on elec-

	tronic documents and the elimination of paper ▪ In a paper-based process, review comments often need to be transferred to multiple document copies. Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents
Process Specific Variables:	**080.03 Send Copies of Design Requirements** ▪ Avg. Number of Pages in Space Program ▪ Avg. Number of Pages in Product Program ▪ Avg. Number of Pages in Project Definition ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **080.04 Log Transmittal of Design Requirements** ▪ Time to Log **080.06 Log Receipt of Design Requirements** ▪ Time to Log **080.08 Reformat Design Requirements** ▪ Number of Space Types per Building ▪ Avg. Time Spent Reformatting Space Program ▪ Number of Unique Product Types ▪ Avg. Time Spent Reformatting Product Program ▪ Percentage of Time Spent by Licensed Professional Architect ▪ Percentage of Time Spent by Architectural Drafter **080.12 Validate Checkset Before Submission**

	Through Manual QA/QC Process ▪ Avg. Time Spent Evaluating Design Early Drawings Against Design Requirements – Space and Equipment **080.13.10 Make Corrections (Architect and/or Consultants)** ▪ Avg. Time Spent Making Corrections due to Non-Conformance with Space or Product Program **080.13.20 Copy Design Early Documents** ▪ Avg. Number of Sheets in Design Early Drawings ▪ Avg. Number of Letter-Sized Pages in Design Early Narrative ▪ Number of Design Submittal Sets Required ▪ Avg. In-house Reproduction Time per Set **080.13.30 Send Design Early Documents** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **080.13.40 Log Transmittal of Design Early Documents** ▪ Avg. Number of Transmittals ▪ Time to Log **080.15 Log Receipt of Design Early Documents** ▪ Avg. Number of Transmittals ▪ Time to Log **080.16 Validate Design Early Documents** ▪ Avg. Time to Review Design Early Drawings for conformance to Space and Product Program **080.17.20 Send Comments to Design Team** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **080.17.30 Log Transmittal of Comments** ▪ Avg. Number of Transmittals ▪ Time to Log

	080.19 Log Receipt of Comments ▪ Avg. Number of Transmittals ▪ Time to Log **080.20 Make Corrections (Architect and/or Consultants)** ▪ Avg. Time Spent Making Corrections due to Non-conformance with Space or Product Program ▪ Avg. Number of Re-Submit Cycles **080.21 Copy Revised Design Early Documents** *Reference variables in section 080.13.20 Copy Design Early Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **080.22 Send Revised Early Documents** *Reference variables in section 080.13.30 Send Design Early Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **080.23 Log Transmittal of Revised Design Early Documents** *Reference variables in section 080.13.40 Log Transmittal of Design Early Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **080.25 Log Receipt of Revised Design Early Documents** *Reference variables in section 080.15 Log Receipt of Design Early Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **080.26 Validate Revised Design Early Documents** *Reference variables in section 080.16 Validate Design Early Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **080.27 Send Comments to Design Team** *Reference variables in section 080.17.20 Send*

	Comments to Design Team. Include the following: ▪ Avg. Number of Re-Submit Cycles **080.28 Log Transmittal of Comments** *Reference variables in section 080.17.30 Log Transmittal of Comments. Include the following:* ▪ Avg. Number of Re-Submit Cycles **080.30 Log Receipt of Comments** *Reference variables in section 080.19 Log Transmittal of Comments. Include the following:* ▪ Avg. Number of Re-Submit Cycles:

4.2.9 Develop design – design schematic

Contracted Exchange/Deliverable:	090 Design Schematic
Diagram:	Figure 26 in Appendix C
Beneficiaries:	Owner's Representative, Architect and Architect's Consultants
Information Content:	▪ Basis of Design Narrative ▪ Design Schematic Drawings ▪ Energy Analysis ▪ Life Cycle Cost Analysis ▪ Cost Estimate ▪ Geotechnical Report ▪ Calculations ▪ Outline Specification ▪ Color Boards ▪ Environmental Report
Potential Savings:	Recreating: ▪ Design Schematic phase requires quantity take-offs (QTOs) for cost estimating. QTOs are a recreation of information because the items have already been documented in the drawings or BIM. COBie addresses spaces and products/equipment. It provides space areas and product types and counts. ▪ If the Owner's Representative rejects the Design Schematic documents because the design does not meet the Owner's space or

	product requirements, the Architect must recreate the design. Reformatting: ▪ Although the Owner's requirements might be provided as e-documents, the design team spends considerable time developing product type templates (or BIM content), as well as specifications. COBie-formatted requirements data could be used directly. Validating: ▪ If the Architect and his Consultants could automate checking of their design against the Owner's space and product requirements, they would save checking time and a rework/re-review cycle could potentially be eliminated. ▪ The Architect sends the Design Schematic documents to the Owner's Representative for review. Currently, this is review is done manually. Use of COBie format would permit automated checking of space and product program at this phase. Copying: ▪ Reproduction savings from reliance on electronic documents and data and the elimination of paper ▪ In a paper-based process, review comments often need to be transferred to multiple document copies. Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Process Specific Variables:	**090.02.10 Produce Design Schematic Documents** ▪ Avg. Number of Plan Drawings in Design Schematic Drawings ▪ Avg. QTO Time for Equipment Components ▪ Avg. QTO Time for Spaces in Building ▪ Percentage of Time Spent by Licensed Professional Architect ▪ Percentage of Time Spent by Architect Drafter **090.02.20 Produce Outline Specification / Product Type Templates** ▪ Number of Unique Product Types ▪ Avg. Time Spent Developing Equipment Type Templates **090.05 Validate Checkset Before Submission Through Manual QA/QC Process – Space and Equipment** ▪ Avg. Time Spent Evaluating Design Schematic Drawings Against Design Requirements – Space and Equipment **090.06.10 Make Corrections (Architect and/or Consultants)** ▪ Avg. Time Spent Making Corrections due to Non-Conformance with Space or Product Program **090.06.20 Copy Design Schematic & Product Type Template Documents** ▪ Avg. Number of Sheets in Design Schematic Drawings ▪ Avg. Number of Letter-Sized Pages in Design Schematic Narrative ▪ Avg. Number of Letter-Sized Pages in Design Schematic Specifications ▪ Number of Design Submittal Sets Required ▪ Avg. In-house Reproduction Time per Set **090.06.30 Send Design Schematic & Product Type Template Documents** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal

	090.06.40 Log Transmittal of Design Schematic & Product Type Template Documents ▪ Avg. Number of Transmittals ▪ Time to Log **090.08 Log Receipt of Design Schematic & Product Type Template Documents** ▪ Avg. Number of Transmittals ▪ Time to Log **090.09 Validate Design Schematic Space & Product Type Template Documents** ▪ Avg. Time to Review Design Schematic Drawings for conformance to Space and Product Program **090.10.20 Send Comments to Design Team** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **090.10.30 Log Transmittal of Comments** ▪ Avg. Number of Transmittals ▪ Time to Log **090.12 Log Receipt of Comments** ▪ Avg. Number of Transmittals ▪ Time to Log **090.13 Make Corrections (Architect and/or Consultants)** ▪ Avg. Time Spent Making Corrections due to Non-conformance with Space or Product Program ▪ Avg. Number of Re-Submit Cycles **090.14 Copy Revised Design Schematic & Product Type Template Documents** *Reference variables in section 090.06.20 Copy Design Schematic Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **090.15 Send Revised Design Schematic & Prod-**

	uct Type Template Documents *Reference variables in section 090.06.30 Send Design Schematic Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **090.16 Log Transmittal of Revised Design Schematic & Product Type Template Documents** *Reference variables in section 090.06.40 Log Transmittal of Design Schematic Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **090.18 Log Receipt of Revised Design Schematic & Product Type Template Documents** *Reference variables in section 090.08 Log Receipt of Design Schematic Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **090.19 Validate Revised Design Schematic Space & Product Type Template Documents** *Reference variables in section 090.09 Validate Design Schematic & Product Type Template Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **090.20 Send Comments to Design Team** *Reference variables in section 090.10.20 Send Comments to Design Team. Include the following:* ▪ Avg. Number of Re-Submit Cycles **090.21 Log Transmittal of Comments** *Reference variables in section 090.10.30 Log Transmittal of Comments. Include the following:* ▪ Avg. Number of Re-Submit Cycles **090.23 Log Receipt of Comments** *Reference variables in section 090.12 Log Receipt of Comments. Include the following:*

	▪ Avg. Number of Re-Submit Cycles

4.2.10 Develop design – design coordinated

Contracted Exchange/Deliverable:	100 Design Coordinated, Product Type Template, Product Type Candidates
Diagram:	Figure 27 in Appendix C
Beneficiaries:	Owner's Representative, Architect and Architect's Consultants, Specifier
Information Content:	▪ Basis of Design Narrative ▪ Design Coordinated Drawings ▪ Energy Analysis ▪ Life Cycle Cost Analysis ▪ Cost Estimate ▪ Geotechnical Report ▪ Calculations ▪ Detailed Specifications ▪ Submittal Register ▪ Project Information Form ▪ Color Boards
Potential Savings:	Recreating: ▪ Design Coordinated phase requires quantity take-offs (QTOs) for cost estimating. QTOs are a recreation of information because the items have already been documented in the drawings or BIM. COBie addresses spaces and products/equipment. It provides space areas and product types and counts. ▪ If the Owner's Representative rejects the Design Coordinated documents because the design does not meet the Owner's space or product requirements, the Architect must recreate the design. Reformatting: ▪ Although the Owner's requirements might be provided as e-documents, the design team spends considerable time developing product type templates (or BIM content), as well as specifications. COBie-formatted requirements data could be used directly.

	Searching: ▪ Candidate Products (typically 3 qualifying products) are identified for each product type template. This is done through reviewing product literature. Standard, structured product data available in COBie format would allow automated product selection based on the product type templates. Validating: ▪ If the Architect and his Consultants could automate checking of their design against the Owner's space and product requirements, they would save checking time and a rework/re-review cycle could potentially be eliminated. ▪ The Architect sends the Design Coordinated documents to the Owner's Representative for review. Currently, this is review is done manually. Use of COBie format would permit automated checking of space areas and product data against Owner requirements. Copying: ▪ Reproduction savings from reliance on electronic documents and data and the elimination of paper ▪ In a paper-based process, review comments often need to be transferred to multiple document copies. Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents.
Process Specific Vari-	**100.02.10 Produce Design Coordinated Documents**

ables:	▪ Avg. Number of Plan Drawings in Design Coordinated Drawings ▪ Avg. QTO Time for Equipment Components ▪ Avg. QTO Time for Spaces in Building ▪ Percentage of Time Spent by Licensed Professional Architect ▪ Percentage of Time Spent by Architect Drafter **100.02.20 Produce Detailed Specification / Product Type Templates** ▪ Number of Unique Product Types ▪ Avg. Time Spent Developing Detailed Equipment Type Templates **100.03 Search for Product Type Candidates** ▪ Number of Unique Product Types ▪ Avg. Time Searching for Product Literature for Candidates **100.06 Validate Checkset before Submission through Manual QA/QC Process** ▪ Avg. Time Spent Evaluating Design Coordinated Drawings Against Design Requirements – Space and Equipment **100.07.05 Make Corrections (Architect and/or Consultants)** ▪ Avg. Time Spent Making Corrections due to Non-Conformance with Space Program **100.07.10 Re-Search and Recreate Product Type Candidates and Detailed Specifications Based on QA/QC Results** ▪ Avg. Percent of Errors in Product Type Candidate ▪ Number of Unique Product Types ▪ Avg. Time Searching for Product Literature for Candidates **100.07.20 Copy Design Coordinated & Product Type Candidate Documents** ▪ Avg. Number of Sheets in Design Coordinated Drawings

	▪ Avg. Number of Letter-Sized Pages in Design Coordinated Narrative ▪ Avg. Number of Letter-Sized Pages in Design Coordinated Specifications ▪ Number of Design Submittal Sets Required ▪ Avg. In-house Reproduction Time per Set **100.07.30 Send Design Coordinated Documents& Product Type Candidate Documents** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **100.07.40 Log Transmittal of Design Coordinated & Product Type Candidate Documents** ▪ Avg. Number of Transmittals ▪ Time to Log **100.09 Log Receipt of Design Coordinated & Product Type Template Documents** ▪ Avg. Number of Transmittals ▪ Time to Log **100.10 Validate Design Coordinated Space & Product Type Candidate Documents** ▪ Avg Time to Review Design Coordinated Drawings for conformance to Space and Product Program **100.11.20 Send Comments to Design Team** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **100.11.30 Log Transmittal of Comments** ▪ Avg. Number of Transmittals ▪ Time to Log **100.13 Log Receipt of Comments** ▪ Avg. Number of Transmittals ▪ Time to Log **100.14 Make Corrections (Architect and/or Consultants)** ▪ Avg. Time Spent Making Corrections Due to

	Non-Conformance with Space Program ▪ Avg. Number of Re-Submit Cycles **100.15 Copy Revised Design Coordinated & Product Type Candidate Documents** *Reference variables in section 100.07.20 Copy Design Coordinated Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **100.16 Send Revised Design Coordinated & Product Type Candidate Documents** *Reference variables in section 100.07.30 Send Design Coordinated Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **100.17 Log Transmittal of Revised Design Coordinated & Product Type Candidate Documents** *Reference variables in section 100.07.40 Log Transmittal of Design Coordinated Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **100.19 Log Receipt of Revised Design Coordinated & Product Type Candidate Documents** *Reference variables in section 100.09 Log Receipt of Design Coordinated Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **100.20 Validate Revised Design Coordinated & Product Type Candidate Documents** *Reference variables in section 100.10 Validate Design Coordinated & Product Type Template Documents. Include the following:* ▪ Avg. Number of Re-Submit Cycles **100.21 Send Comments to Design Team** *Reference variables in section 100.11.20 Send Comments to Design Team. Include the follow-*

	ing: ▪ Avg. Number of Re-Submit Cycles **100.22 Log Transmittal of Comments** *Reference variables in section 100.11.30 Log Transmittal of Comments. Include the following:* ▪ Avg. Number of Re-Submit Cycles **100.24 Log Receipt of Comments** *Reference variables in section 100.13 Log Receipt of Comments. Include the following:* ▪ Avg. Number of Re-Submit Cycles

4.2.11 Finalize design – design final

Contracted Exchange/Deliverable:	110 Design Final, Product Type Template, Product Type Candidates
Diagram:	Figure 28 in Appendix C
Beneficiaries:	Owner's Representative, Architect and Architect's Consultants, Specifier
Information Content:	▪ Basis of Design Narrative ▪ Design Final Drawings ▪ Cost Estimate ▪ Calculations ▪ Environmental Report ▪ Project Information Form ▪ Specifications ▪ Environmental Specifications ▪ Submittal Register ▪ Quality Control Data ▪ Color Documentation Binder ▪ Code Compliance Certification
Potential Savings:	Recreating: ▪ Design Final phase requires quantity take-offs (QTOs) for cost estimating. QTOs are a recreation of information because the items have already been documented in the drawings or BIM. COBie addresses spaces and products/equipment. It provides space areas and product types and counts. Validating:

	▪ Design Final requires a Quality Control Review to evaluate both technical accuracy and discipline coordination. COBie supports automate checking of the design against the Owner's space and product requirements, saving checking time. Copying: ▪ Reproduction savings from reliance on electronic documents and data and the elimination of paper. ▪ In a paper-based process, review comments often need to be transferred to multiple document copies. Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents.
Process Specific Variables:	**110.02.10 Produce Design Final Documents** ▪ Avg. Number of Plan Drawings in Design Final Drawings ▪ Avg. QTO Time for Equipment Components ▪ Avg. QTO Time for Spaces in Building ▪ Percentage of Time Spent by Licensed Professional Architect ▪ Percentage of Time Spent by Architect Drafter **110.02.20 Produce Detailed Specification / Product Type Candidates** ▪ Number of Unique Product Types ▪ Avg. Time Spent Developing Detailed Equipment Type Candidate **110.05 Validate Checkset Before Submission Through Manual QA/QC Process**

	▪ Avg. Time Spent Evaluating Design Final Drawings Against Design Requirements – Space and Equipment **110.06.10 Make Corrections** ▪ Avg. Time Spent Making Corrections due to Non-Conformance with Space Program **110.06.20 Copy Design Final Documents** ▪ Avg. Number of Sheets in Design Final Drawings ▪ Avg. Number of Letter-Sized Pages in Design Final Narrative ▪ Avg. Number of Letter-Sized Pages in Design Final Specification ▪ Number of Design Submittal Sets Required ▪ Avg. In-house Reproduction Time per Set **110.06.30 Send Design Final Documents** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **110.06.40 Log Transmittal of Design Final Documents** ▪ Avg. Number of Transmittals ▪ Time to Log **110.08 Log Receipt of Design Final Documents for Bidding Process** ▪ Avg. Number of Transmittals ▪ Time to Log

4.2.12 Prepare invitation to bid and receive proposals (post design)

Contracted Exchange/Deliverable:	120 Request for Proposal (RFP for Construction)
Diagram:	Figure 29 in Appendix C
Beneficiaries:	Owner's Representative
Information Content:	▪ Final Design Documents ▪ Specifications

Potential Savings:	Copying: ▪ Reproduction savings from reliance on electronic documents and the elimination of paper in both soliciting and submitting proposals Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. A managed electronic collaboration system with a "bidding" module can handle distribution of Requests for Proposal, receiving questions, issuing addenda and receiving and securing the bids submitted by Contractors.
Process Specific Variables:	**120.01 Receive Information from A/E to Develop Bid Documents** ▪ Time to Log **120.03 Copy Request for Proposal (RFP) Package** ▪ Avg. Number of Pages in Front Matter ▪ Avg. Number of Sheets in Design Final Drawings ▪ Avg. Number of Letter-Sized Pages in Design Final Narrative ▪ Avg. Number of Letter-Sized Pages in Design Final Specifications ▪ Avg. Number of Request for Proposal Submittal Sets Required ▪ Avg. In-house Reproduction Time per Set **120.04 Send Request for Proposal (RFP) Package** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal

4.2.13 Respond to pre-proposal inquiries

Contracted Ex-	130 Inquiry Issue (Clarification)

change/Deliverable:	
Diagram:	Figure 30 in Appendix C
Beneficiaries:	Owner's Representative, Contractor and Architect
Information Content:	▪ Clarification Request
Potential Savings:	Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. A managed electronic collaboration system with a "bidding" module can handle receipt of bidder questions and issuing addenda.
Process Specific Variables:	**130.04 Send Inquiry Issue (Clarification)** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **130.05 Log Transmittal of Inquiry Issue (Clarification)** ▪ Avg. Number of Transmittals ▪ Time to Log **130.07 Log Receipt of Inquiry Issue (Clarification)** ▪ Avg. Number of Transmittals ▪ Time to Log **130.08 Send Inquiry Issue (Clarification) to Architect** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare Transmittals for Inquiry Issues **130.09 Log Transmittal of Inquiry Issue (Clarification)** ▪ Avg. Number of Transmittals ▪ Time to Log **130.11 Log Receipt of Inquiry Issue (Clarification)** ▪ Avg. Number of Transmittals ▪ Time to Log

	130.13 Send Inquiry Issue (Clarification) Response ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare Transmittals for Inquiry Issues **130.14 Log Transmittal of Inquiry Issue (Clarification) Response** ▪ Avg. Number of Transmittals ▪ Time to Log **130.16 Log Receipt of Inquiry Issue (Clarification) Response** ▪ Avg. Number of Transmittals ▪ Time to Log **130.18 Send Inquiry Issue (Clarification) Response to Contractor** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare Transmittals for Inquiry Issues **130.19 Log Transmittal of Inquiry Issue (Clarification) Response** ▪ Avg. Number of Transmittals ▪ Time to Log **130.21 Log Receipt of Inquiry Issue (Clarification) Response** ▪ Avg. Number of Transmittals ▪ Time to Log

4.2.14 Develop pre-construction plan

Contracted Exchange/Deliverable:	140 Pre-Construction Plan
Diagram:	Figure 31 in Appendix C
Beneficiaries:	None
Information Content:	▪ Equipment Lists ▪ Certificates of Insurance

	▪ Surety Bonds ▪ List of Proposed Subcontractors ▪ List of Proposed Producers ▪ Construction Progress Schedule ▪ Network Analysis Schedule ▪ Submittal Register ▪ Schedule of Prices ▪ Health and Safety Plans ▪ Work Plan ▪ Quality Control plan ▪ Environmental Protection Plan
Potential Savings:	None
Process Specific Variables:	None

4.2.15 Identify discrepancies

Contracted Exchange/Deliverable:	150 Inquiry Issue (RFI)
Diagram:	Figure 32 in Appendix C
Beneficiaries:	Contractor, Owner's Representative, Architect and Subcontractors
Information Content:	▪ Request for Information (RFI)
Potential Savings:	Handling: ▪ Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. Managed electronic collaboration systems typically have an RFI module that logs the questions and responses and tracks the time until a response is provided. These systems have proven to reduce RFI turnaround time.
Process Specific Variables:	**150.04 Send Inquiry Issue (RFI)** ▪ Avg. Number of RFIs ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) **150.05 Log Transmittal of Inquiry Issue (RFI)** ▪ Avg. Number of RFIs

	▪ Time to Log **150.07 Log Receipt of Inquiry Issue (RFI)** ▪ Avg. Number of RFIs ▪ Time to Log **150.08 Send Inquiry Issue (RFI)** ▪ Avg. Number of RFIs ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) **150.09 Log Transmittal of Inquiry Issue (RFI)** ▪ Avg. Number of RFIs ▪ Time to Log **150.11 Log Receipt of Inquiry Issue (RFI)** ▪ Avg. Number of RFIs ▪ Time to Log **150.13 Send Inquiry Issue (RFI) Response** ▪ Avg. Number of RFIs ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) **150.14 Log Transmittal of Inquiry Issue (RFI) Response** ▪ Avg. Number of RFIs ▪ Time to Log **150.16 Log Receipt of Response of Inquiry Issue (RFI)** ▪ Avg. Number of RFIs ▪ Time to Log **150.18 Send Inquiry Issue (RFI) Response to Contractor** ▪ Avg. Number of RFIs ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) **150.19 Log Transmittal of Inquiry Issue (RFI) Response**

	▪ Avg. Number of RFIs ▪ Time to Log **150.21 Log Receipt of Inquiry Issue (RFI) Response** ▪ Avg. Number of RFIs ▪ Time to Log

4.2.16 Prepare submittal information – product type selection

Contracted Exchange/Deliverable:	160 Product Type Selection
Diagram:	Figure 33 in Appendix C
Beneficiaries:	None
Information Content:	▪ Product Data ▪ Samples ▪ Design Data ▪ Test Reports ▪ Certificates ▪ Manufacturer's Instructions ▪ Manufacturer's Field Reports ▪ Operations and Maintenance Data
Potential Savings:	None
Process Specific Variables:	None

4.2.17 Prepare submittal information – system layout

Contracted Exchange/Deliverable:	170 System Layout
Diagram:	Figure 34 in Appendix C
Beneficiaries:	None
Information Content:	▪ Shop Drawings
Potential Savings:	None
Process Specific Variables:	None

4.2.18 Organize submittal information

Contracted Exchange/Deliverable:	180 Submittal Package
Diagram:	Figure 35 in Appendix C
Beneficiaries:	Contractor, Owner's Representative, Architect and Subcontractors
Information Content:	▪ Product Submittals ▪ Product Type Selection ▪ Other Submittals ▪ Schedules ▪ System Layouts (Shop Drawings) ▪ Samples ▪ Certificates ▪ Manufacturer's Instructions ▪ Field Test Reports ▪ Operations and Maintenance Manuals
Potential Savings:	Reformatting: ▪ Contractors and Subcontractors must extract product requirements from the specifications. COBie provides product requirements in a concise, computable form. ▪ Contractors must compile disparate product data formats into Product Submittal Items and Submittal Packages for the Architect's approval. COBie formats product data consistently. Validating: ▪ Contractors must validate product data against the specifications before including them in a Submittal. COBie supports automate checking of the data against the product specifications, saving time and reducing the number of Product Submittals rejected. This reduces rework.(See Recreating above.) Copying: ▪ Reproduction savings from reliance on electronic documents and data and the elimination of paper

	▪ In a paper-based process, review comments often need to be transferred to multiple Submittal copies. Handling: ▪ Elimination of administrative costs associated with handling paper document Submittals as well as the delivery expense. These costs are high, due to the large number of documents and the requirement for multiple copies. Managed electronic collaboration systems will notify reviewers when Submittal Packages are uploaded, automatically log both the release and the reviewing of those documents and track ball-in-court responsibility and due dates.
Process Specific Variables:	**180.02.15 Log Receipt of Submittal Package from Sub-Contractors and Vendors** ▪ Avg. Number of Transmittals ▪ Time to Log **180.02.20 Produce Submittal Information** ▪ Number of Unique Product Types ▪ Avg. Time Spent Organizing Equipment (Product) Type Information **180.03 Validate Submittal Information against Contract Documents** ▪ Number of Unique Product Types ▪ Avg. Time Spent Evaluating Equipment (Product) Type Submittal Items Against Contract Documents ▪ Percentage of Submittal Items Rejected ▪ Percentage of Time Spent by Construction Project Manager ▪ Percentage of Time Spent by Assistant (Construction) Project Manager **180.05 Copy Submittal Package** ▪ Avg. Number of Submittal Pages in a Submittal Item ▪ Avg. Number of Submittal Sheets in a Sub-

	mittal Item ▪ Avg. Number of Submittal Items in a Product Submittal Package ▪ Number of Unique Product Types ▪ Number of Submittal Sets Required ▪ Avg. In-house Reproduction Time per Set **180.06 Stamp Submittal Package** ▪ Avg. Number of Submittal Pages in a Submittal Item ▪ Avg. Number of Submittal Sheets in a Submittal Item ▪ Avg. Number of Submittal Items in a Product Submittal Package ▪ Number of Submittal Sets Required ▪ Avg. Time to Sign each Page ▪ Avg. Time to Stamp each Sheet **180.07 Send Submittal Package** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **180.08 Log Transmittal of Submittal Package** ▪ Avg. Number of Transmittals ▪ Time to Log **180.10 Log Receipt of Submittal Package** ▪ Avg. Number of Transmittals ▪ Time to Log **180.12 Send Submittal Package to Architect** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **180.13 Log Transmittal of Submittal Package** ▪ Avg. Number of Transmittals ▪ Time to Log **180.15 Log Receipt of Submittal Package** ▪ Avg. Number of Transmittals ▪ Time to Log

4.2.19 Perform submittal review – submittal issue

Contracted Exchange/Deliverable:	190 Submittal Issue
Diagram:	Figure 36 in Appendix C
Beneficiaries:	Architect, Consultants, Contractor and Subcontractors
Information Content:	▪ Marked-Up Submittal Package ▪ Submittal Review Comments
Potential Savings:	Recreating: ▪ If a Submittal Item is rejected by the reviewer (typically the Architect and the Architect's Consultants), the Contractor or Subcontractor must redo the Submittal. COBie supports automated validation product characteristics against the specification, lowering the number of Product Submittals rejected. Validating: ▪ Submittal reviewers (typically the Architect and the Architect's Consultants) must also check Product Submittal data against the specifications. COBie supports automated checking, saving time. Copying: ▪ Reproduction savings from reliance on electronic documents and data and the elimination of paper ▪ In a paper-based process, review comments often need to be transferred to multiple Submittal copies. Handling: ▪ Elimination of administrative costs associated with handling paper document Submittals as well as the delivery expense. These costs are high, due to the large number of documents and the requirement for multiple copies. Managed electronic collabora-

	tion systems will notify reviewers when Submittal Issues are uploaded, automatically log both the release and the reviewing of those documents and track ball-in-court responsibility and due dates.
Process Specific Variables:	**190.02.10 Send Copies of Submittal Package (Product Type Selection, System Layout) to Sub-Consultants** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **190.02.11 Log Transmittal of Submittal Package (Product Type Selection, System Layout)** ▪ Avg. Number of Transmittals ▪ Time to Log **190.02.13 Log Receipt of Sub Consultants Submittal Mark-ups/Comments** ▪ Avg. Number of Transmittals ▪ Time to Log **190.02.20 Validate Submittal Package Not Sent to Sub-Consultants** ▪ Number of Unique Product Types ▪ Avg. Time Spent Evaluating Product Type Submittal Items Against Contract Documents ▪ Percentage of Product Submittals reviewed by Licensed Architect **190.02.21 Mark-up Copies of Submittals with Comments** ▪ Avg. Number of Submittal Pages in a Submittal Item ▪ Avg. Number of Submittal Sheets in a Submittal Item ▪ Avg. Number of Submittal Items in a Product Submittal Package ▪ Number of Unique Product Types ▪ Avg. Time Spent Transferring Comments per Page ▪ Avg. Time Spent Transferring Comments per Sheet

	▪ Number of Submittal Sets Required **190.03.10 Send Copies of Submittal Issues** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **190.03.20 Log Transmittal of Submittal Issues** ▪ Avg. Number of Transmittals ▪ Time to Log **190.05 Log Receipt of Submittal Issues** ▪ Avg. Number of Transmittals ▪ Time to Log **190.06.10 Recreate Submittal Package (Product Type Selection, System Layout)** ▪ Number of Unique Product Types ▪ Avg. Time Spent Revising One Product Submittal Item ▪ Percentage of Product Submittals Rejected on First Review ▪ Percentage of Time Spent by Construction Project Manager ▪ Percentage of Time Spent by Assistant (Construction) Project Manager *4.2.19.1* *4.2.19.2* **190.07 2nd Review Cycle of Submittal Package** *2.19.3* **(Product Type Selection, System yout)** ▪ Percentage of Product Submittals rejected on 2nd Review *4.2.19.4* **190.08 3rd Review Cycle of Submittal Package (Product Type Selection, System Layout)** ▪ Percentage of Product Submittals rejected on 3rd Review **190.09 4th Review Cycle of Submittal Package (Product Type Selection, System Layout)** ▪ Percentage of Product Submittals rejected on 4th Review

4.2.20 Provide resources

Contracted Exchange/Deliverable:	200 Purchase Order
Diagram:	Figure 37 in Appendix C
Beneficiaries:	None
Information Content:	▪ Purchase Order
Potential Savings:	None
Process Specific Variables:	None

4.2.21 Execute construction activities

Contracted Exchange/Deliverable:	210 Product Installation
Diagram:	Figure 38 in Appendix C
Beneficiaries:	Architect, Contractor and Subcontractors
Information Content:	▪ Design Final Drawings and Product Type Candidate ▪ Approved Shop Drawings ▪ Manufacturer's Installations
Potential Savings:	Reformatting: ▪ While the project is ongoing, the Contractor must continually prepare a Product Installation report that describes the status of installed components and corresponding data. The Contractor then spends time in the office processing these notes and compiling the Report. The COBie worksheet would be a vehicle for field data entry, as well as a reference to components. This would allow the Contractor to reduce office time. Handling: ▪ Elimination of administrative costs associated with handling paper documents as well as the delivery expense.
Process Specific Variables:	**210.04 Reformat Product Installation Report** ▪ Number of Tagged Components ▪ Avg. Time Spent Re-formatting Product Installation Report in Office

	210.05 Send Product Installation Report to Architect/ Owner's Rep ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **210.06 Log Transmittal of Product Installation Report** ▪ Avg. Number of Transmittals ▪ Time to Log **210.08 Log Receipt of Product Installation Report** ▪ Avg. Number of Transmittals ▪ Time to Log

4.2.22 Perform equipment testing

Contracted Exchange/Deliverable:	220 Equipment Start-Up Report
Diagram:	Figure 39 in Appendix C
Beneficiaries:	None
Information Content:	▪ Equipment Start-Up Test Results
Potential Savings:	None
Process Specific Variables:	None

4.2.23 Inspect and approve work

Contracted Exchange/Deliverable:	230 Product Inspection Report
Diagram:	Figure 40 in Appendix C
Beneficiaries:	Architect and Contractor
Information Content:	▪ Observation Field Report
Potential Savings:	Reformatting: ▪ The Architect must validate each Contractor Pay Request through a site visit to determine work progress. Typically, the Architect takes drawings to the site to check that items billed have been put in place. The Architect also notes any defects in workman-

	ship. The Architect then spends time in the office composing field notes and quantifying work put in place to support or refute the Pay Request. COBie would provide a definitive list of items required per room or floor that could be "checked off" and automatically totaled. This would allow the Architect to reduce office time. Handling: ▪ Elimination of administrative costs associated with handling paper documents as well as the delivery expense. Managed electronic collaboration systems can notify the Contractor if the Pay Request has been accepted or rejected and deliver the Observation Field Report with tracking.
Process Specific Variables:	**230.04 Reformat Product Inspection** ▪ Avg. Field Time Spent Documenting Report per Site Visit ▪ Avg. Number of Site Visits per Month ▪ Avg. Number of Months of Construction ▪ Total Time Spent in the Office ▪ Avg. Percentage of Office Time Spent Quantifying Products-in-Place **230.05 Send Product Inspection Report to Contractor** ▪ Avg. Number of Transmittals ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **230.06 Log Transmittal of Product Inspection Report** ▪ Avg. Number of Transmittals ▪ Time to Log **230.08 Log Receipt of Product Inspection Report** ▪ Avg. Number of Transmittals ▪ Time to Log

4.2.24 Define, record and certify discrepancies

Contracted Ex-	240 Punchlist

change/Deliverable:	
Diagram:	Figure 41 in Appendix C
Beneficiaries:	None
Information Content:	▪ Punchlist Issues
Potential Savings:	None
Process Specific Variables:	None

4.2.25 Closeout

Contracted Exchange/Deliverable:	250 Turnover Package
Diagram:	in Appendix C
Beneficiaries:	Contractor, Subcontractors and Owner
Information Content:	▪ Operations and Maintenance Manuals ▪ Commissioning Report ▪ Record Specifications ▪ Record (As-Built) Drawings ▪ Final Approved Shop Drawings and Product Submittals
Potential Savings:	Searching: ▪ Contractor must assemble the Turnover Package. A managed electronic collaboration system stores and indexes all documents submitted as they are uploaded. This greatly reduces the time required to find the necessary documents and assemble the Turnover Package, saving the Contractor time, improving the completeness and quality of the Turnover Package, and making the Turnover Package available to the Owner at an earlier date. Copying: ▪ Reproduction savings from turnover of electronic documents and data and the elimination of paper. Typically four sets of Turnover documents are required. Handling:

	▪ Elimination of administrative costs associated with handling paper documents as well as the delivery expense.
Process Specific Variables:	**250.01 Compile Turnover Package** ▪ Avg. Time Spent Searching and Assembling Operations & Maintenance Manuals ▪ Avg. Time Spent Searching and Assembling Commissioning Report ▪ Avg. Time Spent Searching and Assembling Record Specifications ▪ Avg. Number of Sheets in Record (As-Built) Drawings ▪ Avg. Time Spent Searching and Assembling Record (As-Built) Drawings ▪ Avg. Number of Sheets in Final Approved Shop Drawings ▪ Avg. Time Spent Searching and Assembling Final Approved Shop Drawings ▪ Percentage of Time Spent by Construction Project Manager ▪ Percentage of Time Spent by Assistant (Construction) Project Manager **250.02 Copy Turnover Package** ▪ Avg. Number of Pages In Operations & Maintenance Manuals ▪ Number of Unique Product Types ▪ Avg. Number of Pages In Commissioning Report ▪ Avg. Number of Components & Systems to be Commissioned ▪ Avg. Number of Pages In Record Specifications ▪ Avg. Number of Sheets in Record (As-Built) Drawings ▪ Avg. Number of Sheets in Final Approved Shop Drawings ▪ Number of Submittal Sets Required ▪ Avg. In-house Reproduction Time per Set **250.03 Send Copies of Turnover Package** ▪ Avg. Mailing Cost per Transmittal ▪ Avg. Time to Prepare a Transmittal **250.04 Log Transmittal of Turnover Package** ▪ Time to Log

	250.06 Log Receipt of Turnover Package ▪ Time to Log **250.07 Review Turnover Package** ▪ Avg. Number of Pages in Operations & Maintenance Manuals ▪ Avg. Time Spent Reviewing Operations & Maintenance Manuals ▪ Avg. Number of Pages in Commissioning Report ▪ Avg. Time Spent Reviewing Commissioning Report ▪ Avg. Number of Pages in Record Specifications ▪ Avg. Time Spent Reviewing Record Specifications ▪ Avg. Number of Sheets in Record (As-Built) Drawings ▪ Avg. Time Spent Reviewing Record (As-Built) Drawings ▪ Avg. Number of Sheets in Final Approved Shop Drawings ▪ Avg. Time Spent Reviewing Final Approved Shop Drawings **250.08 File Turnover Package** ▪ Avg. Time Spent Filing Operations & Maintenance Manuals ▪ Avg. Time Spent Filing Commissioning Report ▪ Avg. Time Spent Filing Record Specifications ▪ Avg. Number of Sheets in Record (As-Built) Drawings ▪ Avg. Time Spent Filing Record (As-Built) Drawings ▪ Avg. Number of Sheets in Final Approved Shop Drawings ▪ Avg. Time Spent Filing Final Approved Shop Drawings

5 How to use the COBie Calculator

The COBie Calculator is designed to compare current and expected life cycle information exchange process costs. See Chapter 3 and 4 for further description of the Current and Expected Processes and Appendix E for the current and expected values of the cost variables.

The Calculator only addresses variables whose values are affected by using either an electronic collaboration system and/or a structured data format.

5.1 General overview

The COBie Calculator is subdivided into the tabs listed below:

- Introduction
- Current Assumptions
- Expected Assumptions
- Summary
- 25 Life Cycle information exchange (LCie) Processes (010 Facility Criteria, 020 Discipline Specifications, etc.)

To use the COBie Calculator:

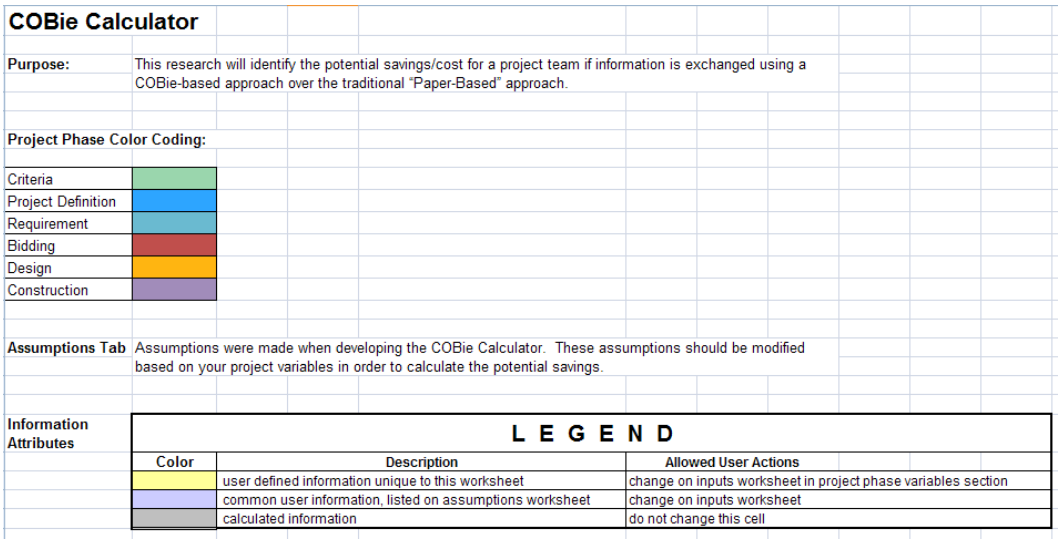
1. Determine processes and tasks of interest.
2. Enter project and relevant process specific costs into Current Assumptions sheet.
3. Adjust reduction factors on Expected Assumptions sheet as required.
4. View overall savings and savings by actor on Summary sheet.
5. View cost and savings detail on relevant LCie process tabs.

5.2 Detailed description

5.2.1 Introduction tab

The Introduction tab, Figure 1, shows the color-coding for the major project phases and variable types. Color-coding is used in the Calculator for ease of identification and understanding.

Figure 1. Introduction tab.



COBie Calculator

Purpose: This research will identify the potential savings/cost for a project team if information is exchanged using a COBie-based approach over the traditional "Paper-Based" approach.

Project Phase Color Coding:

Criteria
Project Definition
Requirement
Bidding
Design
Construction

Assumptions Tab Assumptions were made when developing the COBie Calculator. These assumptions should be modified based on your project variables in order to calculate the potential savings.

Information Attributes

L E G E N D

Color	Description	Allowed User Actions
	user defined information unique to this worksheet	change on inputs worksheet in project phase variables section
	common user information, listed on assumptions worksheet	change on inputs worksheet
	calculated information	do not change this cell

No information or data is required to be keyed into this tab.

5.2.2 Current Assumptions tab

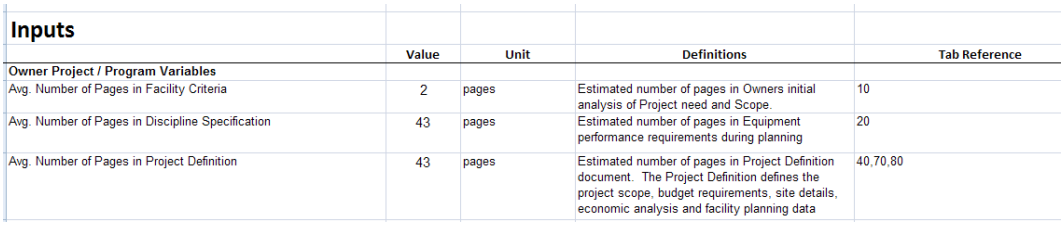
The Current Assumptions tab is the most important tab in the Calculator. It lists the 210 variables associated with the various tasks in the business process model. These variables are classified as:

- Owner Project/Program Variables
- Project Variables
- Pre-Design Variables
- Design Variables
- Estimating Process Variables
- Submittal Process Variables
- Organizational Variables
- General Repro/Postal Delivery Cost Variables
- Process Specific Variables

The default values in this tab have been set to "0", leaving the user to input data for the variables that are applicable to the project (Value column). Once the data is entered, the expected assumptions, summary and 19 of the LCie tabs in the Calculator are populated automatically. Six of the LCie processes are not affected by the use of COBie and managed electronic communications. They are included in the LCie process tabs, but have no associated cost variables.

As shown in Figure 2, the Current Assumptions tab is broken down by variable name, value (where all data is keyed in), units, definitions and tab reference. The Tab Reference column indicates where the variables are used within the Calculator to allow for easy referencing.

Figure 2. Current Assumptions tab.



Inputs				
	Value	Unit	Definitions	Tab Reference
Owner Project / Program Variables				
Avg. Number of Pages in Facility Criteria	2	pages	Estimated number of pages in Owners initial analysis of Project need and Scope.	10
Avg. Number of Pages in Discipline Specification	43	pages	Estimated number of pages in Equipment performance requirements during planning	20
Avg. Number of Pages in Project Definition	43	pages	Estimated number of pages in Project Definition document. The Project Definition defines the project scope, budget requirements, site details, economic analysis and facility planning data	40,70,80

There are a few assumptions that apply to an Owner organization or a project as a whole; however, most assumptions are phase or task specific. For example, an Owner may use an in-house Architect during Pre-Design. The hourly cost of that Architect would be his or her direct cost. However, once the project is scoped, the Design may be completed by an external Architectural firm. Their hourly rates would include overhead and profit. Similarly, in-house reproduction costs may differ from reimbursable reproduction from an outside Architect.

The Current Process assumes a completely paper-based process. Therefore, if a paper-based process has been eliminated from the end user's procedures, "0" should be entered for all variables that are related to paper documentation. Similarly, if a managed electronic collaboration system is in use, enter "0" for "Avg. Mailing Cost per Transmittal." Variables that do not apply to the end user's procedures but are identified in the LCie processes should be left at "0".

Only the Value column should be altered in this tab. All other columns are locked.

5.2.3 Expected Assumptions tab

The Expected Assumptions tab, Figure 3, has a similar layout as the Current Assumptions tab. It introduces the "Reduction Factor" column, which comes pre-populated, and the "Expected Outcome" column.

As data is input for the variables in the Current Assumptions tab, the Current Value column automatically populates in the Expected Assumptions

tab. The "Expected Outcome" column is automatically calculated based on the "Reduction Factor" where applicable. See Figure 3.

The reduction factors derive from the elimination, automation, or streamlining of tasks that involve recreating, reformatting, validating, handling, copying, and searching activities. If the value of a variable is not lower in the Expected Process, it remains the same as on the Current Assumptions tab and is shown in black text. Where cost savings are anticipated, the variables and values are in red text.

Figure 3. Expected Assumptions.

NOTE: Red text indicates variables affected by the expected process.

Inputs

	Current Value	Unit	*Redution Factor*	*Expected Outcome*
Owner Project / Program Variables				
Avg. Number of Pages in Facility Criteria	2	pages		**2.00**
Avg. Number of Pages in Discipline Specification	43	pages		**43.00**
Avg. Number of Pages in Project Definition	43	pages		**43.00**
Avg. Number of Pages in Front Matter	25	pages		**25.00**
Project Variables				
Number of Equipment (product) Types (Types / project)	50	types / project		**50.00**
Number of Tagged Components (components / project)	1706	components / project		**1706.00**
Number of Space Types per Building	19	space types / building		**19.00**
Time to Log (hours / transmittal)	0.25	hours / transmittal	100%	**0.00**

Project Phase Variables

			Redution Factor	Expected Outcome
Facility Criteria				
Avg. Number of Sets Required (sets / submittal)	2	sets / submittal	100%	**0.00**
Avg. In-house Reproduction Time Per Set (hours/set)	0.001	hours/set	100%	**0.00**
Discipline Specification				
Avg. Number of Sets Required (sets / submittal)	2	sets / submittal	100%	**0.00**
Avg. In-house Reproduction Time Per Set (hours/set)	0.029	hours/set	100%	**0.00**
Feasibility Study				
Avg. Number of Transmittals	2	Transmittals	-	**2.00**
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0.068	hours / submittal set	100%	**0.00**
Avg. Mailing Cost per Transmittal ($ / Transmittal)	$20.10	$ / Transmittal	100%	**$0.00**
Avg. Time to Prepare Transmittal (hours / transmittal)	0.5	hours / transmittal	60%	**0.20**

The reduction factors have been assigned default values. Copying and handling activities have a reduction factor of 100% because they will be eliminated due to the use of electronic documentation. Recreating activities are primarily identified in repetitive quantity takeoffs and re-submission of construction product data submittals. The Calculator ambitiously estimates that 100% of this rework will be eliminated due to an automated search and validation of product data. Anecdotal evidence indicates that design consultants spend a large amount of time extracting requirements from government text documents and putting them in a useful format; therefore, the Calculator assumes that at least a 100% savings can be achieved in reformatting. For the checking time needed to validate space program and product selection, the Calculator assumes a 90% time reduction. Streamlining activities have a reduction factor of 60%. The reduction factor is based on an actual comparison between paper based processes and the same processes performed in an electronic collaboration environment at the Chicago Transit Authority (CTA) (Fallon 2003).

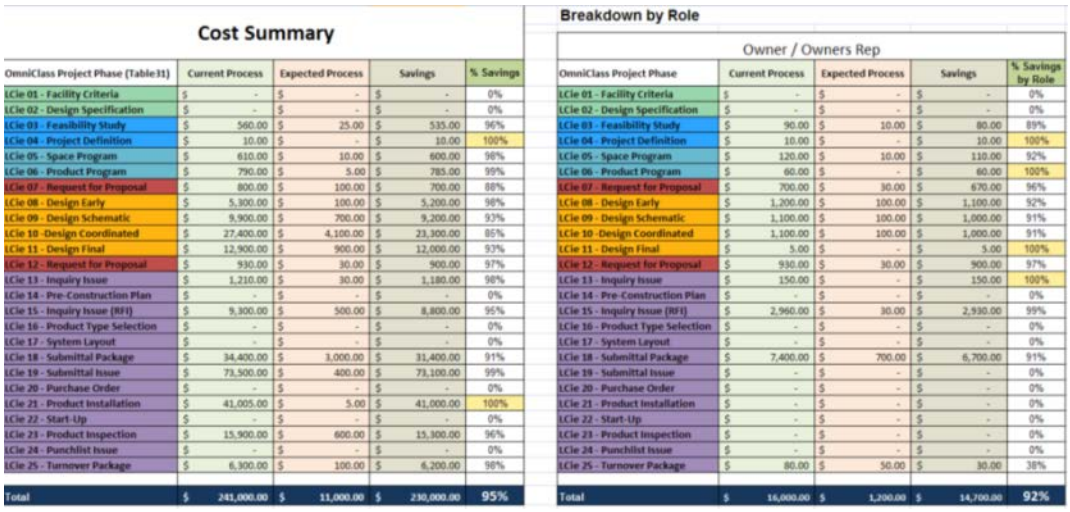
The end user is encouraged to adjust the reduction factors based on his organization's Current and Expected Processes. All other columns are locked excluding the reduction factor column are locked.

5.2.4 Summary tab

Figure 4, shows the Cost Summary tab for the 25 LCie processes. This cost summary reflects savings from potential elimination, streamlining and automation of tasks and not reduction of total project costs.

This tab is itemized collectively by Current Processes, Expected Processes, savings, and percentage savings. The summary is further broken down by role i.e. Owner/Owner's Representative, Architect, and Contractor.

Figure 4. Summary tab.



Cost Summary

OmniClass Project Phase (Table 31)	Current Process	Expected Process	Savings	% Savings
LCie 01 - Facility Criteria	$ -	$ -	$ -	0%
LCie 02 - Design Specification	$ -	$ -	$ -	0%
LCie 03 - Feasibility Study	$ 560.00	$ 25.00	$ 535.00	96%
LCie 04 - Project Definition	$ 10.00	$ -	$ 10.00	100%
LCie 05 - Space Program	$ 610.00	$ 10.00	$ 600.00	98%
LCie 06 - Product Program	$ 790.00	$ 5.00	$ 785.00	99%
LCie 07 - Request for Proposal	$ 800.00	$ 100.00	$ 700.00	88%
LCie 08 - Design Early	$ 5,300.00	$ 100.00	$ 5,200.00	98%
LCie 09 - Design Schematic	$ 9,900.00	$ 700.00	$ 9,200.00	93%
LCie 10 -Design Coordinated	$ 27,400.00	$ 4,100.00	$ 23,300.00	85%
LCie 11 - Design Final	$ 12,900.00	$ 900.00	$ 12,000.00	93%
LCie 12 - Request for Proposal	$ 930.00	$ 30.00	$ 900.00	97%
LCie 13 - Inquiry Issue	$ 1,210.00	$ 30.00	$ 1,180.00	98%
LCie 14 - Pre-Construction Plan	$ -	$ -	$ -	0%
LCie 15 - Inquiry Issue (RFI)	$ 9,300.00	$ 500.00	$ 8,800.00	95%
LCie 16 - Product Type Selection	$ -	$ -	$ -	0%
LCie 17 - System Layout	$ -	$ -	$ -	0%
LCie 18 - Submittal Package	$ 34,400.00	$ 3,000.00	$ 31,400.00	91%
LCie 19 - Submittal Issue	$ 73,500.00	$ 400.00	$ 73,100.00	99%
LCie 20 - Purchase Order	$ -	$ -	$ -	0%
LCie 21 - Product Installation	$ 41,005.00	$ 5.00	$ 41,000.00	100%
LCie 22 - Start-Up	$ -	$ -	$ -	0%
LCie 23 - Product Inspection	$ 15,900.00	$ 600.00	$ 15,300.00	96%
LCie 24 - Punchlist Issue	$ -	$ -	$ -	0%
LCie 25 - Turnover Package	$ 6,300.00	$ 100.00	$ 6,200.00	98%
Total	$ 241,000.00	$ 11,000.00	$ 230,000.00	95%

Breakdown by Role

Owner / Owners Rep

OmniClass Project Phase	Current Process	Expected Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	$ -	$ -	$ -	0%
LCie 02 - Design Specification	$ -	$ -	$ -	0%
LCie 03 - Feasibility Study	$ 90.00	$ 10.00	$ 80.00	89%
LCie 04 - Project Definition	$ 10.00	$ -	$ 10.00	100%
LCie 05 - Space Program	$ 120.00	$ 10.00	$ 110.00	92%
LCie 06 - Product Program	$ 60.00	$ -	$ 60.00	100%
LCie 07 - Request for Proposal	$ 700.00	$ 30.00	$ 670.00	96%
LCie 08 - Design Early	$ 1,200.00	$ 100.00	$ 1,100.00	92%
LCie 09 - Design Schematic	$ 1,100.00	$ 100.00	$ 1,000.00	91%
LCie 10 -Design Coordinated	$ 1,100.00	$ 100.00	$ 1,000.00	91%
LCie 11 - Design Final	$ 5.00	$ -	$ 5.00	100%
LCie 12 - Request for Proposal	$ 930.00	$ 30.00	$ 900.00	97%
LCie 13 - Inquiry Issue	$ 150.00	$ -	$ 150.00	100%
LCie 14 - Pre-Construction Plan	$ -	$ -	$ -	0%
LCie 15 - Inquiry Issue (RFI)	$ 2,960.00	$ 30.00	$ 2,930.00	99%
LCie 16 - Product Type Selection	$ -	$ -	$ -	0%
LCie 17 - System Layout	$ -	$ -	$ -	0%
LCie 18 - Submittal Package	$ 7,400.00	$ 700.00	$ 6,700.00	91%
LCie 19 - Submittal Issue	$ -	$ -	$ -	0%
LCie 20 - Purchase Order	$ -	$ -	$ -	0%
LCie 21 - Product Installation	$ -	$ -	$ -	0%
LCie 22 - Start-Up	$ -	$ -	$ -	0%
LCie 23 - Product Inspection	$ -	$ -	$ -	0%
LCie 24 - Punchlist Issue	$ -	$ -	$ -	0%
LCie 25 - Turnover Package	$ 80.00	$ 50.00	$ 30.00	38%
Total	$ 16,000.00	$ 1,200.00	$ 14,700.00	92%

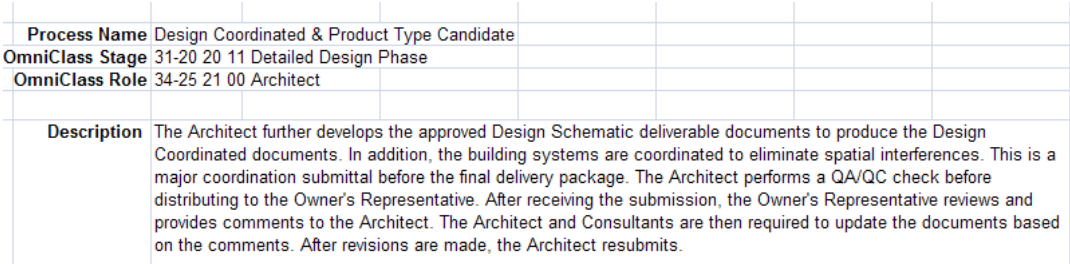
No information or data is required to be keyed into this tab. It is automatically populated upon filling out the Current Assumptions tab.

5.2.5 Life Cycle Information Exchange Process tabs

The 25 LCie Process tabs are populated based on the Current Assumptions and Expected Assumptions tabs. 19 out of the 25 processes have been identified for potential savings due to the use of an electronic collaboration system and a structured data format (COBie). The 6 processes where these two factors would not bring about any savings or improve efficiency are: 140 Pre-construction Plan, 160 Product Type Selection, 170 System Layout, 200 Purchase Order, 220 Start-Up, and 240 Punchlist Issue. These processes are included in the LCie tabs but have no cost variables associated with them.

As seen in Figure 5, each LCie Process tab contains a header that contains the process name, OmniClass stage and role, process description, and breakdown of the activities based on the LCie process maps.

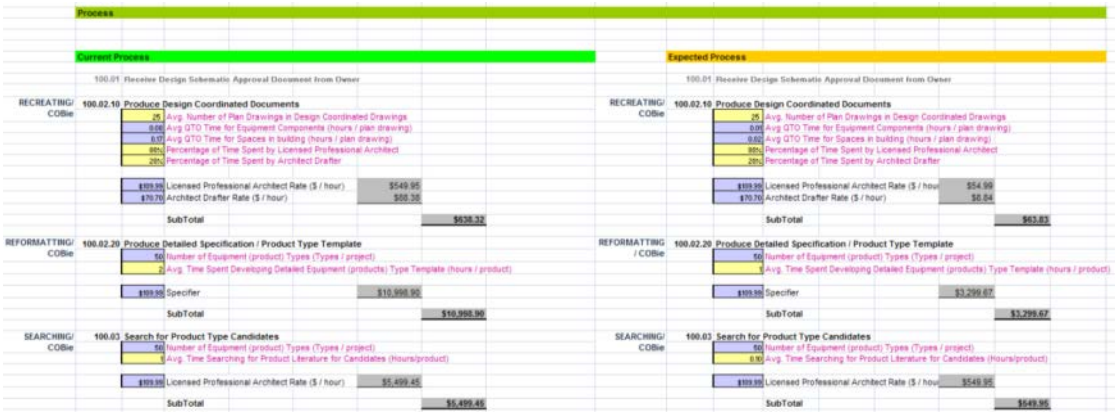
Figure 5. LCie Process Tab: Header.



Process Name	Design Coordinated & Product Type Candidate
OmniClass Stage	31-20 20 11 Detailed Design Phase
OmniClass Role	34-25 21 00 Architect
Description	The Architect further develops the approved Design Schematic deliverable documents to produce the Design Coordinated documents. In addition, the building systems are coordinated to eliminate spatial interferences. This is a major coordination submittal before the final delivery package. The Architect performs a QA/QC check before distributing to the Owner's Representative. After receiving the submission, the Owner's Representative reviews and provides comments to the Architect. The Architect and Consultants are then required to update the documents based on the comments. After revisions are made, the Architect resubmits.

Each of these process tabs is then further divided into Current and Expected Processes as seen in Figure 6. The Current Process is on the left and the Expected Process is on the right.

Figure 6. LCie process tab: Current and Expected Processes.



The process tabs show item by item exactly where cost savings are achieved and their magnitude. Data that is keyed in by the end user in the Current Assumptions tab populates the variables listed on the Current Process side and data from the Expected Outcome column in the Expected Assumptions tab fills the variables listed on the Expected Process side.

The end user should not make any changes or input data on the individual process tabs (e.g. 01 Facility Criteria). All adjustments should be made on the Current Assumptions and Expected Assumptions tabs.

The "Information Attributes" summary, as seen in Figure 7, shows an overall summary of the processes (current and expected) based on the costs attributed to each of the role players.

Figure 7. LCie Process tab: Information Attributes.

Information Attributes				
		Owner	Architect	Contractor
Current process cost:	$ 27,356.26	$ 1,061.96	$25,952.89	$ -
Expected process cost:	$ 4,086.31	$ 53.14	$4,033.18	$ -
Process Cost Difference:	$ 23,269.94	$ 1,008.82	$ 21,919.71	$ -

At any time the LCie worksheets can be navigated to see how the variables and reduction factor affect each Life Cycle stage.

5.3 Example

The illustration below, Figure 8, is a section from the "current" LCie for the Design Coordinated business process model.

Figure 8. Design coordinated current business process model.

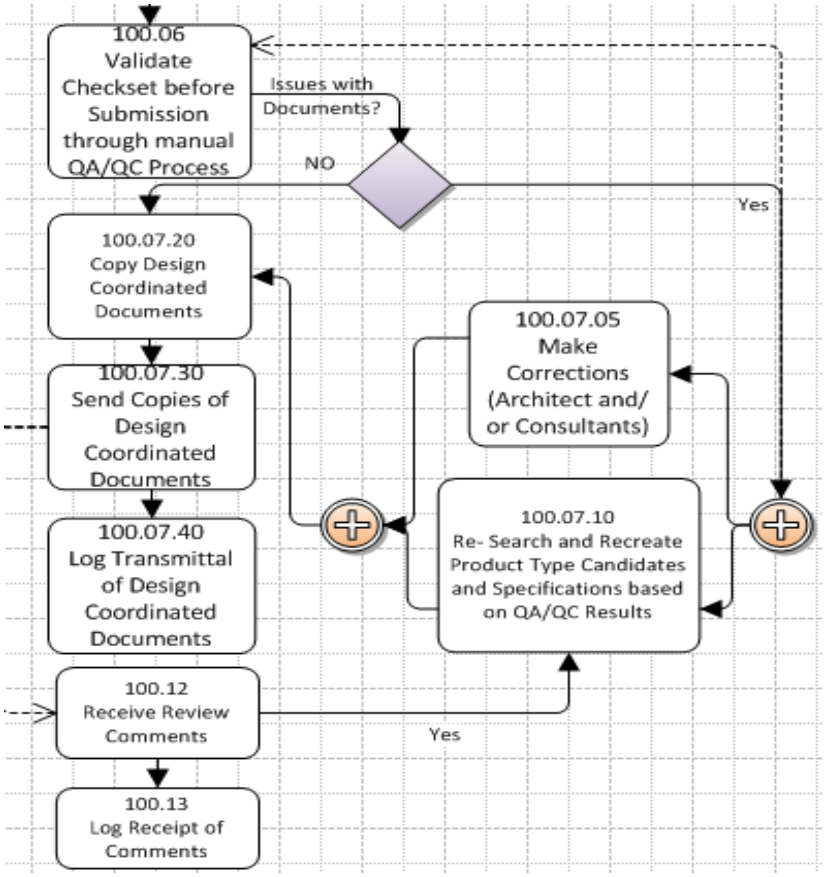


Figure 9 shows the Current Process costs for the above section broken down into its relevant cost variables.

Figure 9. Design coordinated current process costs.

VALIDATING/ COBie	100.06	Validate Checkset before Submission through manual QA/QC Process			
	9.60	Avg. Time Spent Evaluating Design Coordinated Drawings against Design Requirements - Space and Equipment			
	$109.99	Licensed Professional Architect Rate ($ / hour)	$1,055.89		
		SubTotal		$1,055.89	
RECREATING/ COBie	100.07.05	Make Corrections (Architect and/or Consultants)			
	3.10	Avg. Time spent making corrections due to non-conformance with Space Program			
	$109.99	Licensed Professional Architect Rate ($ / hour)	$341.41		
		SubTotal		$341.41	
SEARCHING & RECREATING/ COBie	100.07.10	Re- Search and Recreate Product Type Candidates and Detailed Specifications based on QA/QC Results			
	15%	Avg. Percent of Errors in Product Type Candidate			
	50	Number of Equipment (product) Types (Types / project)			
	1	Avg. Time Searching for Product Literature for Candidates (Hours/product)			
	$109.99	Licensed Professional Architect Rate ($ / hour)	$824.92		
		SubTotal		$824.92	
COPYING/ ELEC.DOC.	100.07.20	Copy Design Coordinated Documents			
	146	Avg. Number of Sheets in Design Coordinated Drawings			
	20	Avg. Number of Letter Sized Pages in a Design Coordinated Narrative			
	300	Avg. Number of Letter Sized Pages in a Design Coordinated Specification			
	6	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.15	Avg. Per Page Copy Cost ($ / page)			
	$3.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.619	Avg. In-house Reproduction Time Per Set (hours/set)			
	$70.70	Architect Drafter Rate ($ / hour)	$262.59		
		Copying Cost	$2,916.00		
		SubTotal		$3,178.59	
HANDLING/ ELEC.DOC.	100.07.30	Send Design Coordinated Documents			
	1	Avg. Number of Transmittals (Transmittals)			
	$47.70	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.50	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$70.70	Architect Drafter Rate ($ / hour)	$35.35		
		Mailing Cost	$47.70		

With the aid of electronic documentation and a structured data format, some tasks will be eliminated, streamlined, or automated and some will remain unchanged. This is reflected in the corresponding Expected Process LCie for the Design Coordinated business process model shown below in Figure 10.

Figure 10. Design coordinated expected business process model.

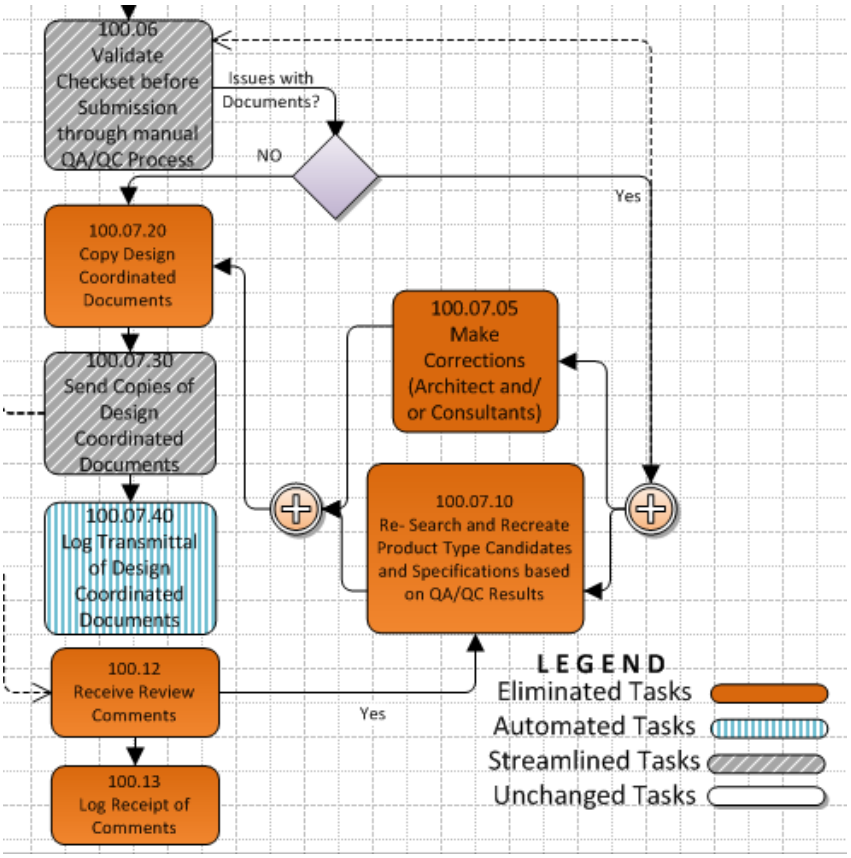
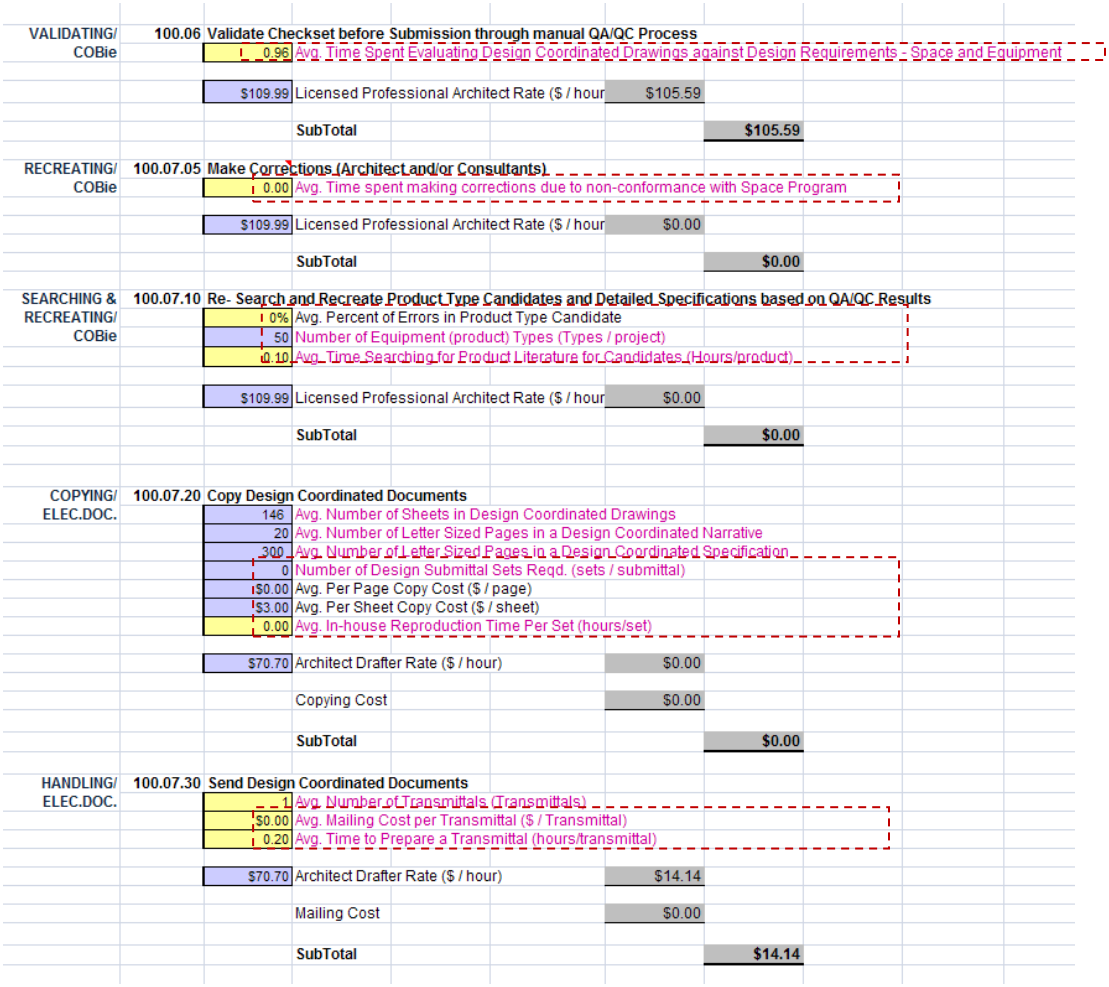


Figure 11 shows the corresponding Expected Process costs broken down into their relevant cost variables. The boxed variables reflect a reduction in cost of the Expected Process. Based on the values assigned to the variables in the Current Assumptions tab and the Reduction Factors assigned on the Expected Assumptions tab, the Current Process cost for the Validate Checkset before Submission Through a Manual QA/QC Process amounts to $1,055.89, while the corresponding Expected Process cost is $105.59. There is a 90% savings.

Figure 11. Design coordinated expected process.



VALIDATING/ COBie	100.06	Validate Checkset before Submission through manual QA/QC Process			
	0.96	Avg. Time Spent Evaluating Design Coordinated Drawings against Design Requirements - Space and Equipment			
	$109.99	Licensed Professional Architect Rate ($ / hour	$105.59		
		SubTotal		$105.59	
RECREATING/ COBie	100.07.05	Make Corrections (Architect and/or Consultants)			
	0.00	Avg. Time spent making corrections due to non-conformance with Space Program			
	$109.99	Licensed Professional Architect Rate ($ / hour	$0.00		
		SubTotal		$0.00	
SEARCHING & RECREATING/ COBie	100.07.10	Re- Search and Recreate Product Type Candidates and Detailed Specifications based on QA/QC Results			
	0%	Avg. Percent of Errors in Product Type Candidate			
	50	Number of Equipment (product) Types (Types / project)			
	0.10	Avg. Time Searching for Product Literature for Candidates (Hours/product)			
	$109.99	Licensed Professional Architect Rate ($ / hour	$0.00		
		SubTotal		$0.00	
COPYING/ ELEC.DOC.	100.07.20	Copy Design Coordinated Documents			
	146	Avg. Number of Sheets in Design Coordinated Drawings			
	20	Avg. Number of Letter Sized Pages in a Design Coordinated Narrative			
	300	Avg. Number of Letter Sized Pages in a Design Coordinated Specification			
	0	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$3.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)			
	$70.70	Architect Drafter Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	100.07.30	Send Design Coordinated Documents			
	1	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.20	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$70.70	Architect Drafter Rate ($ / hour)	$14.14		
		Mailing Cost	$0.00		
		SubTotal		$14.14	

In summary, the COBie Calculator is a tool for estimating Current and Expected costs related to the specification, documentation and fulfillment of managed asset requirements (space and products).

The Calculator can be used to evaluate up to 19 Life Cycle processes. Current costs are entered in the Current Assumptions tab and reduction factors are entered on the Expected Assumptions tab. Results can be viewed on the Summary Tab, and in detail, on each Life Cycle Process tab.

6 Project Analyses

To test the COBie Calculator, the National Institute of Building Sciences' three experimental BIM models (Duplex Apartment, Office Building, and Medical Clinic) were utilized (NIBS 2012d). These models were used as a representation of residential, commercial and medical facilities. In addition, a Chicago Transit Authority (CTA) station program was analyzed.

The 210 variables related to the specification, documentation and fulfillment of managed asset requirements were populated based on drawings, space inventories, specifications, equipment schedules and product data sheets where available. For the Transit program, an electronic collaboration system provided additional details such as number of resubmissions of design review documents and construction product data submittals as well as designers time sheets and billing rates. This information was augmented by published cost indices, project information from additional owners, and the professional experience of the authors. Appendix E documents the source of each current cost and reduction factor assumption for the transit station program. Note that the Total Summary cost is **not** the full cost of design and construction.

The baseline, or Current Process, used in analyzing all sample projects assumed a paper-based communication and documentation system and no use of data exchanges in a standard, structured data format (COBie). The Expected Process assumed an electronic collaboration communication and documentation system and use of standard, structured data (COBie) for data exchanges. The COBie Calculator determined the expected values of the variables affected.

A Medical Clinic, Office building and CTA Transit Station are documented in this chapter.

6.1 Medical Clinic

The Medical Clinic experimental BIM, seen in Figure 12, is based on a federal medical and dental building. The Medical Clinic's statistics are:

- Size: 49,571 SF
- # of Product Types: 155

- # of Components: 3,950

Figure 12. Medical clinic model.

Table 1 shows the overall cost summary of the individual LCie Processes.

Table 1. Clinic cost summary.

Cost Summary				
OmniClass Project Phase (Table31)	Current Process	Expected Process	Savings	% Savings
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	$135.00	-	$135.00	100%
LCie 03 - Feasibility Study	$670.00	$10.00	$660.00	99%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	$840.00	$10.00	$830.00	99%
LCie 06 - Product Program	$1,900.00	$5.00	$1,895.00	99%
LCie 07 - Request for Proposal	$900.00	$100.00	$800.00	89%
LCie 08 - Design Early	$20,840.00	$300.00	$20,900.00	98%
LCie 09 - Design Schematic	$33,400.00	$1,900.00	$31,500.00	94%
LCie 10 -Design Coordinated	$91,100.00	$12,600.00	$82,700.00	86%
LCie 11 - Design Final	$30,400.00	$2,200.00	$28,200.00	93%
LCie 12 - Request for Proposal	$1,990.00	$30.00	$1,960.00	98%
LCie 13 - Inquiry Issue	$1,210.00	$30.00	$1,180.00	98%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$1,800.00	-	$1,800.00	100%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$60,700.00	$5,000.00	$55,700.00	92%
LCie 19 - Submittal Issue	$214,600.00	$500.00	$214,100.00	99%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$94,800.00	-	$94,800.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$29,100.00	$1,200.00	$27,900.00	96%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$14,100.00	$100.00	$14,000.00	99%
Total	$598,000.00	$24,000.00	$574,000.00	96%

Tables 2 – 4 show the cost savings breakdown among Owner/Owner's Representative, Architect, and Contractor.

Table 2. Clinic cost summary - Owner/Owner's Representative.

Breakdown by Role				
Cost Summary - Owner / Owners Rep				
OmniClass Project Phase	Current Process	Expected Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	$135.00	-	$135.00	100%
LCie 03 - Feasibility Study	$75.00	$5.00	$70.00	93%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	$120.00	$5.00	$115.00	96%
LCie 06 - Product Program	$70.00	-	$70.00	100%
LCie 07 - Request for Proposal	$760.00	$30.00	$730.00	96%
LCie 08 - Design Early	$6,400.00	$200.00	$6,200.00	97%
LCie 09 - Design Schematic	$4,400.00	$100.00	$4,300.00	98%
LCie 10 -Design Coordinated	$4,400.00	$100.00	$4,300.00	98%
LCie 11 - Design Final	$5.00	-	$5.00	100%
LCie 12 - Request for Proposal	$1,990.00	$30.00	$1,960.00	98%
LCie 13 - Inquiry Issue	$145.00	$5.00	$140.00	97%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$560.00	-	$560.00	100%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$11,400.00	$1,200.00	$10,200.00	89%
LCie 19 - Submittal Issue	-	-	-	0%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	-	-	-	0%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	-	-	-	0%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$190.00	$70.00	$120.00	63%
Total	$31,000.00	$1,700.00	$28,900.00	93%

Table 3. Clinic cost summary – Architect.

Cost Summary - Architect				
OmniClass Project Phase	Current Process	Expected Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	$590.00	-	$590.00	100%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	$720.00	-	$720.00	100%
LCie 06 - Product Program	$1,800.00	-	$1,800.00	100%
LCie 07 - Request for Proposal	$170.00	$30.00	$140.00	82%
LCie 08 - Design Early	$14,420.00	$170.00	$14,250.00	99%
LCie 09 - Design Schematic	$29,100.00	$1,800.00	$27,300.00	94%
LCie 10 -Design Coordinated	$85,900.00	$12,500.00	$73,400.00	85%
LCie 11 - Design Final	$30,300.00	$2,200.00	$28,100.00	93%
LCie 12 - Request for Proposal	-	-	-	0%
LCie 13 - Inquiry Issue	$240.00	$10.00	$230.00	96%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$700.00	$10.00	$690.00	99%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$6,000.00	-	$6,000.00	100%
LCie 19 - Submittal Issue	$207,500.00	$500.00	$207,000.00	100%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$40.00	-	$40.00	100%
LCie 22 - Start-Up	-	-	-	0%

LCie 23 - Product Inspection	$29,100.00	$1,200.00	$27,900.00	96%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	-	-	-	0%
Total	**$415,500.00**	**$18,700.00**	**$388,200.00**	**95%**

Table 4. Clinic cost summary – Contractor.

Cost Summary - Contractor				
OmniClass Project Phase	Current Process	Expected Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	-	-	-	0%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	-	-	-	0%
LCie 06 - Product Program	-	-	-	0%
LCie 07 - Request for Proposal	-	-	-	0%
LCie 08 - Design Early	-	-	-	0%
LCie 09 - Design Schematic	-	-	-	0%
LCie 10 -Design Coordinated	-	-	-	0%
LCie 11 - Design Final	-	-	-	0%
LCie 12 - Request for Proposal	-	-	-	0%
LCie 13 - Inquiry Issue	$820.00	$10.00	$810.00	99%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$500.00	-	$500.00	100%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$43,200.00	$3,900.00	$39,300.00	91%
LCie 19 - Submittal Issue	$7,020.00	$40.00	$6,980.00	99%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$94,800.00	-	$94,800.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$20.00	-	$20.00	100%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$13,960.00	$50.00	$13,910.00	100%
Total	**$160,300.00**	**$4,000.00**	**$156,300.00**	**98%**

6.2 Office

The Office experimental BIM, seen in Figure 13, is based on a real two story, mid-sized office building. The Office building statistics are:

- Size: 40,053 SF
- # of Product Types: 50
- # of Components: 1,706

Figure 13. Office building model.

Table 5 shows the overall cost summary of the individual LCie Processes.

Table 5. Office cost summary.

Cost Summary				
OmniClass Project Phase (Table31)	Current Process	Expected Process	Savings	% Savings
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	$15.00	-	$15.00	100%
LCie 03 - Feasibility Study	$560.00	$25.00	$535.00	96%
LCie 04 - Project Definition	$10.00	-	$10.00	100%
LCie 05 - Space Program	$615.00	$10.00	$605.00	98%
LCie 06 - Product Program	$790.00	$5.00	$785.00	99%
LCie 07 - Request for Proposal	$800.00	$100.00	$700.00	88%
LCie 08 - Design Early	$5,300.00	$90.00	$5,210.00	98%
LCie 09 - Design Schematic	$9,900.00	$600.00	$9,300.00	93%
LCie 10 -Design Coordinated	$26,300.00	$4,100.00	$22,200.00	85%
LCie 11 - Design Final	$12,900.00	$900.00	$12,000.00	93%
LCie 12 - Request for Proposal	$930.00	$30.00	$900.00	97%
LCie 13 - Inquiry Issue	$1,210.00	$30.00	$1,180.00	98%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$1,280.00	$10.00	$1,270.00	95%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$34,400.00	$3,000.00	$31,400.00	91%
LCie 19 - Submittal Issue	$73,500.00	$400.00	$73,100.00	99%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$41,005.00	$5.00	$41,000.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$15,900.00	$600.00	$15,300.00	96%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$6,300.00	$100.00	$6,200.00	98%
Total	$232,000.00	$10,000.00	$222,000.00	96%

Tables 6 – 8 show the cost savings breakdown among Owner/Owner's Representative, Architect, and Contractor.

Table 6. Office cost summary - Owner/Owner's Representative.

Breakdown by Role				
Cost Summary - Owner / Owners Rep				
OmniClass Project Phase	Current	Expected	Savings	% Savings

	Process	Process		by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	$15.00	-	$15.00	100%
LCie 03 - Feasibility Study	$90.00	$10.00	$80.00	89%
LCie 04 - Project Definition	$10.00	-	$10.00	100%
LCie 05 - Space Program	$120.00	$5.00	$115.00	96%
LCie 06 - Product Program	$60.00	-	$60.00	100%
LCie 07 - Request for Proposal	$700.00	$30.00	$670.00	96%
LCie 08 - Design Early	$1,100.00	$100.00	$1,100.00	91%
LCie 09 - Design Schematic	$1,100.00	-	$1,100.00	100%
LCie 10 -Design Coordinated	$1,100.00	-	$1,100.00	100%
LCie 11 - Design Final	$5.00	-	$5.00	100%
LCie 12 - Request for Proposal	$930.00	$30.00	$900.00	97%
LCie 13 - Inquiry Issue	$145.00	$5.00	$140.00	90%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$410.00	-	$410.00	100%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$7,400.00	$700.00	$6,700.00	91%
LCie 19 - Submittal Issue	-	-	-	0%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	-	-	-	0%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	-	-	-	0%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$80.00	$50.00	$30.00	38%
Total	**$13,000.00**	**$900.00**	**$12,300.00**	**95%**

Table 7. Office cost summary – Architect.

Cost Summary - Architect				
OmniClass Project Phase	Current Process	Expected Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	$470.00	$10.00	$460.00	98%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	$500.00	-	$500.00	100%
LCie 06 - Product Program	$700.00	-	$700.00	100%
LCie 07 - Request for Proposal	$140.00	$30.00	$110.00	79%
LCie 08 - Design Early	$4,190.00	$30.00	$4,150.00	99%
LCie 09 - Design Schematic	$8,900.00	$600.00	$8,300.00	93%
LCie 10 -Design Coordinated	$24,900.00	$4,000.00	$20,900.00	84%
LCie 11 - Design Final	$12,800.00	$900.00	$11,900.00	93%
LCie 12 - Request for Proposal	-	-	-	0%
LCie 13 - Inquiry Issue	$240.00	$10.00	$230.00	96%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$510.00	-	$510.00	100%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$3,900.00	-	$3,900.00	100%
LCie 19 - Submittal Issue	$71,100.00	$400.00	$70,700.00	99%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$40.00	-	$40.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$15,900.00	$600.00	$15,300.00	96%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	-	-	-	0%
Total	**$144,300.00**	**$6,600.00**	**$137,700.00**	**95%**

Table 8. Office cost summary – Contractor.

Cost Summary - Contractor				
OmniClass Project Phase	Current Process	Expected Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	-	-	-	0%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	-	-	-	0%
LCie 06 - Product Program	-	-	-	0%
LCie 07 - Request for Proposal	-	-	-	0%
LCie 08 - Design Early	-	-	-	0%
LCie 09 - Design Schematic	-	-	-	0%
LCie 10 -Design Coordinated	-	-	-	0%
LCie 11 - Design Final	-	-	-	0%
LCie 12 - Request for Proposal	-	-	-	0%
LCie 13 - Inquiry Issue	$820.00	$10.00	$810.00	99%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$400.00	-	$400.00	100%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$23,100.00	$2,200.00	$20,900.00	90%
LCie 19 - Submittal Issue	$2,360.00	$10.00	$2,350.00	99%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$41,000.00	-	$41,000.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$20.00	-	$20.00	100%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$6,240.00	$50.00	$6,190.00	99%
Total	$73,900.00	$2,300.00	$71,700.00	97%

6.3 Transit station program

In addition to the 3 NIBS experimental models, a Chicago Transit Authority (CTA) station program was analyzed. Unlike the NIBS experimental models, the CTA utilized a web-based managed collaboration system with automated workflow and some paper-based communication in executing its projects. It did not make use of standard, structured data for exchanges. This process is referred to as the Hybrid Process. It reflects a common level of automation in the industry today.

With the information gathered from this project, 2 comparisons were developed:

- Paper-Based vs. Hybrid Process
  This was created to evaluate savings that could be associated with a transition from an entirely paper based process to the Hybrid process.
- Hybrid Process vs. Expected Process

This comparison evaluated the savings that could be gained from transitioning from the Hybrid process to one that combines use of an electronic collaboration environment with complete elimination of paper and the use of standard, structured data.

6.3.1 Paper-Based Process vs. Hybrid Process

Table 9 shows the overall cost summary of the individual LCie Processes.

Table 9. Transit station cost summary - Paper Based vs. Hybrid Process.

Cost Summary				
OmniClass Project Phase (Table31)	Current Process	Hybrid Process	Savings	% Savings
LCie 01 - Facility Criteria	$10.00	-	$10.00	100%
LCie 02 - Design Specification	$200.00	-	$200.00	100%
LCie 03 - Feasibility Study	$540.00	$10.00	$530.00	98%
LCie 04 - Project Definition	$10.00	-	$10.00	100%
LCie 05 - Space Program	$700.00	$500.00	$200.00	29%
LCie 06 - Product Program	$1,700.00	$800.00	$900.00	53%
LCie 07 - Request for Proposal	$600.00	$100.00	$500.00	83%
LCie 08 - Design Early	$11,800.00	$11,800.00	-	0%
LCie 09 - Design Schematic	$31,800.00	$31,800.00	-	0%
LCie 10 -Design Coordinated	$68,100.00	$68,100.00	-	0%
LCie 11 - Design Final	$28,900.00	$28,200.00	$700.00	2%
LCie 12 - Request for Proposal	$16,290.00	$20.00	$16,270.00	100%
LCie 13 - Inquiry Issue	$1,200.00	$100.00	$1,100.00	92%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$206,900.00	$26,000.00	$180,900.00	87%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$84,700.00	$84,700.00	-	0%
LCie 19 - Submittal Issue	$61,400.00	$61,400.00	-	0%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$12,900.00	$12,900.00	-	0%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$326,800.00	$326,800.00	-	0%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$15,400.00	$15,400.00	-	0%
Total	$870,000.00	$669,000.00	$201,000.00	23%

Tables 10 – 12 show the cost savings breakdown among Owner/Owner's Representative, Architect, and Contractor.

Table 10. Transit Station cost summary - Paper Based vs. Hybrid Process - Owner/Owner's Representative.

Breakdown by Role				
Cost Summary - Owner / Owners Rep				
OmniClass Project Phase	Current Process	Hybrid Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	$10.00	-	$10.00	100%
LCie 02 - Design Specification	$200.00	-	$200.00	100%
LCie 03 - Feasibility Study	$100.00	-	$100.00	100%

LCie 04 - Project Definition	$10.00	-	$10.00	100%
LCie 05 - Space Program	$120.00	$60.00	$60.00	50%
LCie 06 - Product Program	$300.00	$200.00	$100.00	33%
LCie 07 - Request for Proposal	$470.00	$10.00	$460.00	98%
LCie 08 - Design Early	$2,500.00	$2,500.00	-	0%
LCie 09 - Design Schematic	$7,700.00	$7,700.00	-	0%
LCie 10 -Design Coordinated	$9,900.00	$9,900.00	-	0%
LCie 11 - Design Final	-	-	-	0%
LCie 12 - Request for Proposal	$16,290.00	$20.00	$16,270.00	100%
LCie 13 - Inquiry Issue	$150.00	$10.00	$140.00	93%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$65,600.00	$1,300.00	$64,300.00	98%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$22,500.00	$22,500.00	-	0%
LCie 19 - Submittal Issue	-	-	-	0%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	-	-	-	0%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	-	-	-	0%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$260.00	$260.00	-	0%
Total	**$126,000.00**	**$44,500.00**	**$81,700.00**	**65%**

Table 11. Transit Station cost summary - Paper Based vs. Hybrid Process – Architect.

Cost Summary - Architect				
OmniClass Project Phase	Current Process	Hybrid Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	$450.00	$10.00	$440.00	98%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	$500.00	$400.00	$100.00	20%
LCie 06 - Product Program	$1,400.00	$600.00	$800.00	57%
LCie 07 - Request for Proposal	$200.00	$100.00	$100.00	50%
LCie 08 - Design Early	$9,300.00	$9,300.00	-	0%
LCie 09 - Design Schematic	$24,200.00	$24,200.00	-	0%
LCie 10 -Design Coordinated	$57,300.00	$57,300.00	-	0%
LCie 11 - Design Final	$28,800.00	$28,000.00	$800.00	3%
LCie 12 - Request for Proposal	-	-	-	0%
LCie 13 - Inquiry Issue	$240.00	$40.00	$200.00	83%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$82,000.00	$15,200.00	$66,800.00	81%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$15,100.00	$15,100.00	-	0%
LCie 19 - Submittal Issue	$53,700.00	$53,700.00	-	0%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$40.00	$40.00	-	0%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$326,700.00	$326,700.00	-	0%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	-	-	-	0%
Total	**$599,900.00**	**$530,700.00**	**$69,200.00**	**12%**

Table 12. Transit Station cost summary - Paper Based vs. Hybrid Process – Contractor.

Cost Summary - Contractor				
OmniClass Project Phase	Current Process	Hybrid Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	-	-	-	0%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	-	-	-	0%
LCie 06 - Product Program	-	-	-	0%
LCie 07 - Request for Proposal	-	-	-	0%
LCie 08 - Design Early	-	-	-	0%
LCie 09 - Design Schematic	-	-	-	0%
LCie 10 -Design Coordinated	-	-	-	0%
LCie 11 - Design Final	-	-	-	0%
LCie 12 - Request for Proposal	-	-	-	0%
LCie 13 - Inquiry Issue	$820.00	$20.00	$800.00	98%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$59,200.00	$9,500.00	$49,700.00	84%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$47,100.00	$47,100.00	-	0%
LCie 19 - Submittal Issue	$7,700.00	$7,700.00	-	0%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$12,900.00	$12,900.00	-	0%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$20.00	$20.00	-	0%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$15,100.00	$15,100.00	-	0%
Total	$142,800.00	$92,300.00	$50,500.00	35%

6.3.2 Hybrid Process vs. Expected Process

Table 13 shows the overall cost summary of the individual LCie Processes.

Table 13. Transit Station cost summary – Hybrid Process vs. Expected Process.

Cost Summary				
OmniClass Project Phase (Table31)	Hybrid Process	Expected Process	Savings	% Savings
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	$10.00	$10.00	-	0%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	$510.00	$10.00	$500.00	98%
LCie 06 - Product Program	$890.00	$30.00	$860.00	97%
LCie 07 - Request for Proposal	$80.00	$80.00	-	0%
LCie 08 - Design Early	$11,800.00	$300.00	$11,500.00	97%
LCie 09 - Design Schematic	$31,800.00	$1,500.00	$30,300.00	95%
LCie 10 -Design Coordinated	$68,000.00	$7,600.00	$60,400.00	89%
LCie 11 - Design Final	$28,200.00	$1,900.00	$26,300.00	93%
LCie 12 - Request for Proposal	$20.00	$10.00	$10.00	50%
LCie 13 - Inquiry Issue	$100.00	$100.00	-	0%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$3,200.00	$300.00	$2,900	91%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$32,700.00	$1,800.00	$30,900.00	94%
LCie 19 - Submittal Issue	$61,400.00	$500.00	$60,900.00	99%

LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$12,900.00	-	$12,900.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$326,800.00	$13,100.00	$313,700.00	96%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$15,400.00	$300.00	$15,100.00	98%
Total	**$594,000.00**	**$28,000.00**	**$566,000.00**	**95%**

Tables 14 – 16 show the cost savings breakdown among Owner/Owner's Representative, Architect, and Contractor.

Table 14. Transit Station cost summary - Hybrid Process vs. Expected Process - Owner/Owner's Representative.

Breakdown by Role				
Cost Summary - Owner / Owners Rep				
OmniClass Project Phase	Hybrid Process	Expected Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	-	-	-	0%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	$70.00	$10.00	$60.00	86%
LCie 06 - Product Program	$250.00	$20.00	$230.00	92%
LCie 07 - Request for Proposal	$10.00	$10.00	-	0%
LCie 08 - Design Early	$2,480.00	$80.00	$2,400.00	97%
LCie 09 - Design Schematic	$7,660.00	$260.00	$7,400.00	97%
LCie 10 -Design Coordinated	$9,900.00	$330.00	$9,570.00	97%
LCie 11 - Design Final	-	-	-	0%
LCie 12 - Request for Proposal	$20.00	$10.00	$10.00	50%
LCie 13 - Inquiry Issue	$10.00	$10.00	-	0%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$200.00	-	$200.00	100%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$6,600.00	$100.00	$6,500.00	98%
LCie 19 - Submittal Issue	-	-	-	0%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	-	-	-	0%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	-	-	-	0%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$300.00	$200.00	$100.00	33%
Total	**$28,000.00**	**$1,000.00**	**$26,500.00**	**95%**

Table 15. Transit Station cost summary - Hybrid Process vs. Expected Process – Architect.

Cost Summary - Architect				
OmniClass Project Phase	Hybrid Process	Expected Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	$10.00	$10.00	-	0%
LCie 04 - Project Definition	-	-	-	0%

LCie 05 - Space Program	$450.00	$10.00	$440.00	98%
LCie 06 - Product Program	$640.00	$10.00	$630.00	98%
LCie 07 - Request for Proposal	$70.00	$70.00	-	0%
LCie 08 - Design Early	$9,300.00	$200.00	$9,100.00	98%
LCie 09 - Design Schematic	$24,100.00	$1,300.00	$22,800.00	95%
LCie 10 -Design Coordinated	$57,300.00	$7,300.00	$50,000.00	87%
LCie 11 - Design Final	$28,000.00	$1,900.00	$26,100.00	93%
LCie 12 - Request for Proposal	-	-	-	0%
LCie 13 - Inquiry Issue	$40.00	$40.00	-	0%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$1,900.00	$200.00	$1,700.00	89%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$4,500.00	-	$4,500.00	100%
LCie 19 - Submittal Issue	$53,700.00	$400.00	$53,300.00	99%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$40.00	-	$40.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$326,700.00	$13,100.00	$313,600.00	96%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	-	-	-	0%
Total	**$506,800.00**	**$24,500.00**	**$482,200.00**	**95%**

Table 16. Transit Station cost summary - Hybrid Process vs. Expected Process – Contractor.

Cost Summary - Contractor				
OmniClass Project Phase	Hybrid Process	Expected Process	Savings	% Savings by Role
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	-	-	-	0%
LCie 03 - Feasibility Study	-	-	-	0%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	-	-	-	0%
LCie 06 - Product Program	-	-	-	0%
LCie 07 - Request for Proposal	-	-	-	0%
LCie 08 - Design Early	-	-	-	0%
LCie 09 - Design Schematic	-	-	-	0%
LCie 10 -Design Coordinated	-	-	-	0%
LCie 11 - Design Final	-	-	-	0%
LCie 12 - Request for Proposal	-	-	-	0%
LCie 13 - Inquiry Issue	$20.00	$20.00	-	0%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$1,200.00	$100.00	$1,100.00	92%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$21,600.00	$1,700.00	$19,900.00	92%
LCie 19 - Submittal Issue	$7,680.00	$40.00	$7,640.00	99%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$12,900.00	-	$12,900.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$20.00	-	$20.00	100%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$15,100.00	$100.00	$15,000.00	99%
Total	**$92,300.00**	**$12,300.00**	**$80,100.00**	**87%**

This chapter illustrates Calculator results for the project types based on cost assumptions defined in Appendix E. The Transit Station program is of particular interest because the majority of cost assumptions for the 'Hybrid' approach are derived from actual project data. The comparison of Current vs. Hybrid shows the cost savings associated with the move to electronic communications within a managed project collaboration system but not the total elimination of paper copies. This is the actual approach taken by much of the industry. The Hybrid vs. Expected analysis shows the additional savings that could be realized by a transition to structured data exchanges in a totally paperless environment.

7 Short Form of the COBie Calculator

The Short Form of the COBie Calculator requires only 23 input variables, referred to as scaling variables, rather than 210. These variables define the size and complexity of the project and are used to scale the variables on the Current Assumptions tab. Of these 23 variables, only 3 new variables have been introduced. These are:

- Number of Floors/Levels
- Number of 1/8" = 1' 0" Plan Drawings per Sheet
- Number of Design Disciplines.

In addition, the Short Form allows the user to adjust the Reduction factors for activities that are eliminated, automated, or streamlined.

7.1 General overview

The Short Form COBie Calculator includes 1 additional tab – Short Form Variables.

To use the Calculator:

1. Enter project values for scaling variables and reduction factors into the Short Form Variables tab.
2. View overall savings and savings by role on Project Summary tab.
3. View cost and savings detail on relevant LCie process tabs.
4. To fine tune results, use override fields on the Current Assumptions Tab.

7.2 Detailed description

7.2.1 Introduction

The Short Form of the COBie Calculator is similar to the Full Version of the COBie Calculator. The only changes are:

- Addition of a new tab- Short Form Variables
- Addition of 3 new columns-Short Form Value, Override Value, and Final Value- on the Current Assumptions Tab

See Chapter 5 for information on all other tabs.

7.2.2 Short Form Variables tab

The variables in Short Form Variables tab are organized into the following categories:

- Scaling Variables
- Reduction Factors

The 23 scaling variables are:

Estimated Number of Pages in Facility Criteria: Estimated number of pages in Owner's initial analysis of Project need and Scope

Estimated Number of Pages in Discipline Specification: Estimated number of pages in Equipment performance requirements provided during planning

Estimated Number of Pages in Project Definition: Estimated number of pages in Project Definition document. The Project Definition defines the project scope, budget requirements, site details, economic analysis and facility planning data

Estimated Number of Pages in Front Matter: Estimated number of pages that precede the technical content of the RFP for Design Services and Construction Services.

Number of Space Types per Project: Number of space types (by function) found in each project

Number of Unique Product Types: Number of different product types that will be installed.

Number of Tagged Components: Total number of pieces of equipment that will have asset tags and will be managed by the owner

Pre-Design Submittal Sets Reqd.: Number of pre-design drawing sets required for each submittal.

Estimated Number of Sheets per Option: Estimated number of drawing sheets included in each project option in the feasibility study.

Estimated Number of Letter Sized Pages in Pre-Design Narrative per Option: Estimated number of pages included in the pre-design narrative per project option in the feasibility study.

Number of Design Submittal Sets Reqd.: Number of Design Phase drawing sets required

Estimated Number of Letter- Sized Pages in Design Narrative: Estimated number of pages in the design narrative for each design review

Estimated Number of Letter Sized Pages in Specification: Estimated number of pages in the Specification document

Number of Submittal Sets Reqd.: Number of construction phase submittal sets required

Estimated Number of Letter Sized Pages in Proposal: Estimated number of Letter-Sized Pages in the Architect's response to the Owner's Request for Proposal

Estimated Number of Drawing Sheets in Proposal: Estimated number of sheets included in the Architect's response to the Owner's Request for Proposal

Number of RFP copies Reqd.: Number of RFP sets required

Avg. Number of Months of Construction: Average construction duration of a project

Number of Floors / Levels: Number of floors within each project

Number of 1/8" = 1' 0" Plan Drawings per Sheet: Number of 1/8"= 1' 0" floor plans on a drawing sheet

Number of Design Disciplines: Architectural, Structural, Mechanical, Electrical etc

Small Printer – Letter Sized Pages: Number of Letter Sized Pages printed per minute

Large Printer – E1 Size Sheets: Number of Sheets printed per minute

The default values for the Scaling Variables are set to "0", requiring the user to input data for the variables. Values for the Reduction Factors in this tab are pre-populated but can be altered by the end user.

Based on the values supplied by the user, the following tabs are populated automatically: Current Assumptions, Expected Assumptions, Project Summary and the LCie tabs.

7.2.3 Current Assumptions tab

The Short Form of the COBie Calculator introduces 3 new columns on the Current Assumptions tab: Short Form Value, Override Value, and Final Value.

The Short Form Value column contains some values directly transferred from the Short Form Variables sheet. These are shown in red. Other values are calculated by the Short Form COBie Calculator. The assumptions used in these calculations are documented in Appendix F.

If a user decides the value found in the Short Form Value column is inaccurate, he/she may override that value by providing a new value in the Override Value column. The default value for the Override Value column is "N/A". The Final Value column displays the value that will be used in performing the calculations for each variable.

In summary, the Short Form of the COBie Calculator requires user input of only 23 values. The LCie worksheets are then automatically populated based on the assumptions found in Appendix F to determine current and expected costs.

7.3 Testing the Short Form of the COBie Calculator

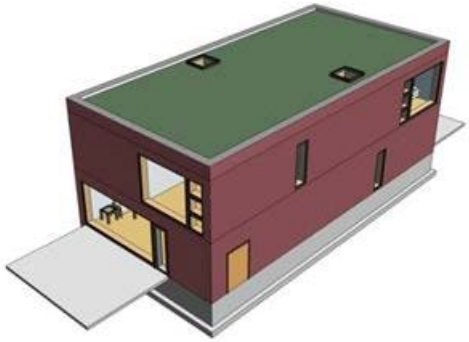
To test the Short Form of the COBie Calculator, the results generated for a program using the Short Form Calculator were compared to the results generated using the Long Form of the COBie Calculator. To do this, the

Duplex Apartment Experimental BIM model, mentioned in Chapter 6 was used.

The Duplex Apartment model, seen in Figure 14, is a two-story, two unit apartment building. Listed below are the overall building statistics:

- Size: 3,372 SF
- # of Product Types: 43
- # of Components: 232

Figure 14. Duplex apartment model.



It was assumed that a military base was developing a residential program comprised of 100 Duplex units.

Table 17 below shows the Overall cost and cost savings results of the Long Form of the Calculator, while Table 18 shows the results from the Short Form of the Calculator.

Table 17. Long Form Duplex cost summary.

Cost Summary				
OmniClass Project Phase (Table31)	Current Process	Expected Process	Savings	% Savings
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	$15.00	-	$15.00	100%
LCie 03 - Feasibility Study	$470.00	$20.00	$450.00	96%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	$550.00	$10.00	$540.00	98%
LCie 06 - Product Program	$660.00	$5.00	$655.00	99%
LCie 07 - Request for Proposal	$400.00	$100.00	$300.00	75%
LCie 08 - Design Early	$3,430.00	$30.00	$3,400.00	99%
LCie 09 - Design Schematic	$4,500.00	$400.00	$4,100.00	91%
LCie 10 -Design Coordinated	$18,300.00	$3,400.00	$14,900.00	81%
LCie 11 - Design Final	$7,000.00	$500.00	$6,500.00	93%
LCie 12 - Request for Proposal	$490.00	$30.00	$460.00	94%
LCie 13 - Inquiry Issue	$1,210.00	$30.00	$1,180.00	98%

LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$5,000.00	-	$5,000.00	100%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$12,200.00	$600.00	$11,600.00	95%
LCie 19 - Submittal Issue	$56,300.00	$400.00	$55,900.00	99%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$278,300.00	-	$278,300.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$15,900.00	$600.00	$15,300.00	96%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$27,400.00	$100.00	$27,300.00	99%
Total	**$432,000.00**	**$6,000.00**	**$426,000.00**	**99%**

Table 18. Short Form of Duplex cost summary.

Cost Summary				
OmniClass Project Phase (Table31)	Current Process	Expected Process	Savings	% Savings
LCie 01 - Facility Criteria	-	-	-	0%
LCie 02 - Design Specification	$20.00	-	$20.00	100%
LCie 03 - Feasibility Study	$470.00	$20.00	$450.00	96%
LCie 04 - Project Definition	-	-	-	0%
LCie 05 - Space Program	$510.00	$10.00	$500.00	98%
LCie 06 - Product Program	$540.00	$20.00	$520.00	96%
LCie 07 - Request for Proposal	$400.00	$100.00	$300.00	75%
LCie 08 - Design Early	$4,900.00	$100.00	$4,800.00	98%
LCie 09 - Design Schematic	$7,100.00	$700.00	$6,400.00	90%
LCie 10 -Design Coordinated	$21,600.00	$3,700.00	$17,900.00	83%
LCie 11 - Design Final	$9,200.00	$800.00	$8,400.00	91%
LCie 12 - Request for Proposal	$410.00	$30.00	$380.00	93%
LCie 13 - Inquiry Issue	$1,210.00	$30.00	$1,180.00	98%
LCie 14 - Pre-Construction Plan	-	-	-	0%
LCie 15 - Inquiry Issue (RFI)	$4,700.00	-	$4,700.00	100%
LCie 16 - Product Type Selection	-	-	-	0%
LCie 17 - System Layout	-	-	-	0%
LCie 18 - Submittal Package	$12,200.00	$600.00	$11,600.00	95%
LCie 19 - Submittal Issue	$60,500.00	$400.00	$60,100.00	99.3%
LCie 20 - Purchase Order	-	-	-	0%
LCie 21 - Product Installation	$278,300.00	-	$278,300.00	100%
LCie 22 - Start-Up	-	-	-	0%
LCie 23 - Product Inspection	$15,900.00	$600.00	$15,300.00	96%
LCie 24 - Punchlist Issue	-	-	-	0%
LCie 25 - Turnover Package	$27,400.00	$100.00	$27,300.00	99%
Total	**$445,000.00**	**$7,000.00**	**$438,000.00**	**98%**

The results show a 3% deviation between the Long Form of the Calculator and the Short Form of the Calculator. This demonstrates that the Short Form of the Calculator provides comparable results, even though only 23 Scaling Variables are used instead of the 210 variables found in the Long Form of the Calculator.

8 Program Analysis

The Program Analysis Form of the Calculator is designed for use by organizations that have capital programs comprised of multiple project types. Examples would include developers that have both residential and commercial projects, and universities with projects that vary from dormitories and laboratories to sports facilities. The Program Analysis template is designed to analyze up to 3 project types but can be extended by the user.

The Program Analysis Form of the Calculator is based on the Short Form of the Calculator discussed in Chapter 7. The Program Analysis Form requires 24 input variables for each project type. These variables define the size and complexity of each project type and are used to scale the variables on the Current Assumptions tab.

Twenty-three of these variables are the same as those in the Short Form and are described in Chapter 7. One additional variable is introduced:

> **Number of Projects:** Estimated number of projects of similar type, size, and complexity in the capital program

Like the Short Form, the Program Form allows the user to adjust the Reduction factors for activities that are eliminated, automated, or streamlined.

8.1 General overview

The Program Analysis template for the COBie Calculator adds 53 tabs to the original Long Form of the COBie Calculator:

- Program Short Form Variables
- Project Type Summary
- Program Summary
- 50 additional Life Cycle information exchange (LCie) Processes (25 to represent PT_B and 25 to represent PT_C)

The Program Analysis template also adds columns to the following tabs:

- Program Short Form Variables

- Based on Short Form Variables Tab
- Provides a separate column for variables and reduction factors for each project type

Figure 15. Program Short Form Variables tab.

Variables	Value		
	PROJECT TYPE A	*PROJECT TYPE B*	*PROJECT TYPE C*
Program Variables			
Number of Projects	*5*	*4*	*3*
Scaling Variables			
Estimated Number of Pages in Facility Criteria	**2**	**14**	**20**
Estimated Number of Pages in Discipline Specification	**43**	**400**	**549**

- Current Assumptions Tab
  - Similar to Short Form Current Assumptions Tab
  - Provides 3 columns for each project type
    - Short Form Value
    - Override Value
    - Final Value

Figure 16. Current Assumptions tab.

Inputs NOTE: Red text indicates variables populated based on values from Scaling Variables from Short Form Variables Tab	Value								
	PROJECT TYPE A			PROJECT TYPE B			PROJECT TYPE C		
	Short Form Value	Override Value	Final Value	Short Form Value	Override Value	Final Value	Short Form Value	Override Value	Final Value
Owner Project / Program Variables									
Avg. Number of Pages in Facility Criteria	2	N/A	2	14	N/A	14	2	N/A	2
Avg. Number of Pages in Discipline Specification	52	N/A	52	400	N/A	400	52	N/A	52
Avg. Number of Pages in Project Definition	2	N/A	2	14	N/A	14	2	N/A	2

- Expected Assumptions Tab
  - Similar to Short Form Expected Assumptions Tab
  - Provides spate Current Value and Expected Value columns for each project type

Figure 17. Expected Assumptions tab.

Inputs NOTE: Red text indicates variables affected by the expected process.	Current Value			Unit	Reduction Factor	Expected Outcome		
	PROJECT TYPE A	PROJECT TYPE B	PROJECT TYPE C			PROJECT TYPE A	PROJECT TYPE B	PROJECT TYPE C
Number of Space Types per Project	18	30	18	space types / building		18.00	30.00	18.00
Number of Unique Product Types (Types / program)	53	155	53	types / project		53.00	155.00	53.00
Number of Tagged Components (components / project)	262	3950	262	components / project		262.00	3950.00	262.00
Time to Log (hours / transmittal)	0.25	0.25	0.25	hours / transmittal	100%	0.00	0.00	0.00
Pre-Design Variables								
Avg. Number of Options	3	3	3	count		3.00	3.00	3.00
Avg. Number of Pre-Design Submittal Sets Reqd. (sets / submittal)	4	4	4	sets / submittal	100%	0.00	0.00	0.00

To use the Program Analysis Form of the Calculator:

1. Enter project values into Program Short Form Variables tab for each project type.
2. View total savings and total savings by role on the Program Summary tab.
3. View savings and savings by role for an individual project of each type on the Project Summary tab
4. View detailed costs and savings for each project type on the related LCie process tabs.
5. To fine tune results, use override fields on the Current Assumptions Tab.
6. To modify the Expected Value results, change the reduction factors on the Program Short Form Variables tab

8.2 Detailed description

8.2.1 Project Type Summary tab

The Project Type Summary tab shows the costs and cost savings for one of each project type and a breakdown of costs and cost savings by role i.e. Owner/Owner's Representative, Architect and Contractor.

8.2.2 Program Summary tab

The Program Summary tab reports total costs and cost savings for all projects of each type. It also provides a roll up report across all projects.

8.2.3 Life Cycle Information Exchange Process tabs

As opposed to having 25 LCie Process tabs, this version of the Calculator has 75 tabs. This allows each of the 3 project types to have its own set of LCie tabs and allows the end user to view cost savings for one of each project type independently of the others. The LCie tabs are labeled as follows: 010_Facility_Critera_PT A, 010_Facility_Criteria_PT B, 010_Facility_Critera_PT C, 020_Discipline_SpecificationPT A, 020_Discipline_SpecificationPT B, etc.

The end user should not make any changes or input data on the individual process tabs. All adjustments should be made on the Program Short Form Variables tab or the Current Assumptions tab where necessary.

8.2.4 User customization

The developed version of the Program Analysis Form of the Calculator allows for 3 different project types; however, a user or organization may require more than 3 project types to analyze their capital program. Below are the steps to take in order to expand the Calculator to include additional project types.

1. On the Program Short Form Variables tab, insert a new Project Type column under the Value subdivision for the new project type.
2. On the Current Assumptions tab, insert 3 new columns (Short Form Value, Override Value, and Final Value) for the new project type next to the existing project types. For each cell in these new columns, reference the appropriate value on the Program Short Form Variables tab using the existing project types as a guide.
3. On the Expected Assumptions tab, add a Current Value column and an Expected Outcome column for the new project type. For each cell in these new columns, reference the appropriate value on the Current Assumptions tab and/or Program Scaling Variables tab for the new project type using the existing project types as a guide.
4. Add a set of the LCie worksheets for the new project type. It is important that the names of the new LCie worksheets reflect the new project type (e.g. 010_Facility_Criteria_PT D). For each yellow or blue colored cell on the worksheet, reference the appropriate value on the Current Assumptions tab or the Expected Assumptions tab using the existing LCie worksheets as a guide.

5. On the Project Types Summary tab, add new Project Type Summary tables for the new project type. For each cell in these new tables, reference the appropriate LCie worksheet and value using the existing Project Type Summary tables as a guide.
6. On the Program Summary Tab, add a Program Summary for the new project type. For each cell in these new tables, reference the appropriate table and value using from the Project Types Summary tab using the existing Program Summary tables as a guide.
7. On the Program Summary Tab, update the Overall Summary table to accommodate the new project type, in the Total column of the Overall Summary table add a reference to the overall Total Program Cost row for the Current Process and Expected Process columns of the new project type to the Current Process Cost and Expected Process Cost rows respectively. Repeat this process for each of the 3 role types.

Note: The simplest way to perform the insertion and referencing for a column, worksheet, or table is to copy the necessary existing column, worksheet, or table from Project Type C and paste it into the correct location for the new project type. Then, highlight the newly inserted column, worksheet, or table and use the "Find and Replace" feature in Excel to replace the worksheet and/or cell references to Project Type C's data with the worksheet and/or cell references to the new project type's data. It is recommended that if a user or organization is adding a large number of new project types, an Excel macro is developed to automate the process.

In summary, the Program Analysis Form of the Calculator is useful for organizations that have a capital program with diverse project types. It allows for the summation of current and expected costs and savings across the entire capital program. While the Calculator is set up for 3 project types, users or organizations can expand the Calculator to include additional project types.

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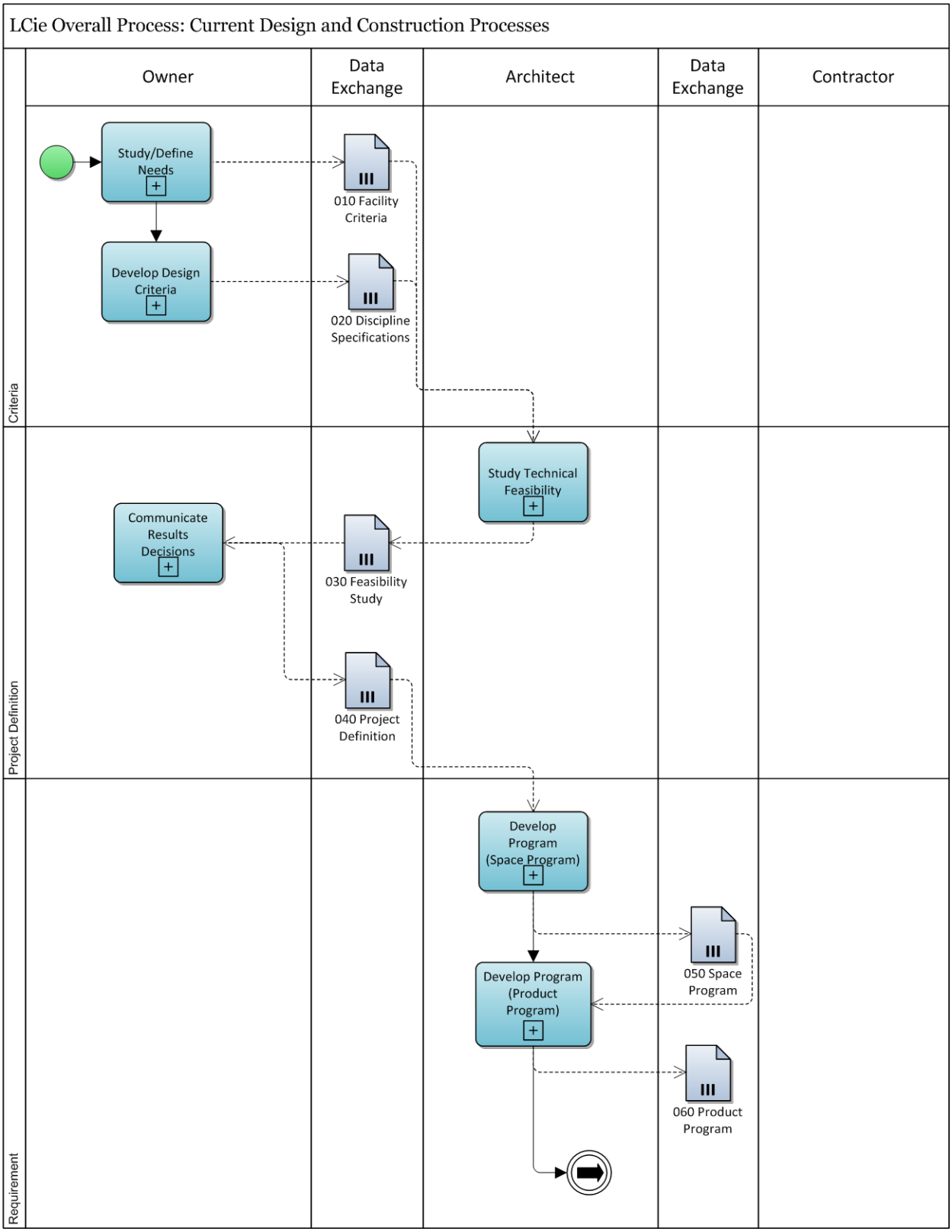
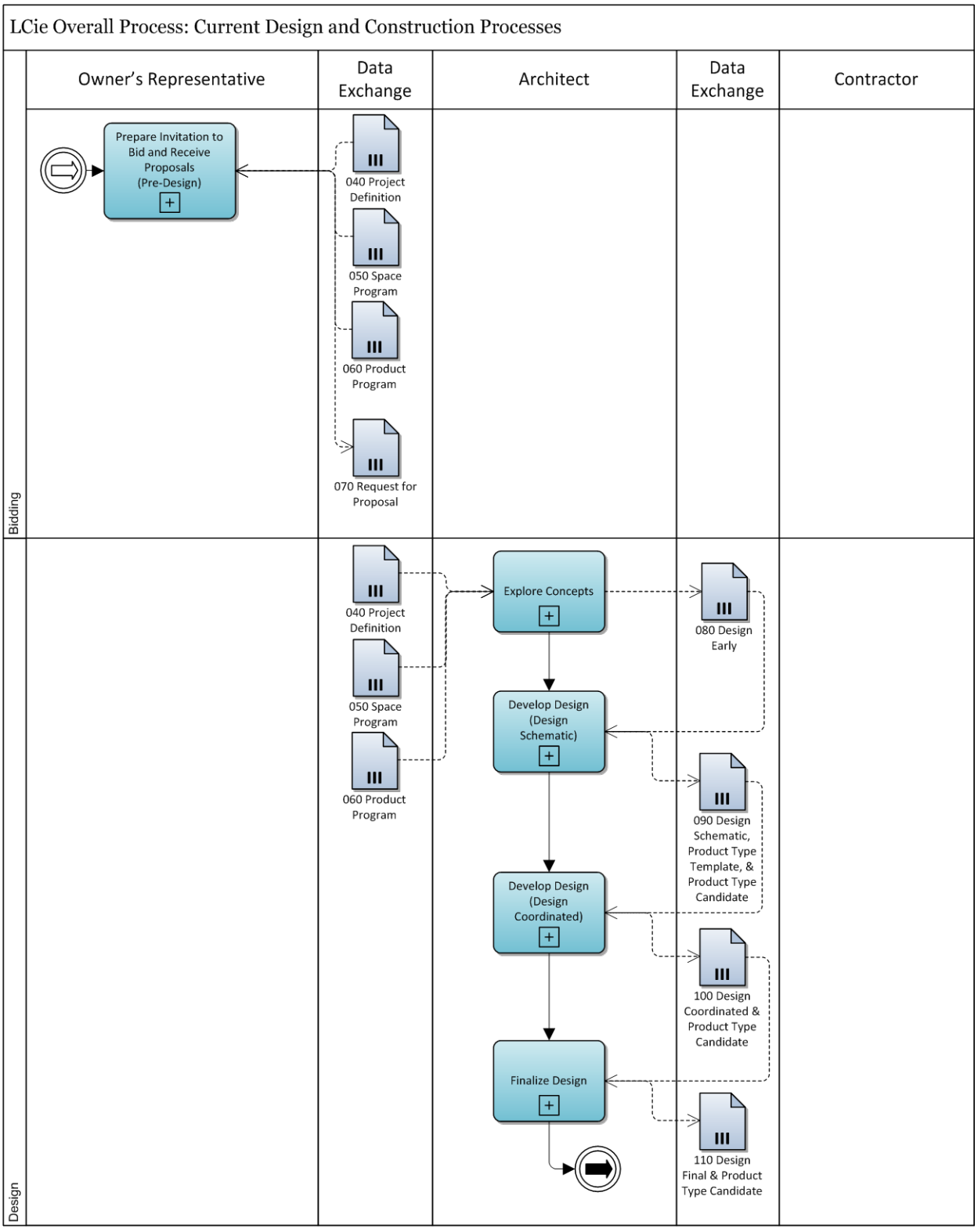
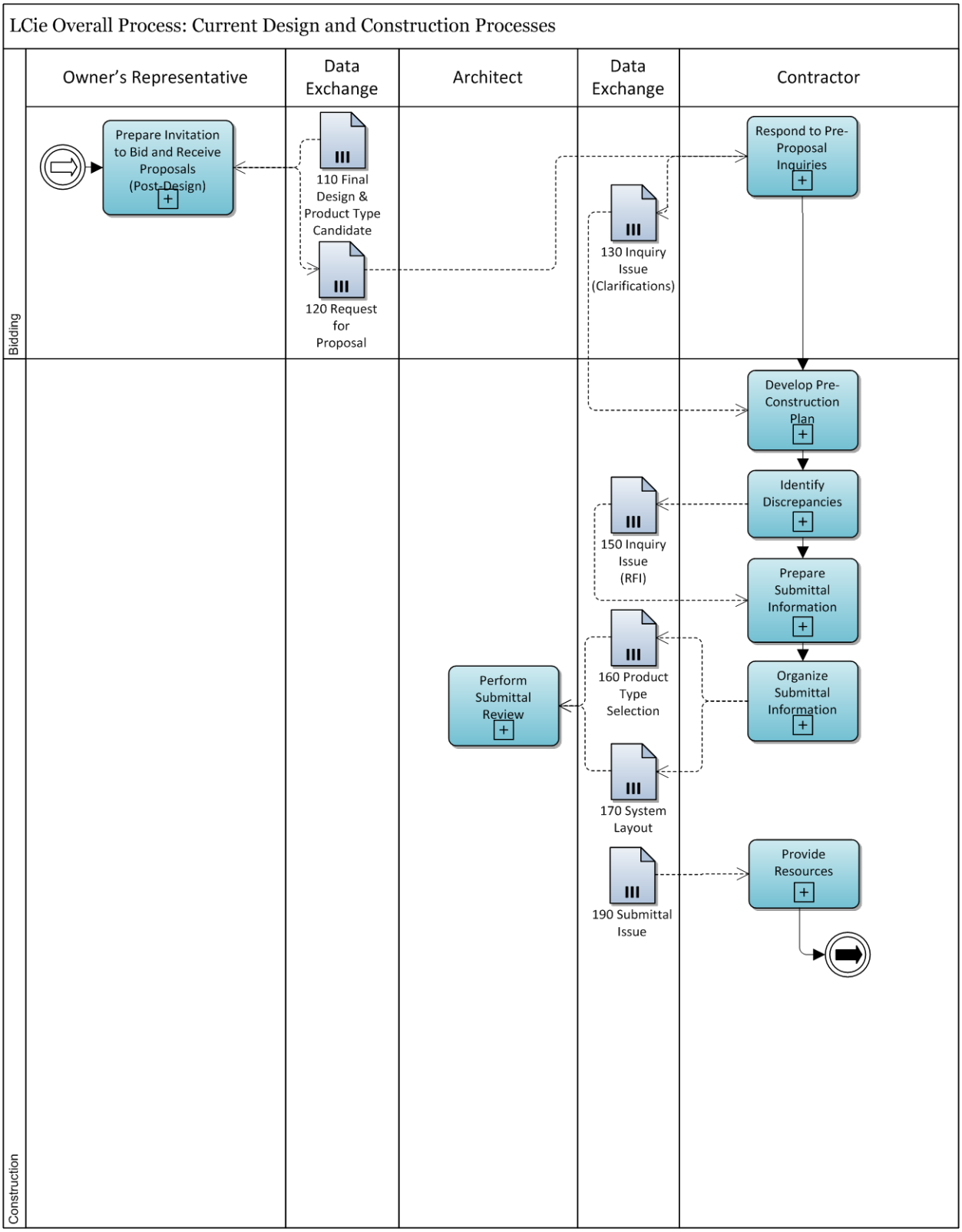
Appendix A: Overall Process Map


LCie Overall Process: Current Design and Construction Processes
Owner
Data Exchange
Architect
Data Exchange
Contractor
Criteria
Project Definition
Requirement
Study/Define Needs
Develop Design Criteria
010 Facility Criteria
020 Discipline Specifications
Study Technical Feasibility
Communicate Results Decisions
030 Feasibility Study
040 Project Definition
Develop Program (Space Program)
Develop Program (Product Program)
050 Space Program
060 Product Program


LCie Overall Process: Current Design and Construction Processes
Owner's Representative
Data Exchange
Architect
Data Exchange
Contractor
Bidding
Prepare Invitation to Bid and Receive Proposals (Pre-Design)
040 Project Definition
050 Space Program
060 Product Program
070 Request for Proposal
Design
040 Project Definition
050 Space Program
060 Product Program
Explore Concepts
Develop Design (Design Schematic)
Develop Design (Design Coordinated)
Finalize Design
080 Design Early
090 Design Schematic, Product Type Template, & Product Type Candidate
100 Design Coordinated & Product Type Candidate
110 Design Final & Product Type Candidate


LCie Overall Process: Current Design and Construction Processes
Bidding
Construction
Owner's Representative
Data Exchange
Architect
Data Exchange
Contractor
Prepare Invitation to Bid and Receive Proposals (Post-Design)
110 Final Design & Product Type Candidate
120 Request for Proposal
130 Inquiry Issue (Clarifications)
Respond to Pre-Proposal Inquiries
Develop Pre-Construction Plan
Identify Discrepancies
150 Inquiry Issue (RFI)
Prepare Submittal Information
160 Product Type Selection
Organize Submittal Information
Perform Submittal Review
170 System Layout
190 Submittal Issue
Provide Resources

Appendix B: Comparison of AIA/CSI MasterFormat and UFC/UFGS Submittal Requirements

Lifecycle Phase	LCie Exchange	Industry Standard (AIA B101-2007)				Unified Facilities Criteria			
		Section	Deliverable	Format	Number of Copies	Section	Deliverable	Format	Number of Copies
Criteria, Initiation, Requirement	**Discipline Specificaitons, Project Definition, Space Program, & Product Program**					**CH. 9**	**Predesign Submittal Requirements**		
						9.1	1391 with the following information	EPG	n/a
							• Detailed Scope	EPG	n/a
							• Collateral equipment list & cost	EPG	n/a
							• Preliminary budgetary cost information for primary and supporting facilities	EPG	n/a
							•Site location and approval	EPG	n/a
							• NEPA documents	EPG	n/a
							• SHPO (as required)	EPG	n/a
							• Economic Analysis	EPG	n/a
							• Facility Planning Data	EPG	n/a
							• Project specific Data	EPG	n/a
Design	**Design Early**	B101-2007 3.2	**Schematic Design**			**CH. 10.2**	**Concept Design Submittal Requirements (10 - 15%)**		
		B101-2007 3.2.3	Feasibility Study	n/a	n/a	10-2.1	Basis of design narrative	electronic	n/a
		B101-2007 3.2.4	Preliminary Design (2 - 3 Options)	n/a	n/a	10-2.2	Concept Design Documents	electronic	n/a
		B101-2007 3.2.5	Schematic Design (Approved preliminary design)	n/a	n/a				
			• Site Plan	n/a	n/a		• Site Plan	electronic	n/a
			• Building Plans	n/a	n/a		• Building Plans	electronic	n/a
			• Building Sections	n/a	n/a		• Building Sections	electronic	n/a
			• Elevations	n/a	n/a		• Single line diagram (electrical)	electronic	n/a
			• Preliminary selection of building materials	n/a	n/a		• Building Elevations	electronic	n/a
			• Preliminary selection of building systems	n/a	n/a		• Life safety floor plan	electronic	n/a
		B101-2007 3.2.6	• Estimate of the Cost of the Work	n/a	n/a	10-1.4	Cost Estimate	electronic	n/a
						10-2.3	Calculations	electronic	n/a
	Design Schematic	B101-2007 3.3	**Design Development**			**CH. 10.3**	**Design Development Submittal Requirements (35 - 50%)**		
		B101-2007 3.3.1	Design Development Documents (approved schematic design)	n/a	n/a	10-3.1	Basis of design narrative	electronic	n/a
						10-3.2	Design Development Documents	electronic	n/a
			• Site Plan	n/a	n/a		• Site Plan	electronic	n/a
			• Building Plans	n/a	n/a	10-3.2.1	• Floor Plans	electronic	n/a
							• Roof Plan	electronic	n/a
			• Elevations	n/a	n/a		• Building Elevations	electronic	n/a
			• Sections	n/a	n/a		• Building Sections	electronic	n/a
			• Typical Construction Details	n/a	n/a		• Typical Wall Sections	electronic	n/a

Lifecycle Phase	LCie Exchange	Industry Standard (AIA B101-2007)				Unified Facilities Criteria			
		Section	Deliverable	Format	Number of Copies	Section	Deliverable	Format	Number of Copies
			• Diagrammatic layout of building systems	n/a	n/a		• Finish Schedule	electronic	n/a
			• Outline specifications that identify major materials & systems and establish in general their quality levels.	n/a	n/a		• Furniture Plan	electronic	n/a
		B101-2007 3.3.2	• Estimate of the Cost of the Work	n/a	n/a	10-3.2.2	• Landscape planting plan	electronic	n/a
							• Plant schedule and details	electronic	n/a
							• Irrigation Plan & Details	electronic	n/a
						10-3.2.3	• Utility Plan	electronic	n/a
							• Layout Plan	electronic	n/a
						10-3.2.4	• Foundation Plans	electronic	n/a
							• Framing Plans	electronic	n/a
							• Structural Details	electronic	n/a
							• Structural Elevations	electronic	n/a
						10-3.2.5	• Plumbing Floor Plan	electronic	n/a
							• HVAC Floor Plan	electronic	n/a
							• Mechanical room Plan	electronic	n/a
						10-3.2.6	• Lighting Plans	electronic	n/a
							• Power Plans	electronic	n/a
							• Lightning Protection Plans	electronic	n/a
							• Cathodic Protection Plans	electronic	n/a
							• Special Systems Plans	electronic	n/a
							• Single Line Diagrams Plans	electronic	n/a
							• Additional Plans/risers	electronic	n/a
						10-3.2.7	• Life Safety Plan	electronic	n/a
							• Fire Suppression plans	electronic	n/a
							• Fire Alarm and Mass Notification System Plans	electronic	n/a
						10-3.2.8	• Geotechnical report	electronic	n/a
						10-3.3	Outline Specification	electronic	n/a
						10-3.4	Color Boards	electronic	n/a
						10-3.5	Calculations	electronic	n/a
						10-3.5.3.4	ASHRAE 90.1 compliance calculations	electronic	n/a
						10-3.5.1	Energy Analysis	electronic	n/a
						10-3.5.2	Life Cycle Cost Analysis	electronic	n/a
						10-3.5.3	Building Heating & Cooling Load	electronic	n/a
						10-3.6	Environmental Report	electronic	n/a
								electronic	n/a
	Design Coordinated					**10.4**	**Pre-Final Design Submittals (100%)**		n/a
						10-4.1	Basis of design narrative	electronic	n/a
						10-4.2	Pre-Final Design Documents (in addition to drawings indicated in Design Development)	electronic	n/a
						10-4.2.1	• Lighting Details	electronic	n/a
							• Power Details	electronic	n/a

Lifecycle Phase	LCie Exchange	Industry Standard (AIA B101-2007)				Unified Facilities Criteria			
		Section	Deliverable	Format	Number of Copies	Section	Deliverable	Format	Number of Copies
							• Power Single Line Diagram	electronic	n/a
							• Telephone Riser Diagram	electronic	n/a
							• Intercommunication Riser Diagram	electronic	n/a
							• Intercommunication Riser Diagram	electronic	n/a
							• Fire Alarm Riser Diagram	electronic	n/a
							• Panel Schedules	electronic	n/a
							• Switchboard and Motor control Center schedules	electronic	n/a
							• Lighting Fixture Details	electronic	n/a
						10-4.3	Specifications	electronic	n/a
							Submittal Register	electronic	n/a
						10-4.4	Project Information Form (PIF)	electronic	n/a
						10-4.5	Color Boards	electronic	n/a
						10-4.6	Calculations	electronic	n/a
	Design Final	B101-2007 3.4	**Construction Documents**			**10.5**	**Final Design Submittal**		
		B101-2007 3.4.1	Construction Documents (approved schematic design)	n/a	n/a		All items from previous submittal plus the following:		
			• Site Plan	n/a	n/a	10-5.2.2	Quality Control Data	electronic	n/a
			• Building Plans	n/a	n/a	10-5.5	Color documentation binder	electronic	n/a
			• Enlarged Plans	n/a	n/a	10-5.8.1	Code compliance certification		n/a
			• Sections	n/a	n/a				
			• Elevations	n/a	n/a				
			• Typical Construction Details	n/a	n/a				
			• Diagrammatic layout of building systems	n/a	n/a				
			• Complete specifications	n/a	n/a				
		B101-2007 3.4.4	• Estimate of the Cost of the Work	n/a	n/a				
Bidding	**Inquiry Issue**	B101-2007 3.5	**Bidding or Negotiation**			**11**	**Pre-Proposal/Pre-Bid Inquiries**		
		B101-2007 3.5.2.2	Procure reproduction of bidding documents	n/a	n/a				
		B101-2007 3.5.2.3	Prepare & distribute addenda	n/a	n/a	11.2	DOR provides response to PP/PBI or RFI		

Lifecycle Phase	LCie Exchange	Industry Standard (CSI MasterSpec 2004)				Unified Facilities Guide Specifications (UFGS)			
		Section	Deliverable	Format	Number of Copies	Section	Deliverable	Format	Number of Copies
Construction	**Product Type Selection**	013300	Submittal Schedule	Paper or Electronic in PDF file format	3 - Paper, 1 - Electronic	01 33 00	SD-01 Preconstruction Submittals		3
			Product Data	Paper or Electronic in PDF file format	3 - Paper, 1 - Electronic		Certificates of insurance		
			Shop Drawings	Paper or Electronic in PDF file format	3 - Paper, 1 - Electronic		Surety Bonds		
			Samples	Physical	3		List of proposed subcontractors		
			Product Schedule	Paper or Electronic in PDF file format	3 - Paper, 1 - Electronic		List of proposed producers		
			Reports	Paper or Electronic in PDF file format	3 - Paper, 1 - Electronic		Construction Progress Schedule		
			Certificates	Paper or Electronic in PDF file format	3 - Paper, 1 - Electronic		Network Analysis Schedule		
							Submittal Register	Electronic	
							Schedule of Prices		
							Health and Safety Plan		
							Work Plan		
							Quality Control Plan		
							Environmental Protection Plan		
						01 33 00	SD-02 Shop Drawings		7
						01 33 00	SD-03 Product Data		7
						01 33 00	SD-04 Samples		2
						01 33 00	SD-05 Design Data		7
						01 33 00	SD-06 Test Reports		7
						01 33 00	SD-07 Certificates		7
						01 33 00	SD-08 Manufacturer's Instructions		7
						01 33 00	SD-09 Manufacturer's Field Reports		7
						01 33 00	SD-10 Operation and Maintenance Data		3
		017839	Record Drawings	Paper, PDF, or CAD file format	3 paper or 1 PDF and 3 paper or 1 CAD and 3 paper	01 33 00/ 01 78 00	SD-11 Closeout Submittals		3
			Record Specifications	Paper or Electronic in PDF file format	1 paper or 1 PDF file	01 78 00	Record/As-Built Drawings	Electronic or Paper	2 paper sets, 1 electronic in CAD
						01 78 00	Final Approved Shop Drawings	Electronic or Paper	2 paper sets, 1 electronic in CAD
						01 78 00	As-Built Construction Contract Specifications	Paper	2 Paper sets
			Record Product Data	Paper or Electronic in PDF file format	1 paper or 1 PDF file	01 78 00	Final DD Form 1354	Electronic	1
			Miscellaneous Record Submittals	Paper or Electronic in PDF file format	1 paper or 1 PDF file	01 78 00	Certification of EPA Designated Items		
		017700	Warranties	Paper or Electronic in PDF	1 paper copy or 1 paper and 1 PDF file	01 78 00	Warranty Management Plan	Not specified	1
						01 78 00	Warranty Tags		2
						01 78 00	Operations and Maintenance Manuals	Paper, 3-ring Binders	7

Lifecycle Phase	LCIe Exchange	Industry Standard (CSI MasterSpec 2004)				Unified Facilities Guide Specifications (UFGS)			
		Section	Deliverable	Format	Number of Copies	Section	Deliverable	Format	Number of Copies
	System Layout					01 33 00	Detail Shop Drawings	Paper	7
						23 00 00	Detail Shop Drawings	N/A	N/A
	Product Installation	12900	Schedule of Values on AIA G703	Paper	3	01 20 00. 00 20/ 01 45 00.10 10	Earned Value Report	Electronic/Paper	1 Electronic, 1 Paper
		12900	Liens	Paper	3	01 20 00. 00 20/ 01 45 00.10 10	Interim DD Form 1354	Electronic/Paper	1 Electronic, 1 Paper
		12900	Waivers	Paper	3	01 20 00. 00 20/ 01 45 00.10 10	Contractor's Invoice	Electronic/Paper	1 Electronic, 1 Paper
						01 20 00. 00 20/ 01 45 00.10 10	Updated Project Schedule	Electronic/Paper	1 Electronic, 1 Paper
						01 20 00. 00 20/ 01 45 00.10 10	Submittal Register	Electronic/Paper	1 Electronic, 1 Paper
						01 20 00. 00 20/ 01 45 00.10 10	Contractor Safety Self Evaluation Checklist	Electronic/Paper	1 Electronic, 1 Paper
						01 78 00	Record/As-Built Drawings	Electronic/Paper	2 paper sets, 1 electronic
						01 78 00	Final Approved Shop Drawings	Paper	1
						01 78 00	As-Built Construction Contract Specifications	Paper	2
	Product Inspection	1770	Punchlist	Paper or Electronic (PDF or MS Excel)	3 paper or 1 electronic file	01 45 00.00 10	Quality Control Plan	Not specified	3
							Punch Lists	Electronic	N/A
							QA/QC Comments	Electronic	N/A
							Three Control Phase Checklist	Electronic	N/A
						01 45 00.00 40	Test Reports	Not specified	7
							Quality Control Data	Not specified	7
							Quality Control Coordinating Actions	Not specified	7
							Quality Control Training	Not specified	7
							Inspection Records	Not specified	7
							Letters of Authority or Delegation	Not specified	7
							Field Tests	Not specified	7
							Factory Tests	Not specified	7
						01 45 00.00 40	Quality Assurance Plan		7
						01 45 00.00 40	Contractor's Quality Representative Qualifications		
						01 45 00.00 40	Special Certifications		
	Punchlist Issue					01 45 00.10 10	Nonconformance Issues	Electronic	N/A
						01 45 00.10 10	Deficiency Lists	Electronic	N/A
						01 45 00.10 10	Correspondence to the Owner	Electronic	N/A
						01 45 00.10 10	Requests for Information	Electronic	N/A

Appendix C: Current and Expected LCie Process Maps

This appendix contains the LCie workflows for the Current and Expected Processes. Each business process diagram contains the Current Process workflow overlaid by the Expected Process workflow. Where tasks were eliminated, automated, or streamlined in the Expected Process, the task box was color-coded according to the following legend:

- Eliminated Tasks 
- Automated Tasks 
- Streamlined Tasks 
- Unchanged Tasks from Current LCie Process 

Figure 18. Study/define needs.

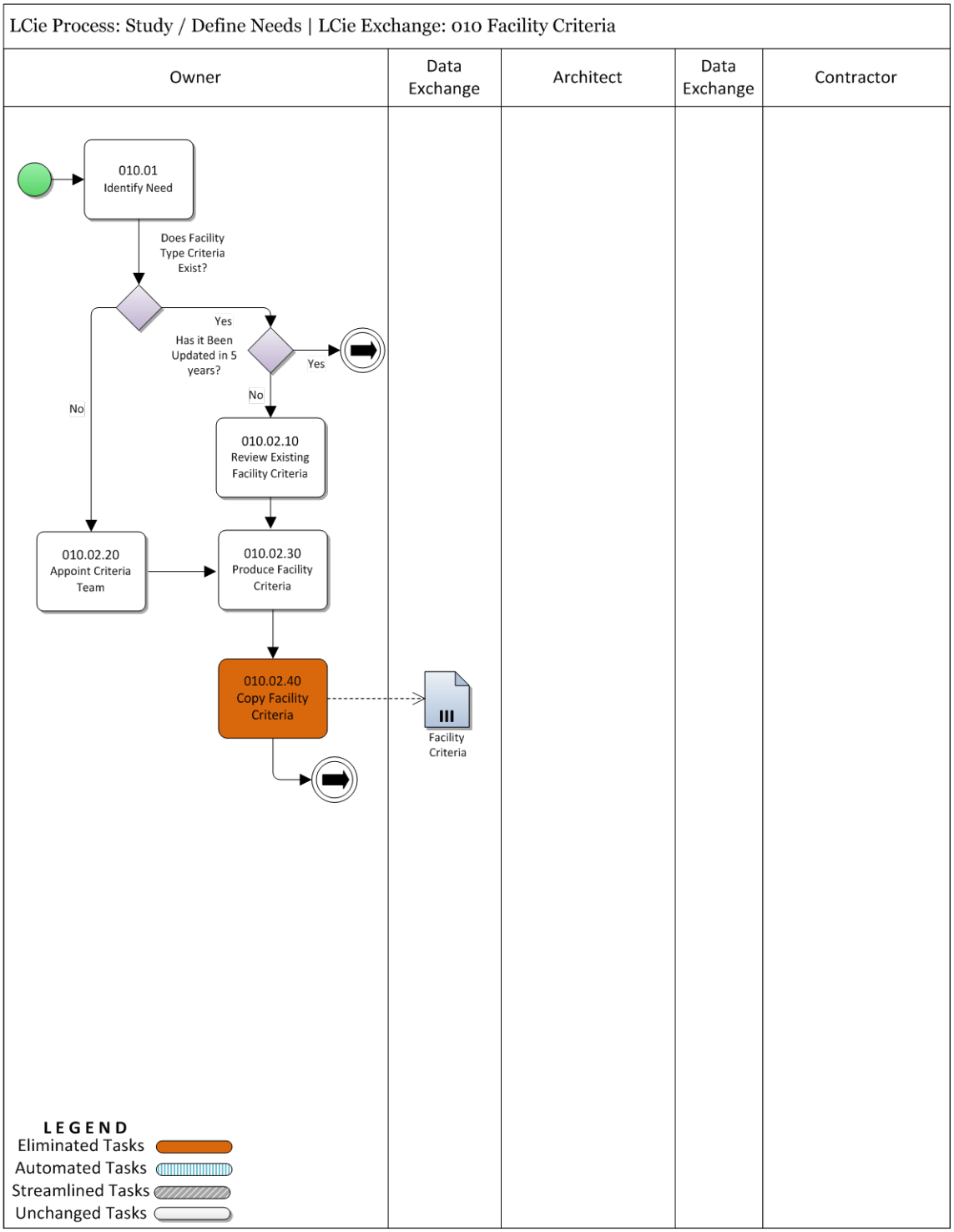


Figure 19. Develop design criteria.

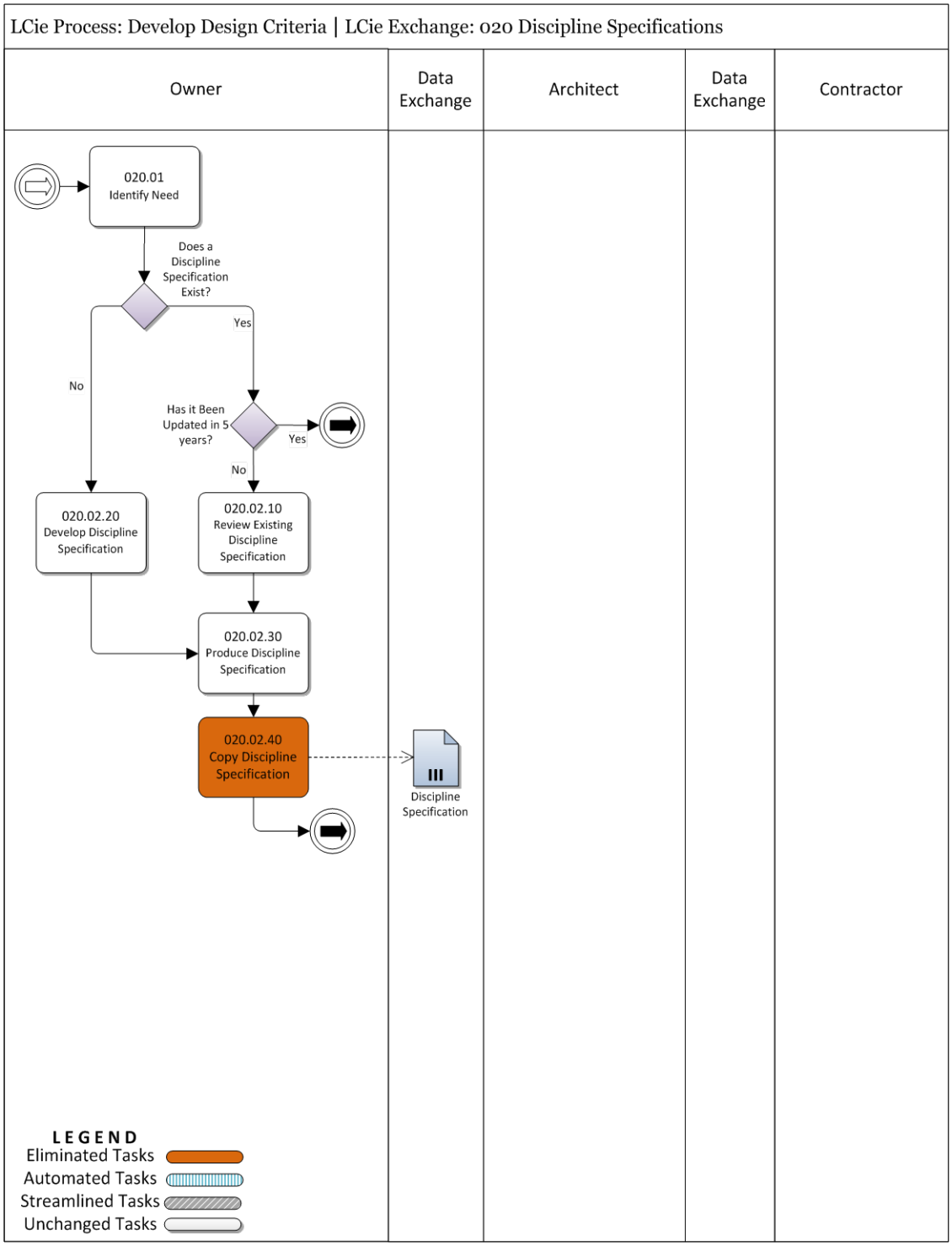


Figure 20. Study technical feasibility.

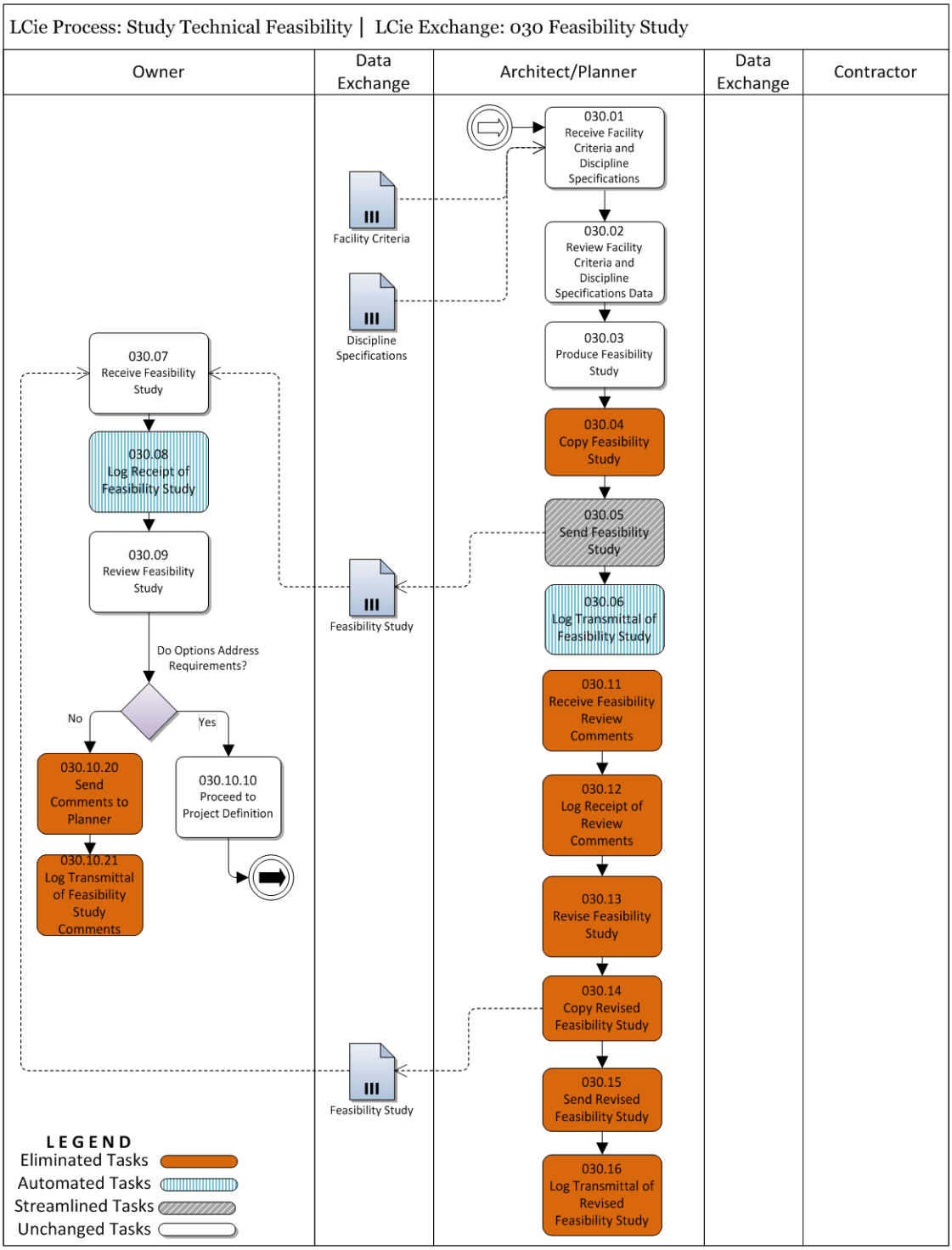


Figure 21. Communicate results decisions.

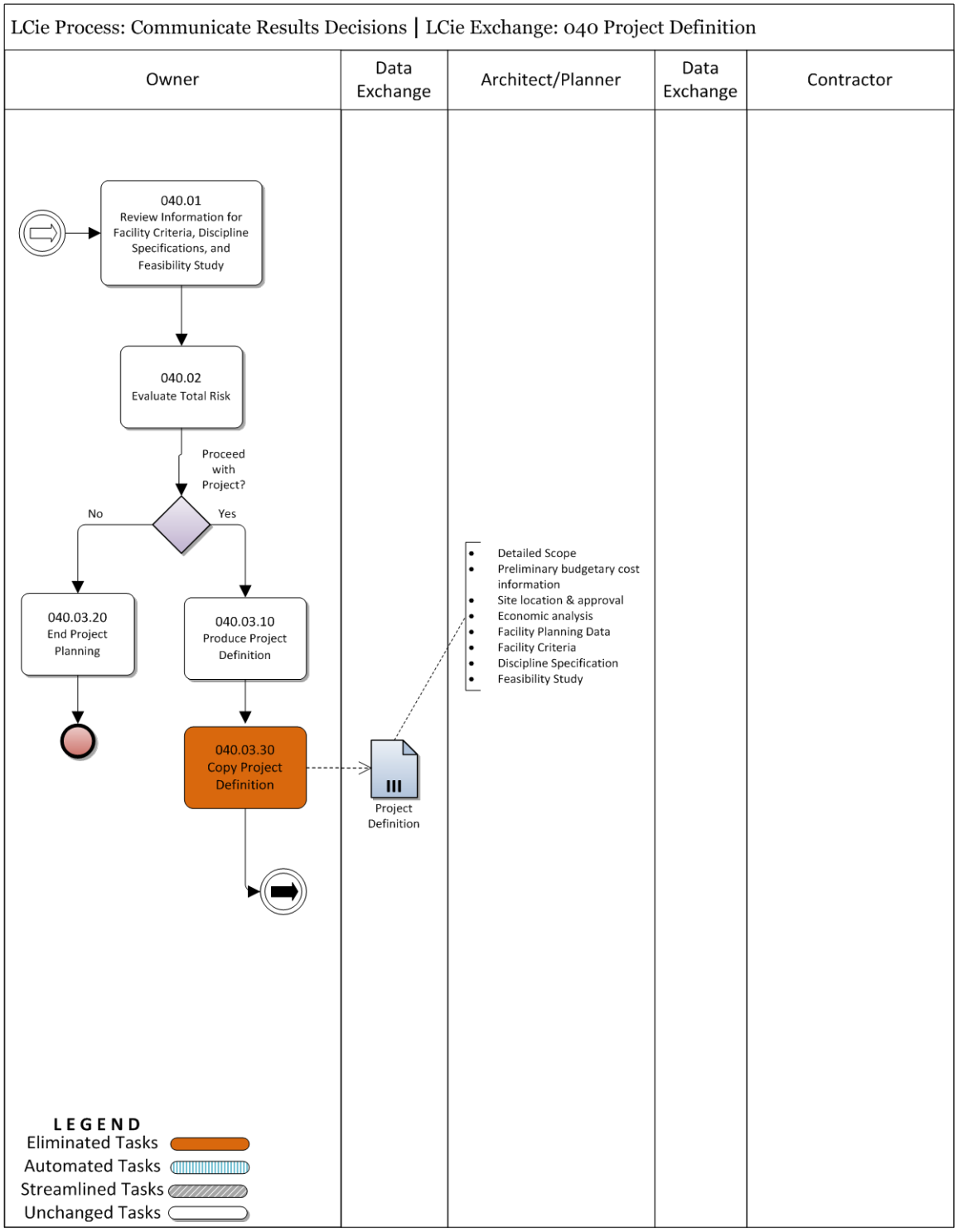


Figure 22. Develop Program- Space Program.

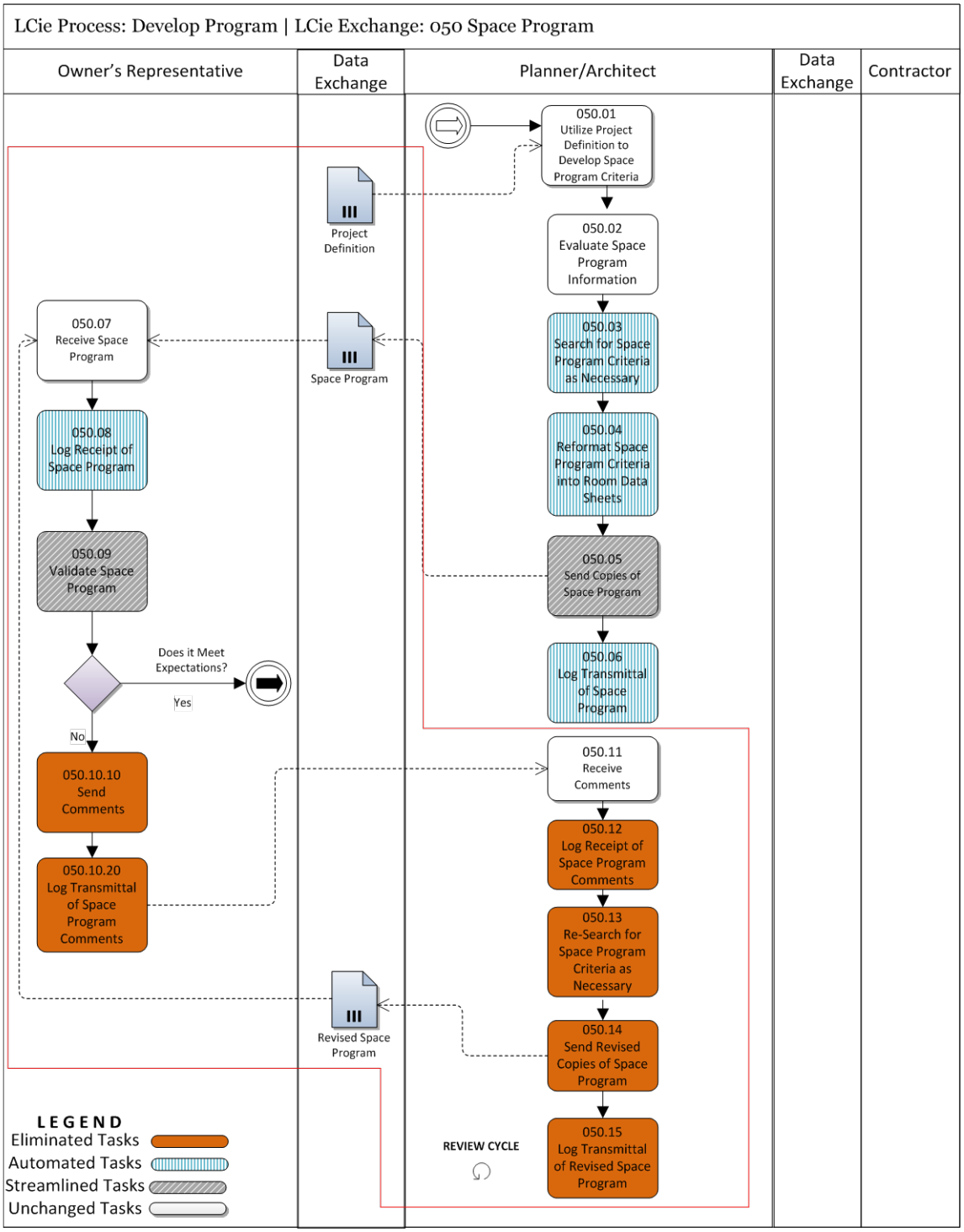


Figure 23. Develop Program- Product Program.

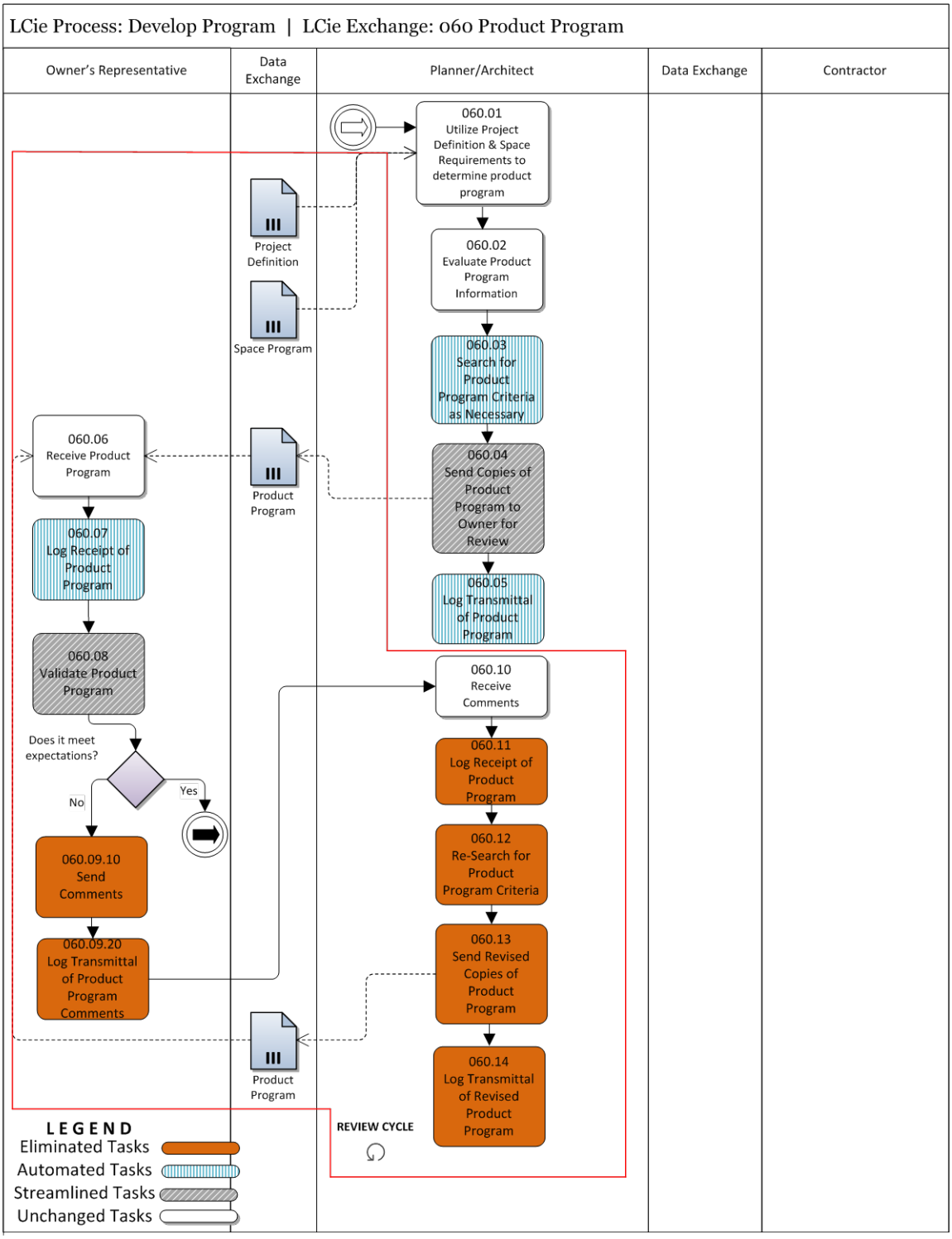


Figure 24. Prepare invitation to bid and receive proposals (pre-design).

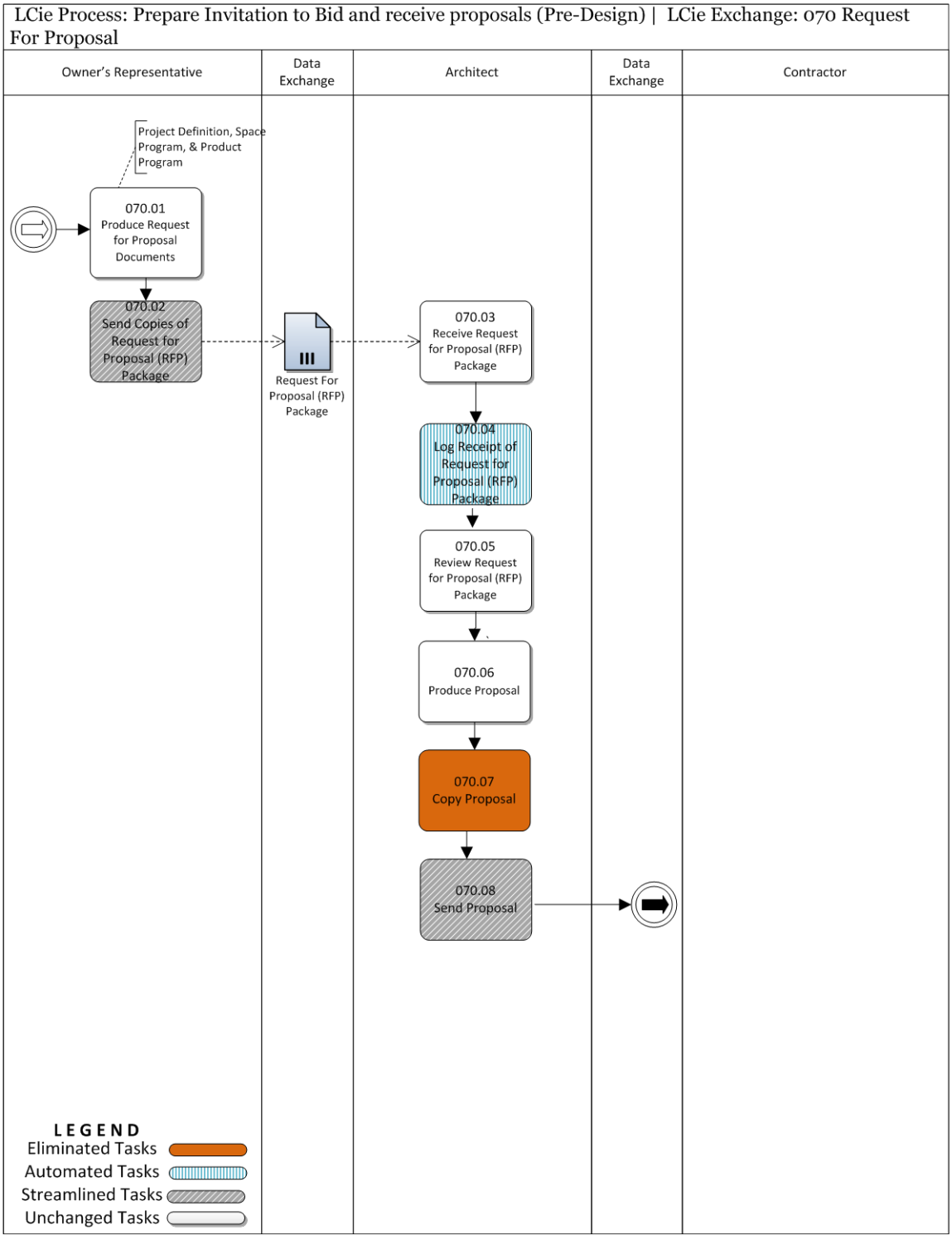


Figure 25. Explore Concepts- Design Early.

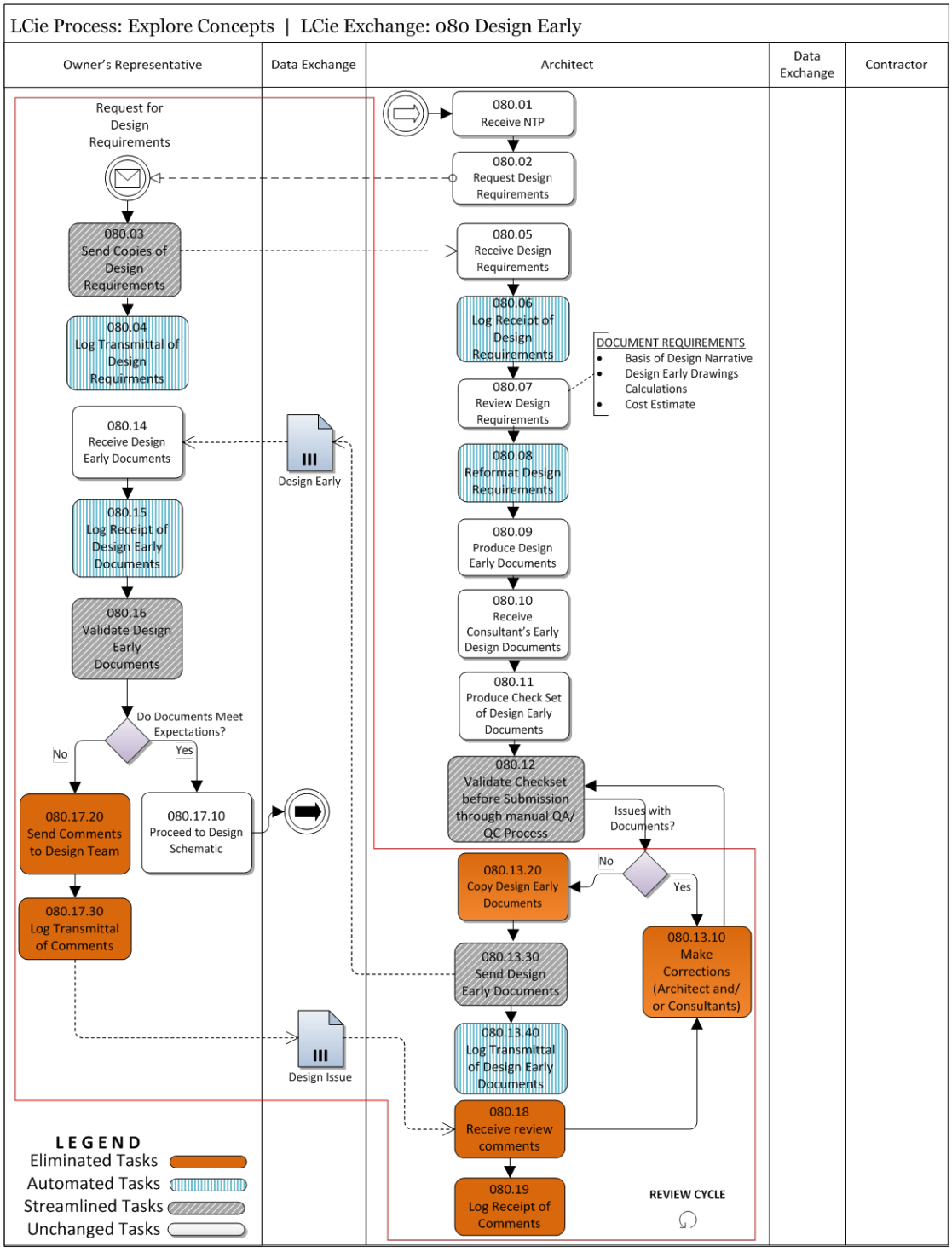


Figure 26. Develop Design- Design Schematic.

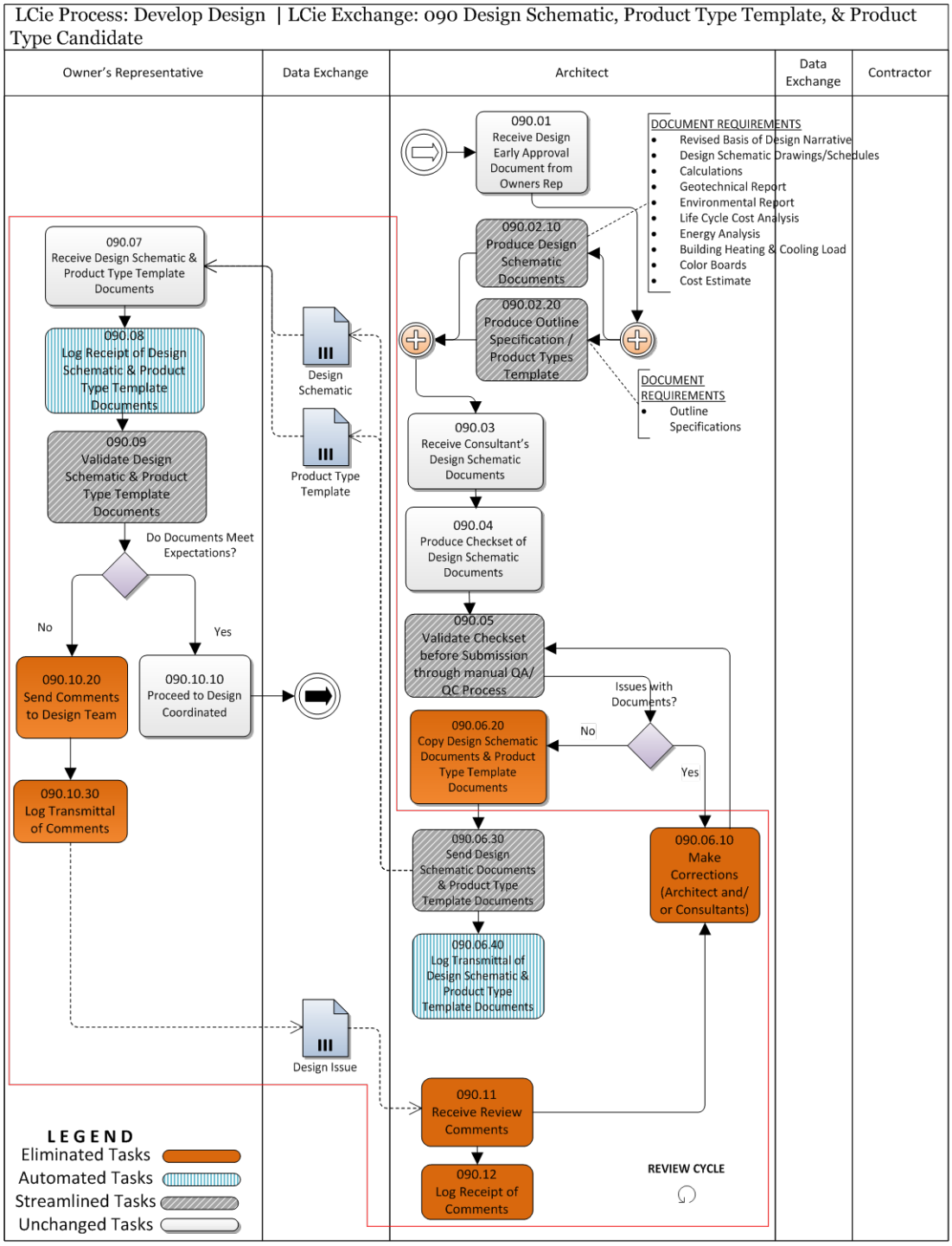


Figure 27. Develop Design- Design Coordinated.

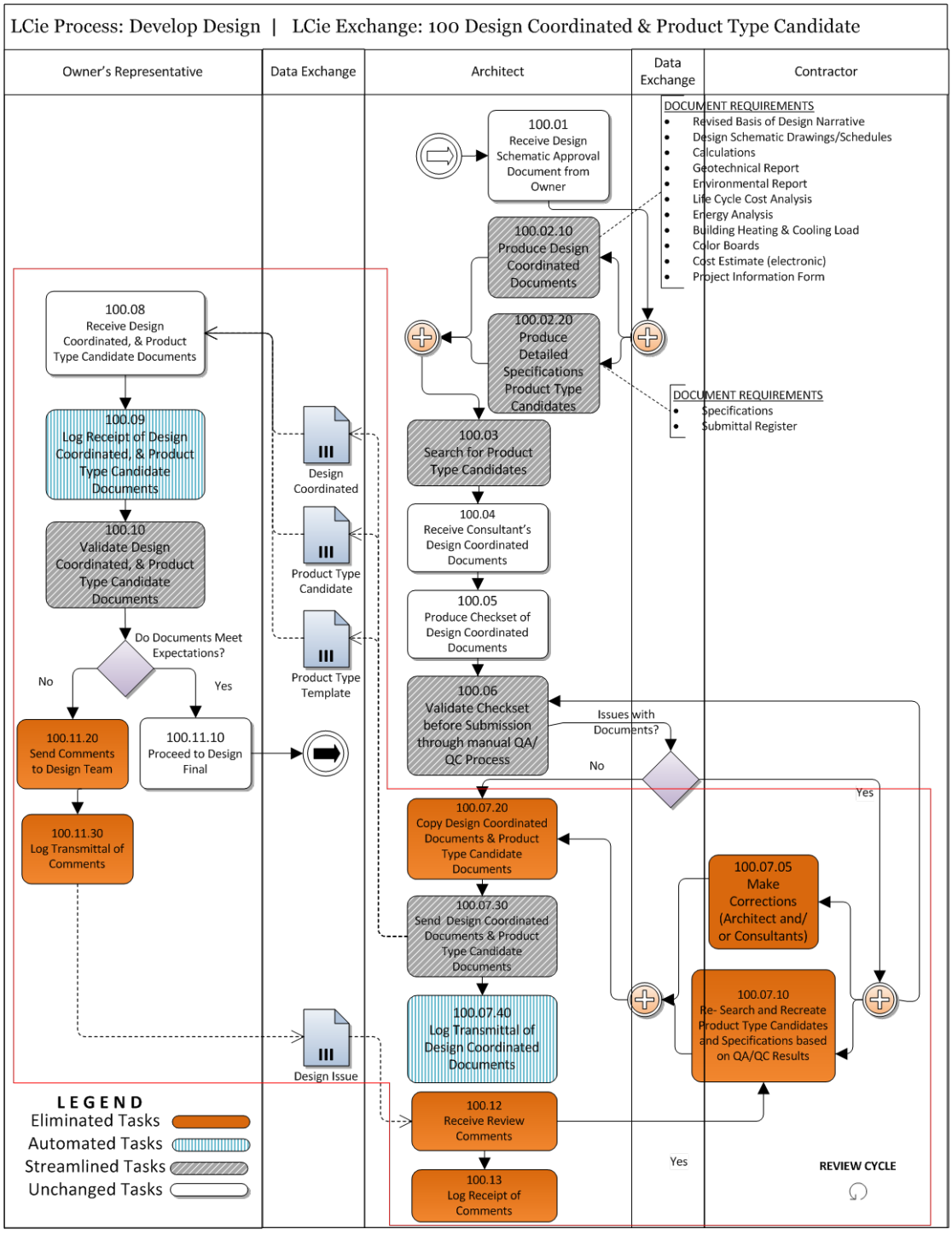


Figure 28. Finalize Design- Design Final.

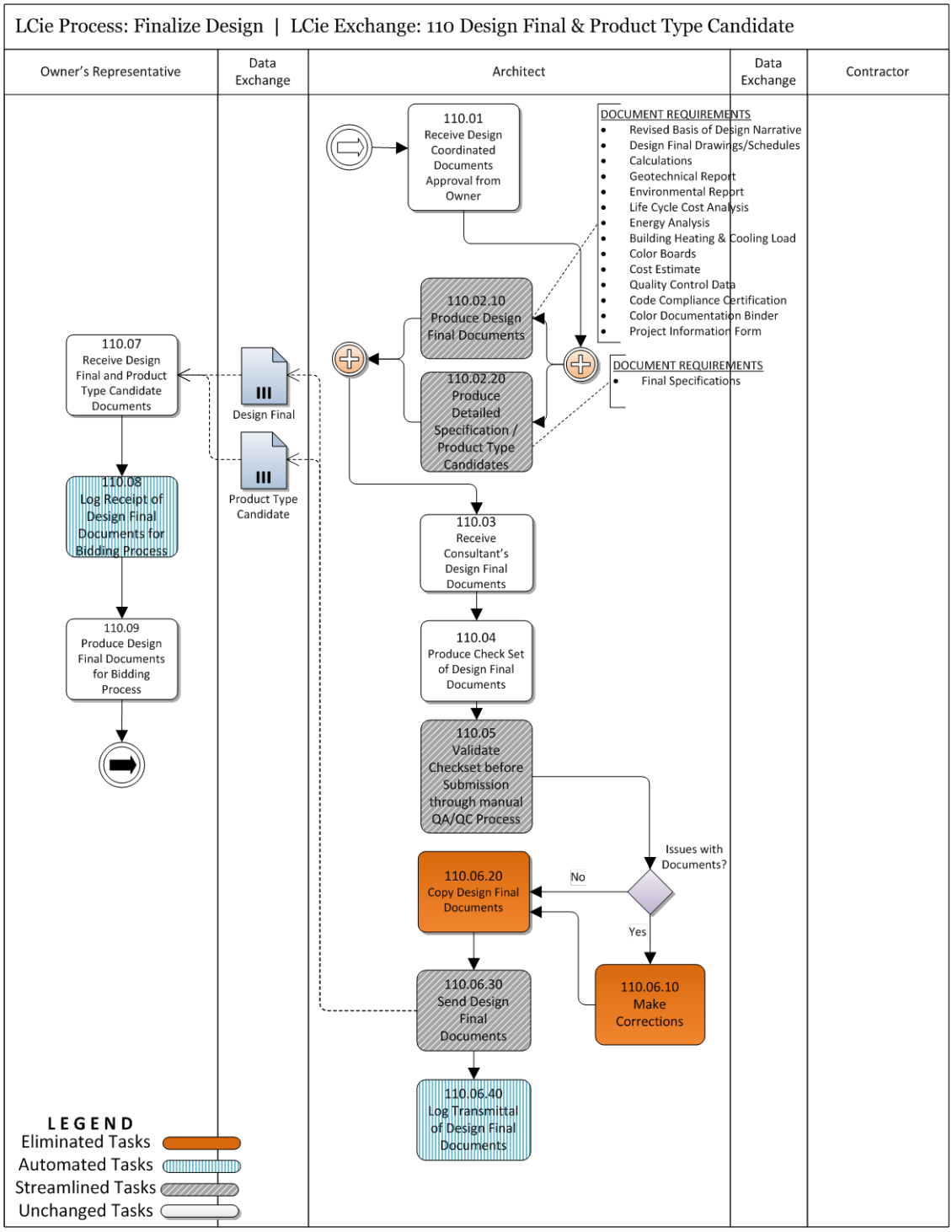


Figure 29. Prepare Invitation to Bid and Receive Proposals (Post-Design).

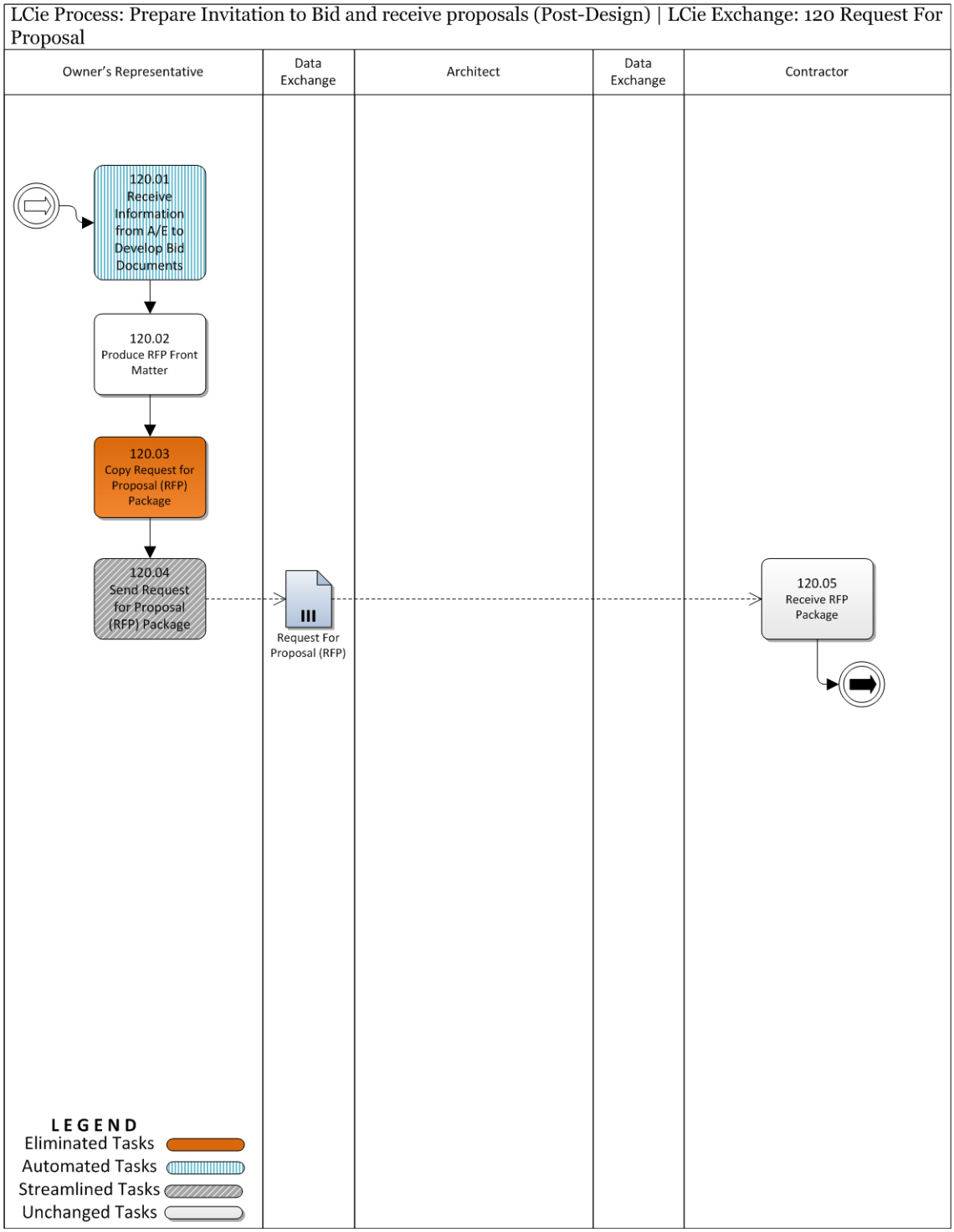


Figure 30. Respond to Pre-Proposal Inquiries.

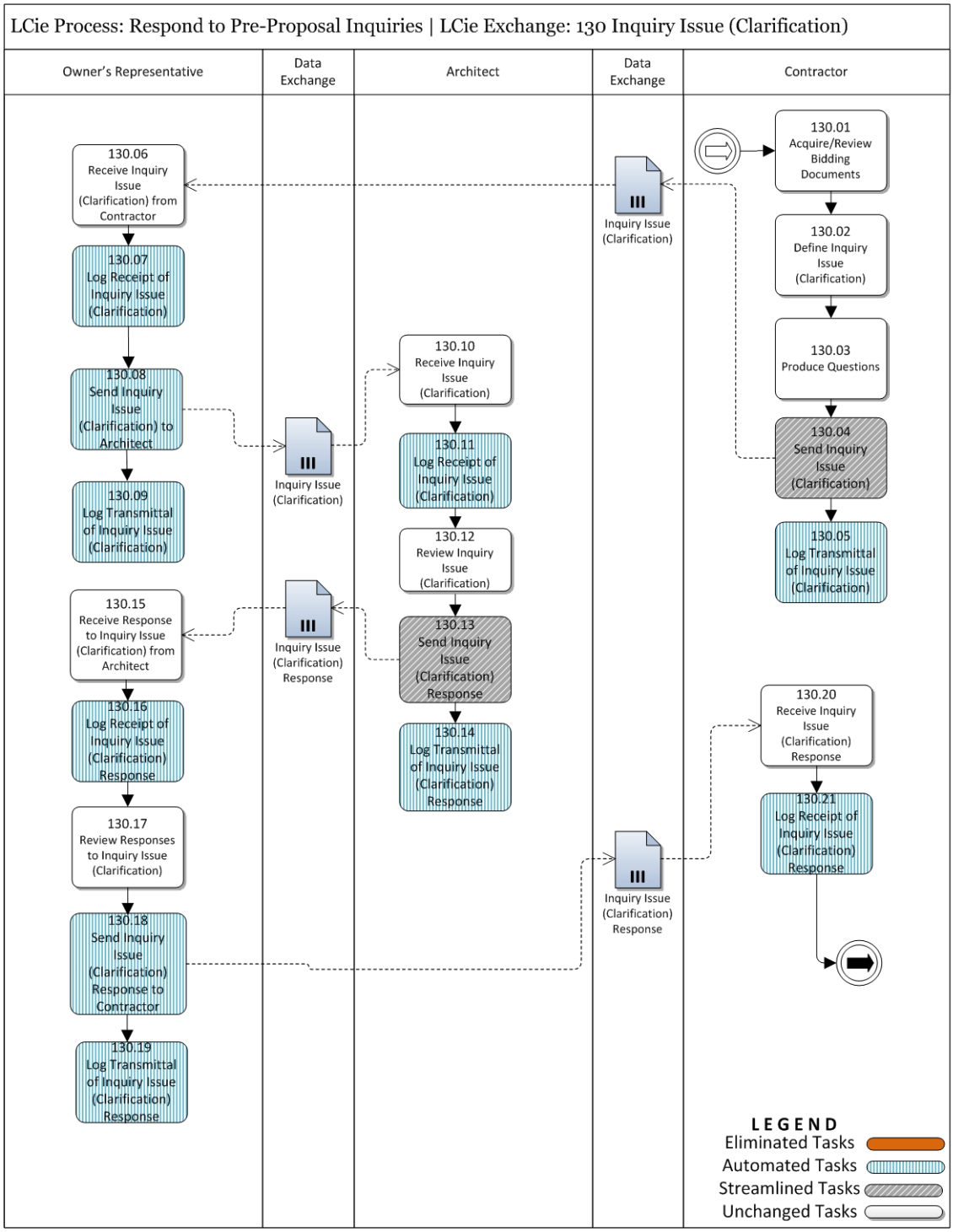


Figure 31. Develop Pre-Construction Plan.

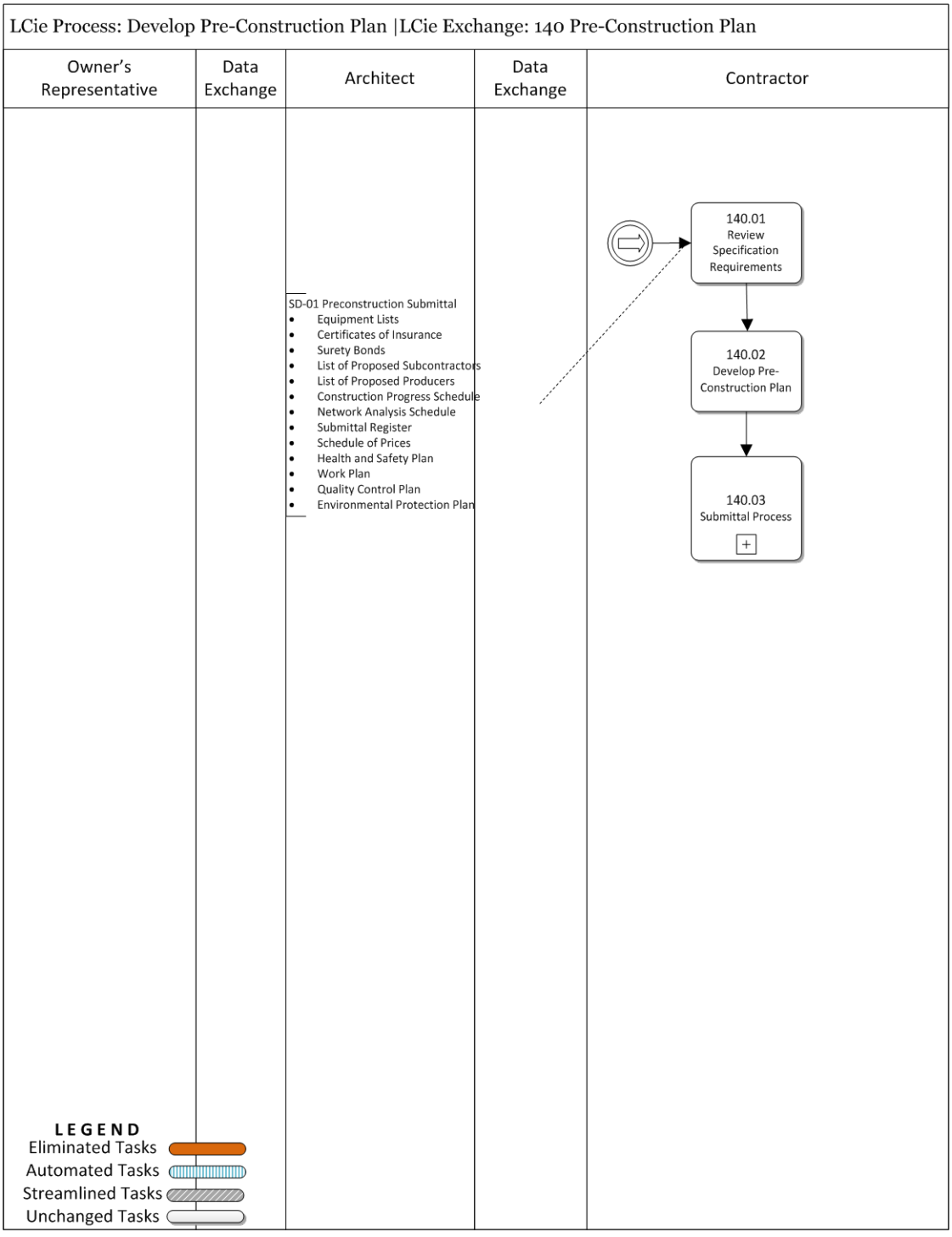


Figure 32. Identify Discrepancies.

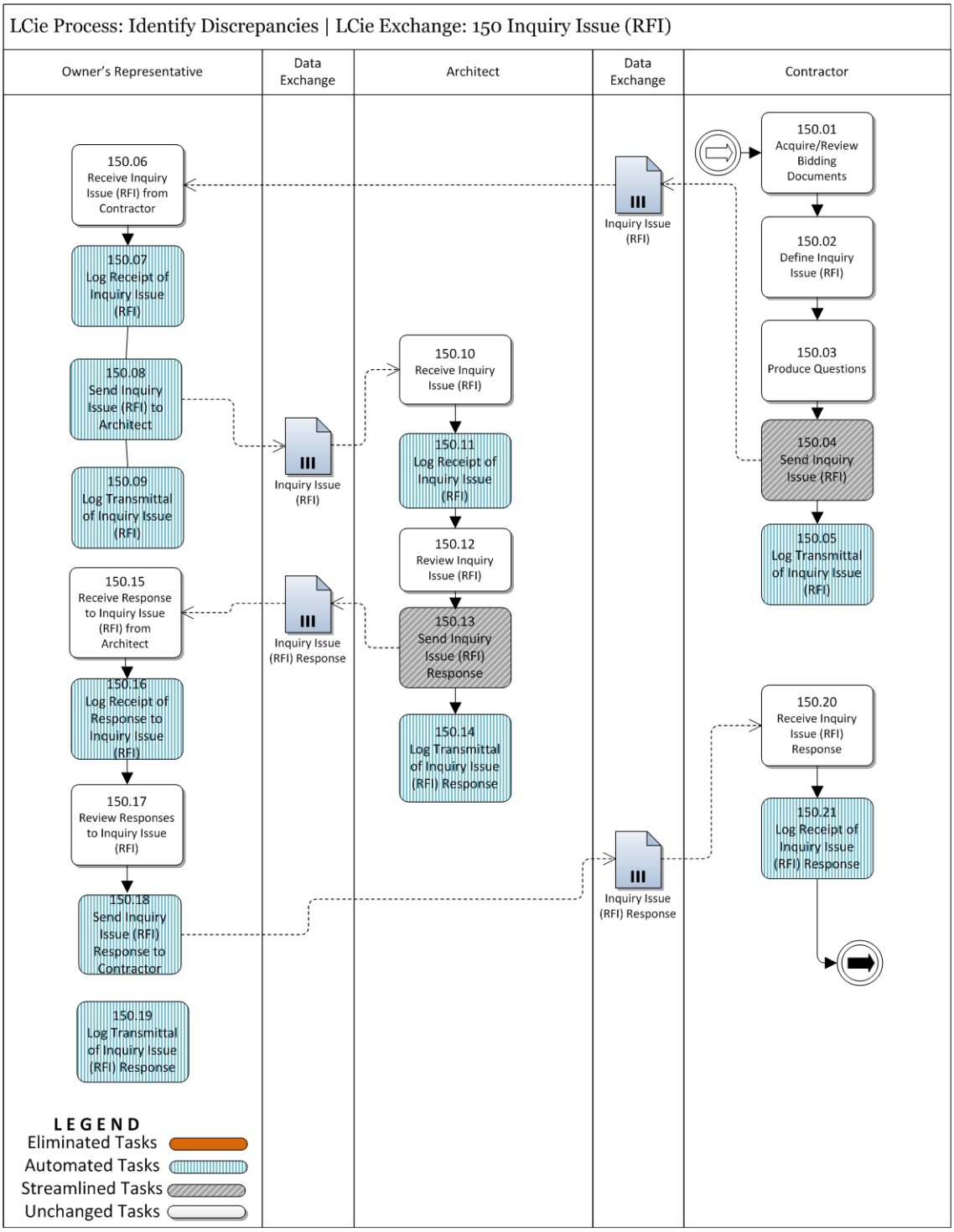


Figure 33. Prepare Submittal Information- Product Type Selection.

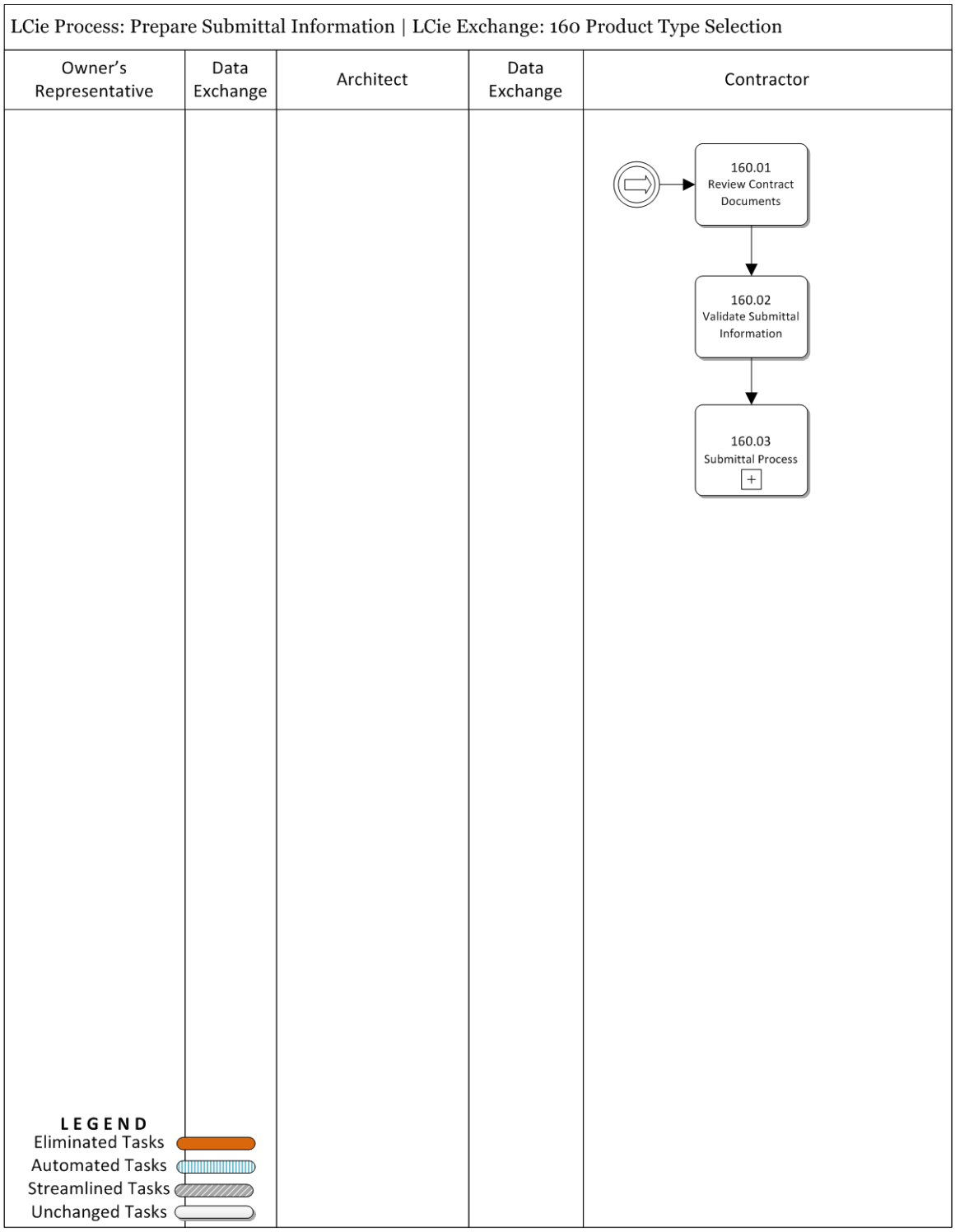


Figure 34. Prepare Submittal Information- System Layout.

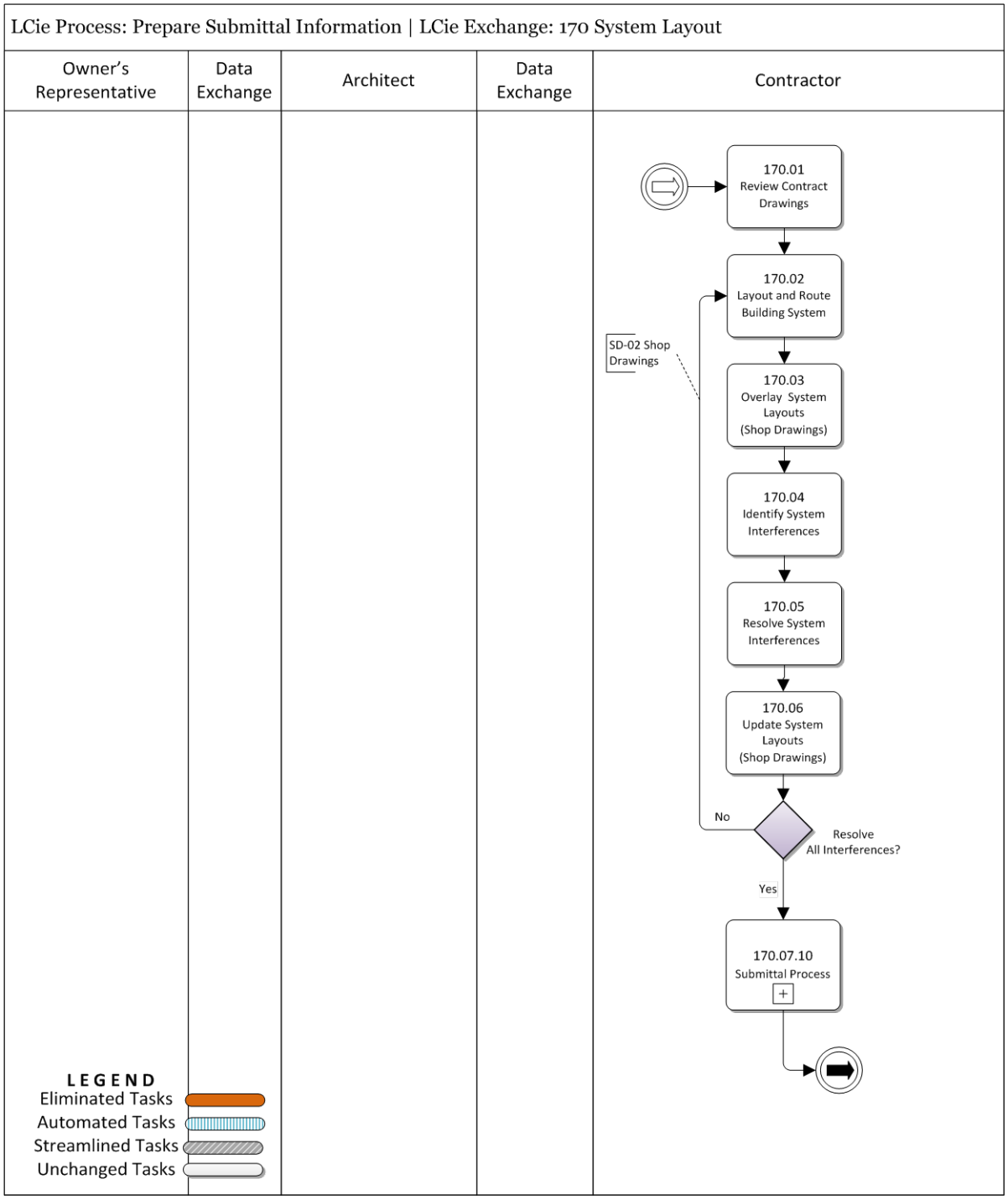


Figure 35. Organize Submittal Information.

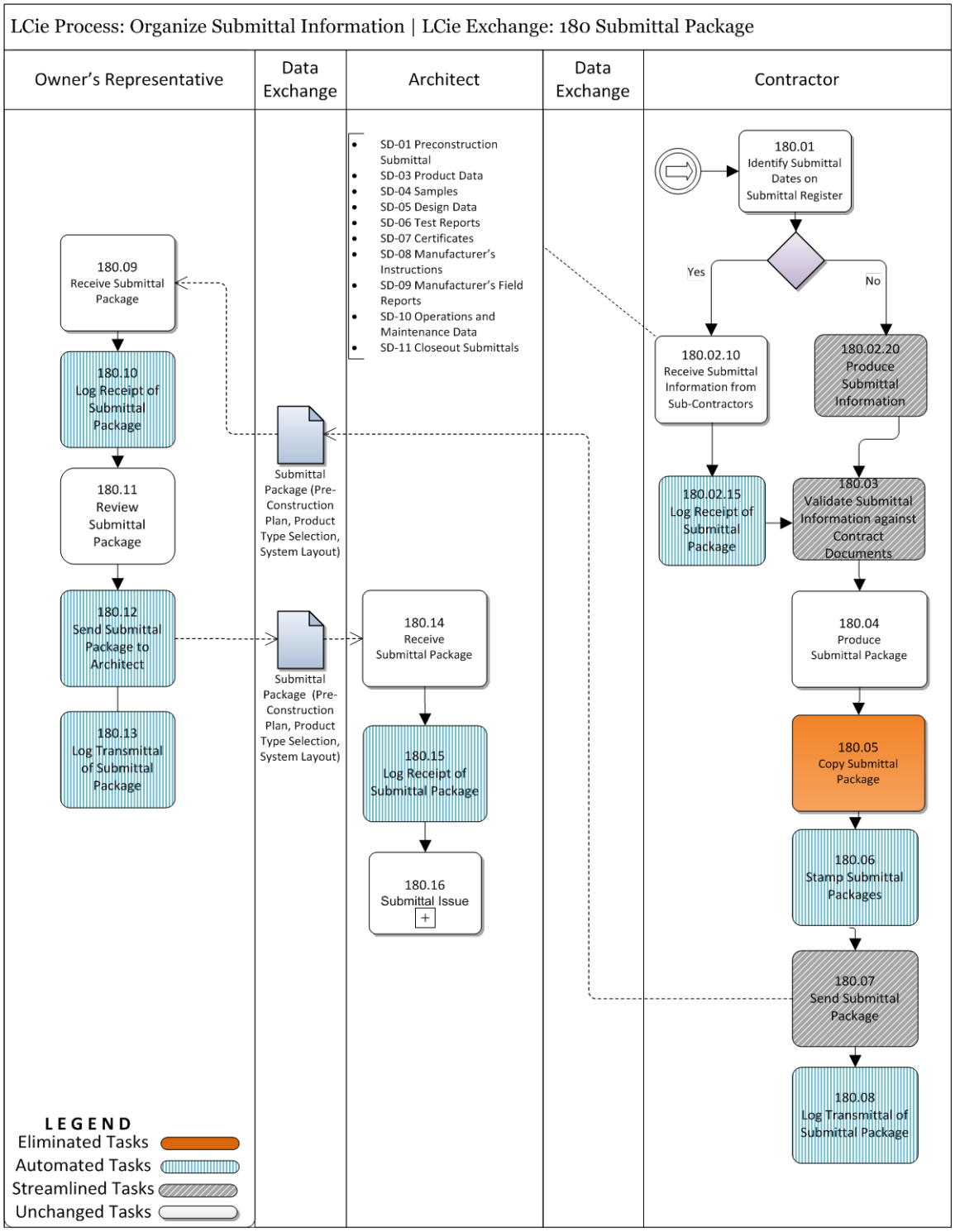


Figure 36. Perform Submittal Review- Submittal Issue.

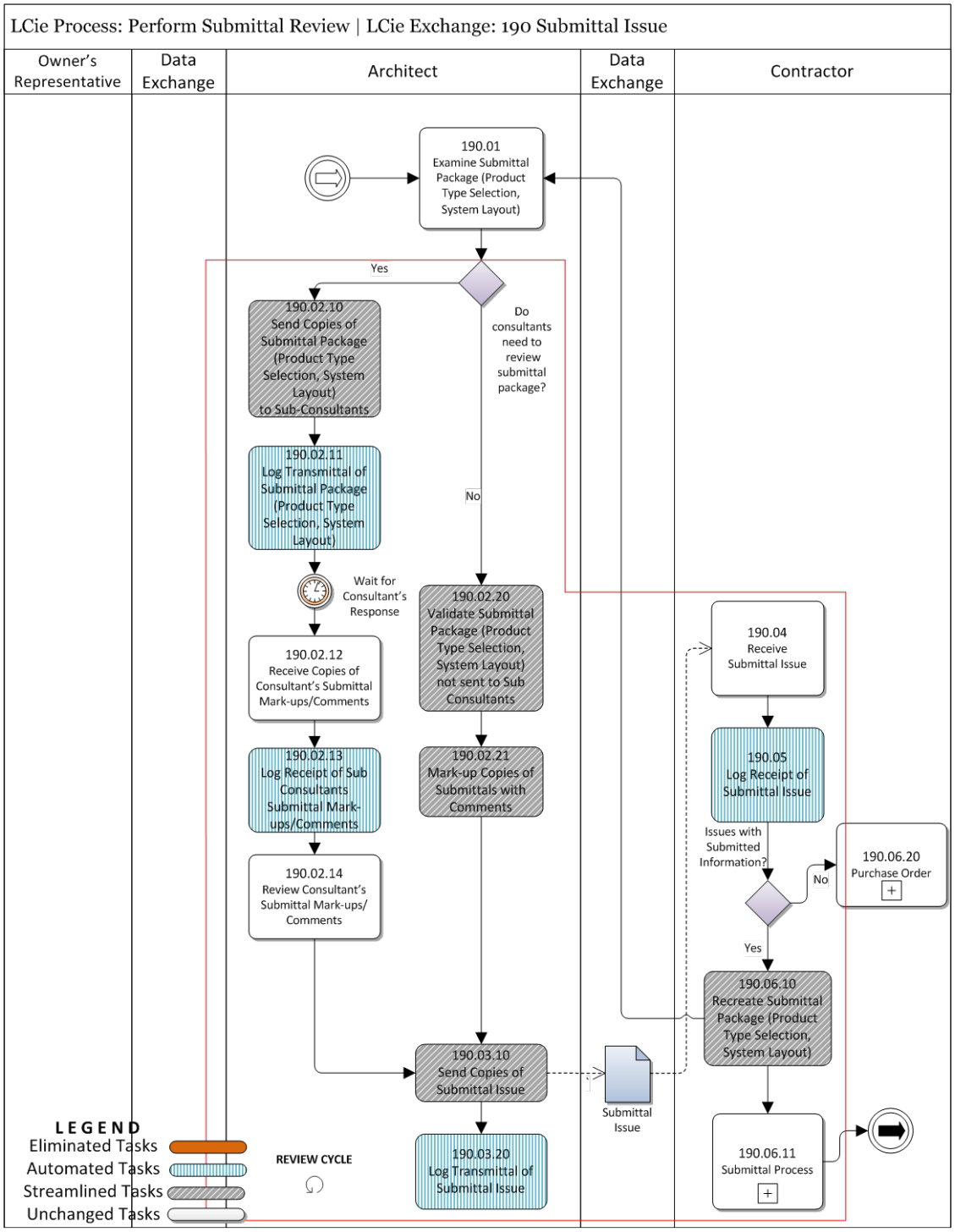


Figure 37. Provide resources.

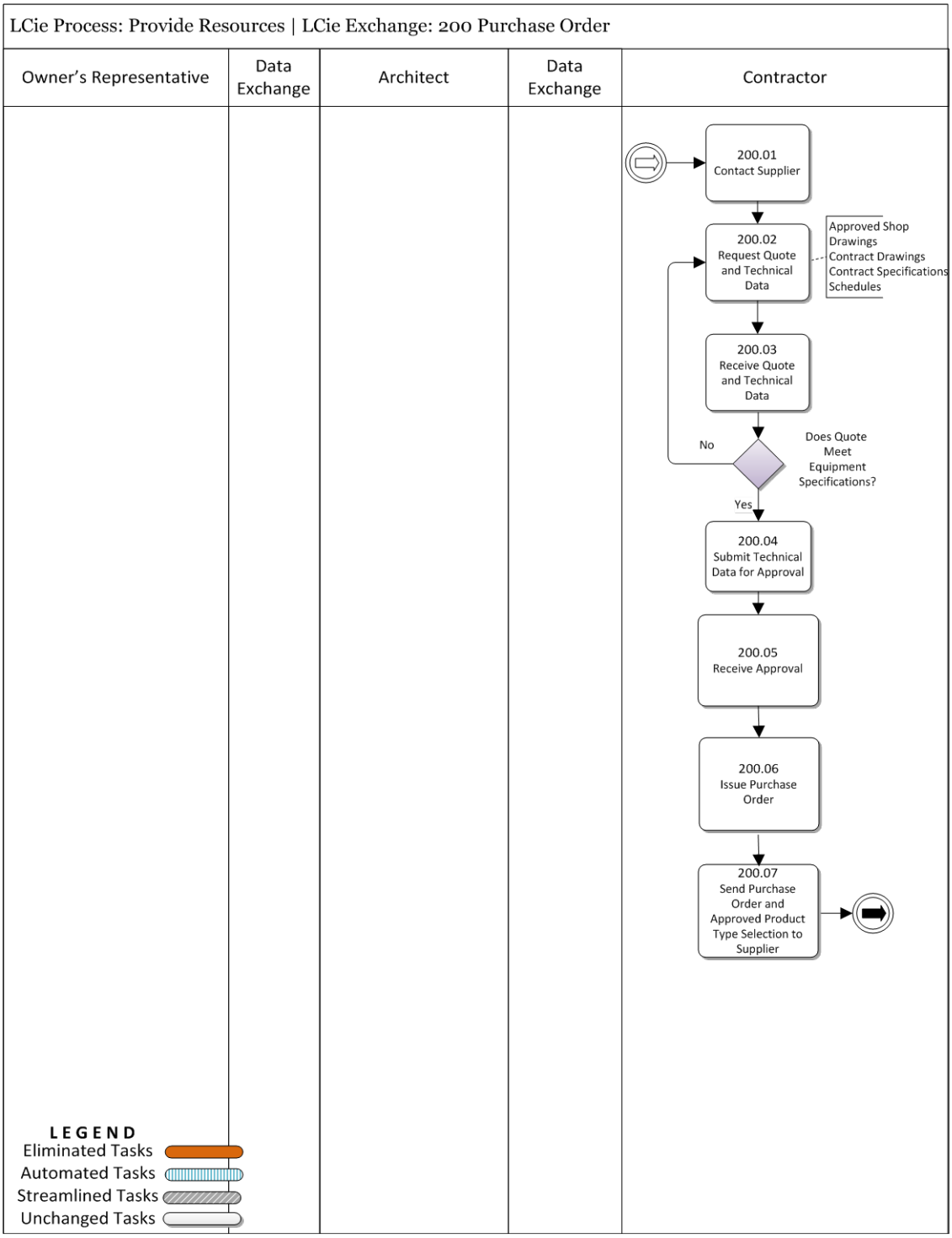


Figure 38. Execute construction activities.

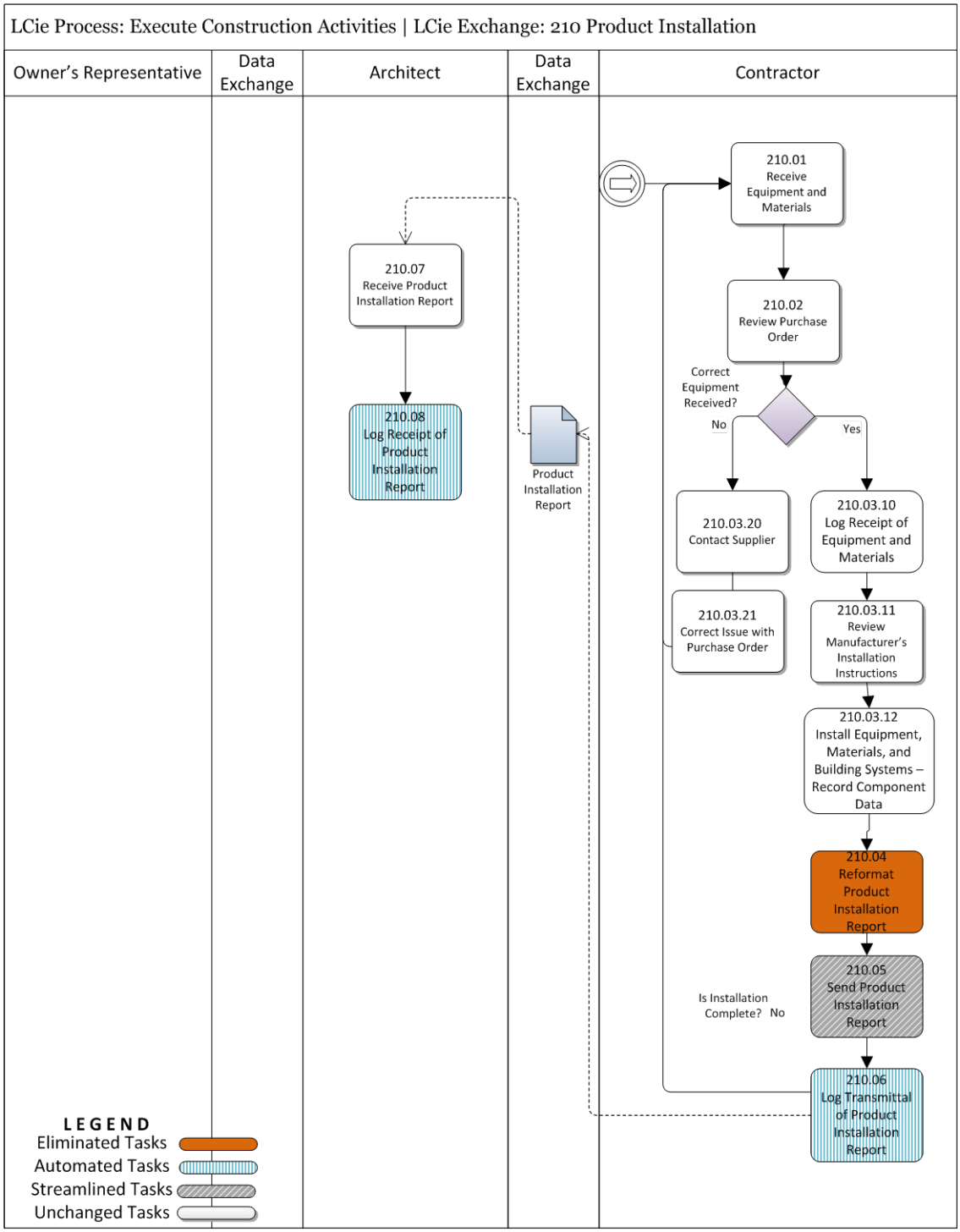


Figure 39. Perform equipment testing.

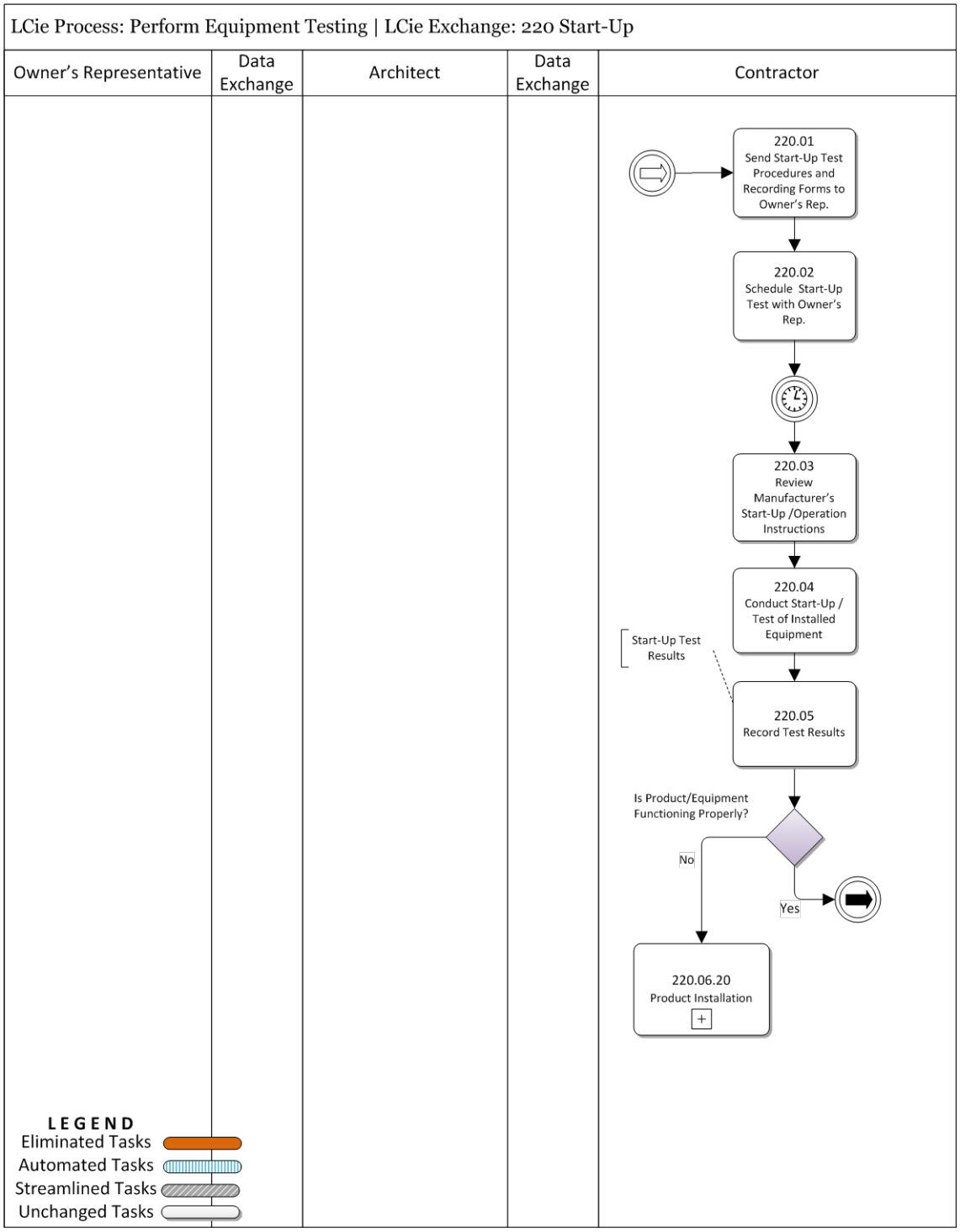


Figure 40. Inspect and approve work.

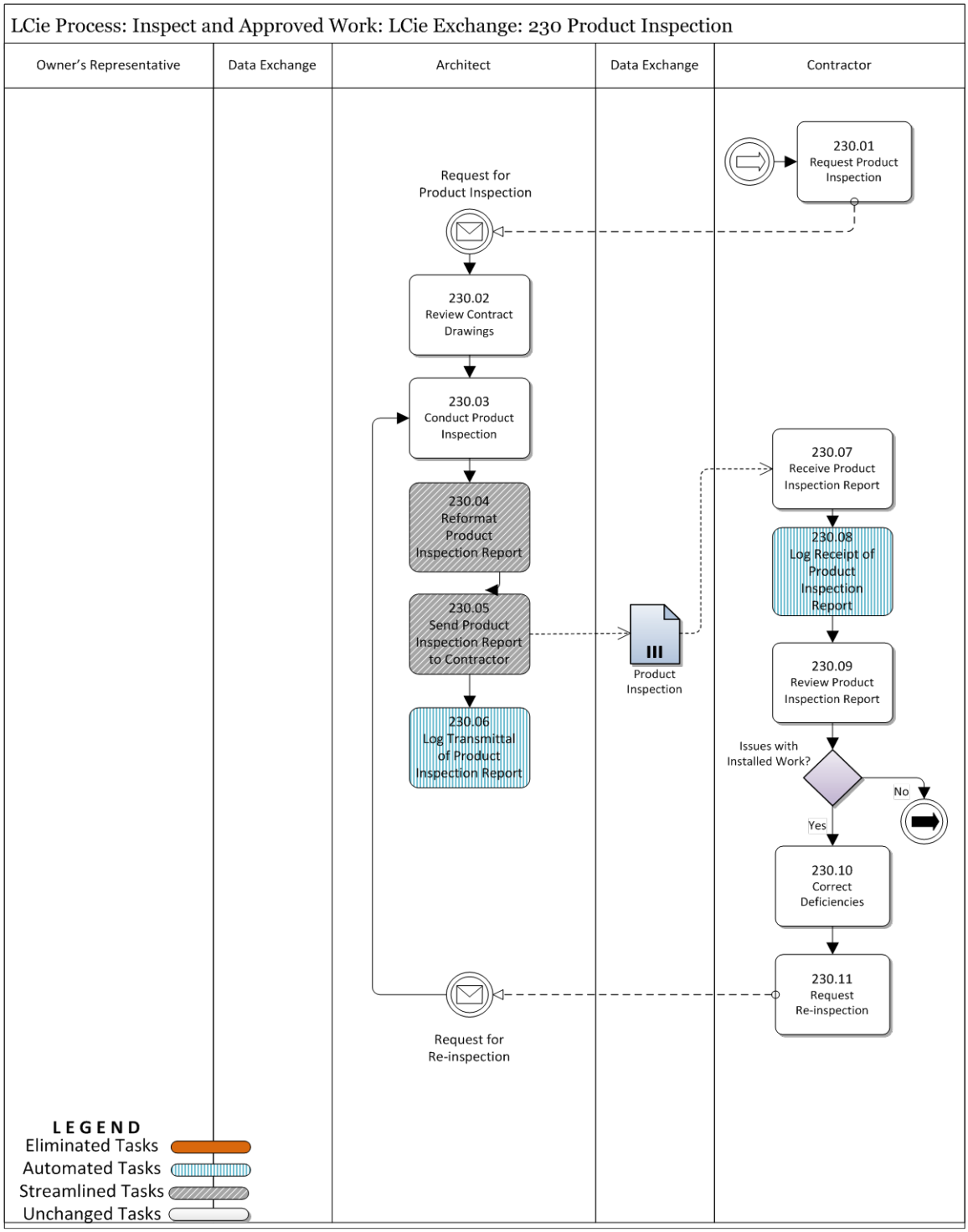


Figure 41. Define, record, and certify discrepancies.

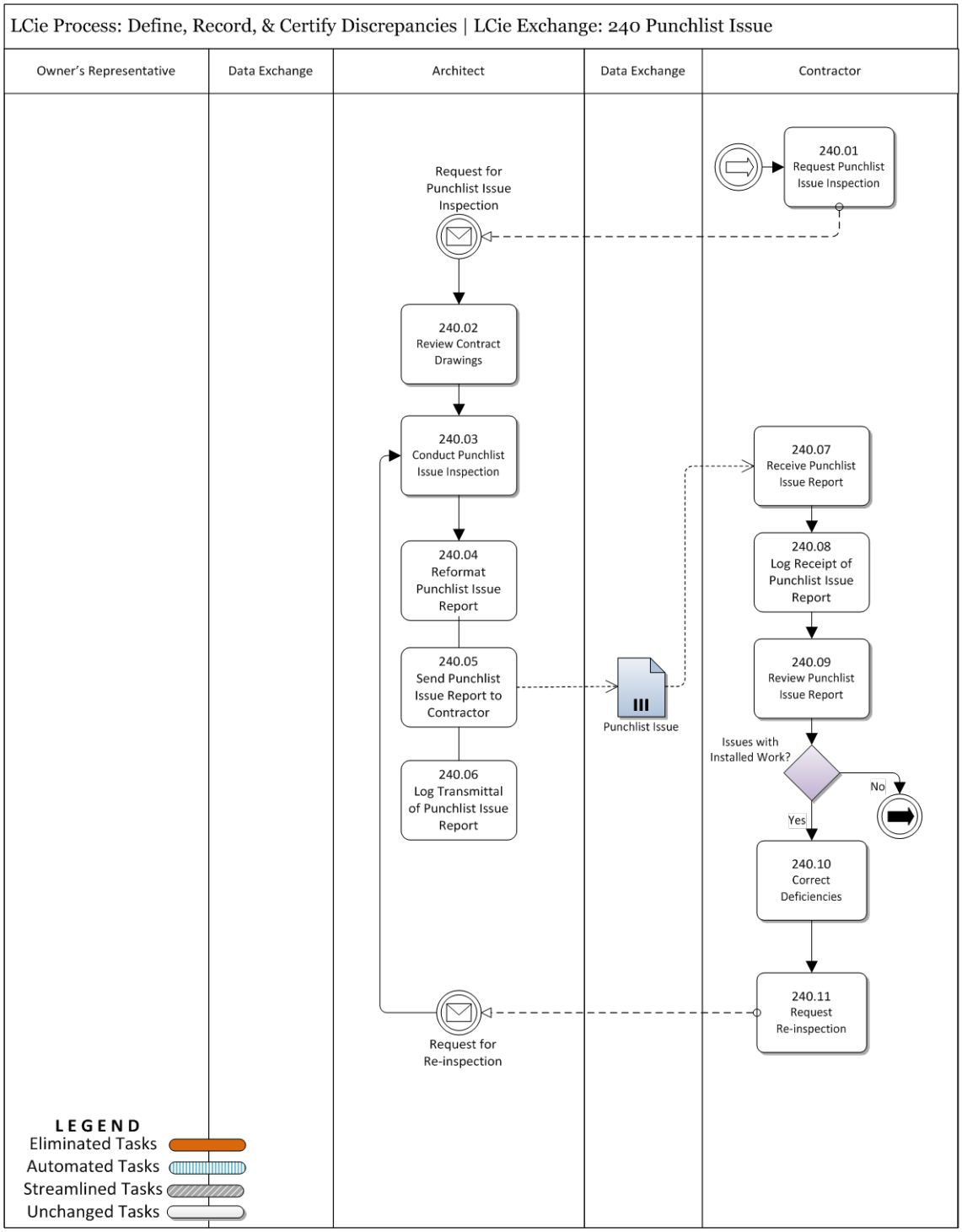
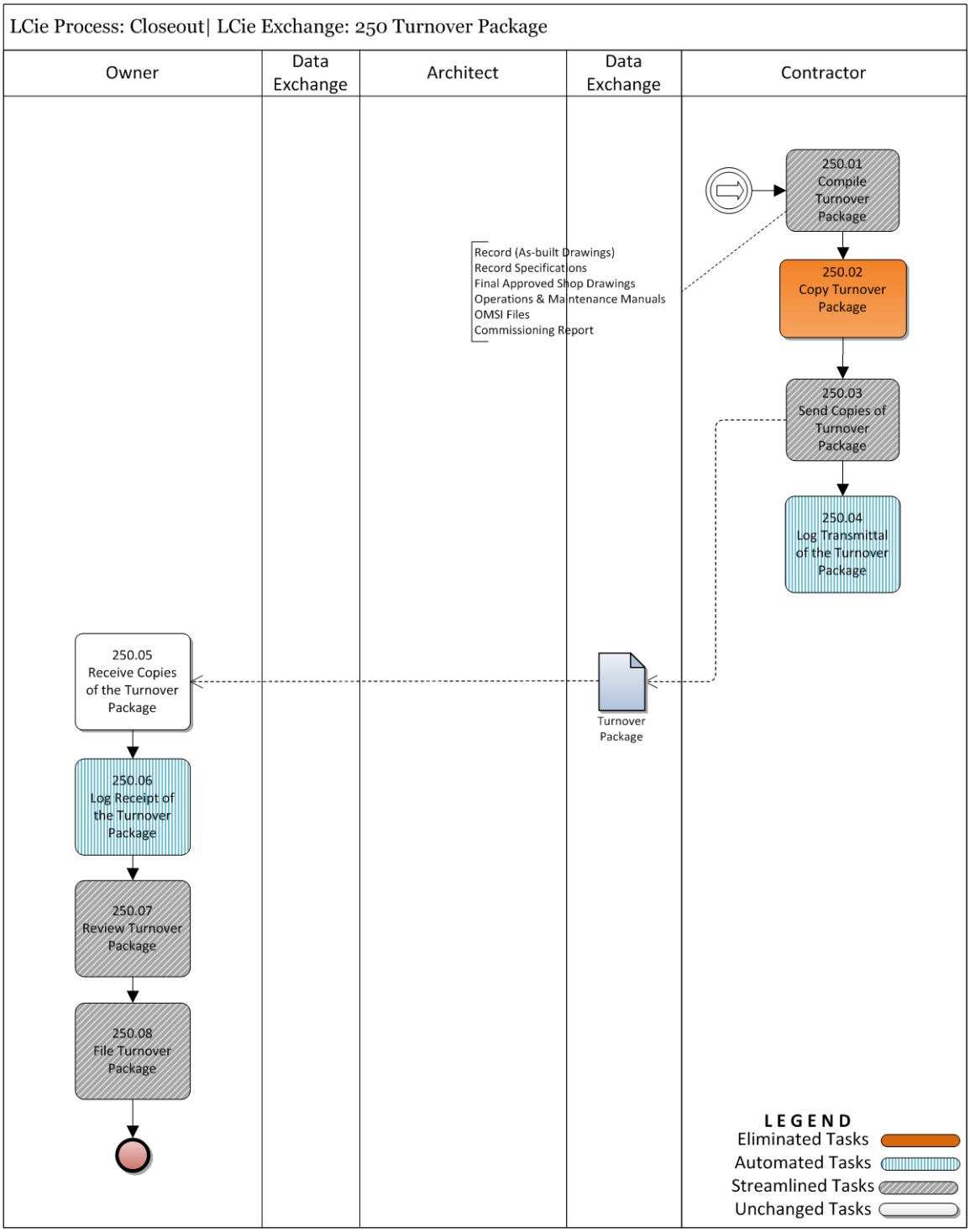


Figure 42. Closeout.



Appendix D: List of Eliminated, Streamlined, and Automated Tasks

Eliminated tasks

Study and Define Needs: 010 Facility Criteria

010.02.40 Copy Facility Criteria

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper.

Develop Design Criteria: 020 Discipline Specifications

020.02.40 Copy Discipline Specification

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper.

Study Technical Feasibility: 030 Feasibility Study

030.04 Copy Feasibility Study and 030.14 Copy Revised Feasibility Study

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper.

Communicate Results Decisions: 040 Project Definition

040.03.30 Copy Project Definition

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper

Develop Program – Space Program: 050 Space Program

050.10.10 Send Comments

050.10.20 Log Transmittal of Space Program Comments

050.12 Log Receipt of Space Program Comments

050.13 Re - Search for Space Program Criteria as Necessary

050.14 Send Revised Copies of Space Program

050.15 Log Transmittal of Revised Space Program

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense. And if the Architect/Planner could automate checking of his work product against

the Owner's requirements, then a rework/re-review cycle could be eliminated.

Develop Program – Product Program: 060 Product Program

060.09.10 Send Comments

060.09.20 Log Transmittal of Product Program Comments

060.11 Log Receipt of Product Program Comments

060.12 Re - Search for Product Program Criteria as Necessary

060.13 Send Revised Copies of Product Program

060.14 Log Transmittal of Revised Product Program

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense. And if the Architect/Planner could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated.

Prepare Invitation to Bid and Receive Proposal (Pre-Design): 070 Request for Proposal (RFP)

070.07 Copy Proposal

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper.

Explore Concepts – Design Early: 080 Design Early

080.13.10 Make Corrections (Architect and/or Consultants)

Assumptions: If the Architect could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated.

080.13.20 Copy Design Early Documents

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper.

080.17.20 Send Comments to Design Team

080.17.30 Log Transmittal of Comments

080.18 Receive Review Comments

080.19 Log Receipt of Comments

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense.

Begin Rework Cycle

080.20 _R Make Corrections (Architect and /or Consultants)

080.21_R Copy Revised Design Early Documents

080.22_R Send Revised Design Early Documents

080.23_R Log Transmittal of Revised Design Early Documents

080.24_R Receive Design Early Documents

080.25_R Log Receipt of Revised Design Early Documents

080.26_R Validate Revised Design Early Documents - Space and Equipment

080.27_R Send Comments to Design Team

080.28 _R Log Transmittal of Comments

080.29 _R Log Receive Review Comments

080.30_*R Log Receipt of Comments*

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense. And if the Architect could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated.

Develop Design – Design Schematic: 090 Design Schematic, Product Type Template & Product Type Candidate

090.06.10 Make Corrections (Architect and/or Consultants)

Assumptions: If the Architect could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated.

090.06.20 Copy Design Schematic & Product Type Template Documents

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper.

090.10.20 Send Comments to Design Team

090.10.30 Log Transmittal of Comments

090.11 Receive Review Comments

090.12 Log Receipt of Comments

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense.

Begin Rework Cycle

090.13_R Make Corrections (Architect and/or Consultants)

090.14_R Copy Revised Design Schematic & Product Type Template Documents

090.15_R Send Revised Design Schematic & Product Type Template Documents

090.16_R Log Transmittal of Revised Design Schematic & Product Type Template Documents

090.17_R Receive Revised Design Schematic & Product Type Template Documents

090.18_R Log Receipt of Revised Design Schematic & Product Type Template Documents

090.19_R Validate Revised Design Schematic Space & Product Type Template Documents

090.20_R Send Comments to Design Team

090.21 _R Log Transmittal of Comments

090.22 _R Receive Review Comments

090.23 _R Log Receipt of Comments

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense. And if the Architect could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated.

Develop Design: 100 Design Coordinated & Product Type Candidate

100.07.05 Make Corrections (Architect and/or Consultants)

Assumptions: If the Architect could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated.

100.07.10 Re- Search and Recreate Product Type Candidates and Detailed Specifications based on QA/QC Results

Assumptions: If the Architect could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated.

100.07.20 Copy Design Coordinated Documents & Product Type Candidate Documents

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper

100.11.20 Send Comments to Design Team

100.11.30 Log Transmittal of Comments

100.12 Receive Review Comments

100.13 Log Receipt of Comments

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense.

Begin Rework Cycle

100.14_R Make Corrections (Architect and/or Consultants)

100.15_R Copy Revised Design Coordinated & Product Type Candidate Documents

100.16_R Send Revised Design Coordinated & Product Type Candidate Documents

100.17_R Log Transmittal of Revised Design Coordinated & Product Type Candidate Documents

100.18_R Receive Design Coordinated & Product Type Candidate Documents

100.19_R Log Receipt of Revised Design Coordinated & Product Type Candidate Documents

100.20_R Validate Revised Design Coordinated Space & Product Type Candidate Documents

100.21_R Send Comments to Design Team

100.22 _R Log Transmittal of Comments

100.23 _R Receive Review Comments

100.24 _R Log Receipt of Comments

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense. And if the Architect could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated.

Finalize Design: 110 Design Final & Product Type Candidate

110.06.10 Make Corrections (Architect and/or Consultants)

Assumptions: If the Architect could automate checking of his work product against the Owner's requirements, then a rework/re-review cycle could be eliminated.

110.06.20 Copy Design Final Documents

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper.

Prepare Invitation to Bid (Post Design): 120 Request for Proposal

120.03 Copy Request for Proposal (RFP) Package

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper.

Organize Submittal Information: 180 Submittal Package

180.05 Copy Submittal Package

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper.

Execute Construction Activities: 210 Product Installation

210.04 Reformat Product Installation Report

Assumptions: The use of a structured data format from the onset will eliminate the need to reformat the Product Installation Report.

Closeout: 250 Turnover Package

250.02 Copy Turnover Package

Assumptions: Reproduction savings from reliance on electronic documents and the elimination of paper

Streamlined tasks

Study Technical Feasibility: 030 Feasibility Study

030.05 Send Feasibility Study

030.10.20 Send Comments to Planner

030.15 Send Revised Feasibility Study

Assumptions: An electronic management system will aid in streamlining these processes by reducing time spent preparing transmittals. Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense will also create savings.

Develop Program – Space Program: 050 Space Program

050.05 Send Copies of Space Program

Assumptions: An electronic management system will aid in streamlining these processes by reducing time spent preparing transmittals. Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense will also create savings.

050.09 Validate Space Program

Assumptions: Use of COBie format would permit automated checking and aid in streamlining this process by reducing time spent validating program sent by Architect/Planner.

Develop Program – Product Program: 060 Product Program

060.04 Send Copies of Product Program to Owner for Review

Assumptions: An electronic management system will aid in streamlining this process by reducing time spent preparing transmittals. Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense will also create savings.

060.08 Validate Product Program

Assumptions: Use of COBie format would permit automated checking and aid in streamlining this process by reducing time spent validating program sent by Architect/Planner.

Prepare Invitation to Bid and Receive Proposal (Pre-Design): 070 Request for Proposal (RFP)

070.02 Send Copies of Request for Proposal (RFP) Package

070.08 Send Proposal

Assumptions: An electronic management system will aid in streamlining these processes by reducing time spent preparing transmittals. Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense will also create savings.

Explore Concepts – Design Early: 080 Design Early

080.03 Send Copies of Design Requirements

Assumptions: An electronic management system will aid in streamlining this process by reducing time spent preparing transmittals. Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense will also create savings.

080.12 Validate Checkset before Submission through Manual QA/QC Process – Space and Equipment

Assumptions: COBie would permit the Architect to automate checking of his Concept Design against the Owner's space requirements, saving the Architect time and potentially eliminating a rework/re-review cycle.

080.13.30 Send Design Early Documents and 080.22 Send Revised Design Early Documents

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense

080.16 Validate Design Early Documents – Space and Equipment

Assumptions: Use of COBie format would permit automated checking and aid in streamlining this process by reducing time spent validating program sent by Architect/Planner.

Develop Design – Design Schematic: 090 Design Schematic, Product Type Template & Product Type Candidate

090.02.10 Produce Design Schematic Documents

Assumptions: COBie would permit ease of QTOs for cost estimating, as it addresses spaces and products/equipments and provides space areas and product types and counts.

090.02.20 Produce Outline Specification / Product Type Templates

Assumptions: COBie formatted requirements data could be used directly aiding the Architect to develop product type templates.

090.05 Validate Checkset before Submission through Manual QA/QC Process - Space and Equipment – Space and Equipment

Assumptions: Use of COBie format would permit automated checking of space and product program at this phase prior to submission.

090.06.30 Send Design Schematic and Product Type Template Documents

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense

090.09 Validate Design Schematic Space and Product Type Template Documents and 090.19 Validate Revised Design Schematic Space and Product Type Template Documents

Assumptions: Use of COBie format would permit automated checking of space and product program of Architects submission against Owner requirements by Owners Rep.

Develop Design: 100 Design Coordinated & Product Type Candidate

100.02.10 Produce Design Coordinated Documents

Assumptions: COBie would permit ease of QTOs for cost estimating, as it addresses spaces and products/equipments and provides space areas and product types and counts.

100.02.20 Produce Detailed Specification / Product Type Templates

Assumptions: COBie formatted requirements data could be used directly aiding the Architect to develop product type templates.

100.03 Search for Product Type Candidates

Assumptions: Standard, structured product data available in a COBie format would allow automated product selection based on the product type templates.

100.06 Validate Checkset before Submission through Manual QA/QC Process - Space and Equipment

Assumptions: Use of COBie format would permit automated checking of space and product program at this phase prior to submission.

100.07.30 Send Design Coordinated and Product Type Candidate Documents and 100.16 Send Revised Design Coordinated and Product Type Candidate Documents

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense

100.10 Validate Design Coordinated Space & Product Type Candidate Documents and 100.20 Validate Revised Design Coordinated Space & Product Type Candidate Documents

Assumptions: Use of COBie format would permit automated checking of space and product program of Architects submission against Owner requirements by Owners Rep.

Finalize Design: 110 Design Final & Product Type Candidate

110.02.10 Produce Design Final Documents

Assumptions: COBie would permit ease of QTOs for cost estimating, as it addresses spaces and products/equipments and provides space areas and product types and counts.

110.02.20 Produce Detailed Specification / Product Type Templates

Assumptions: COBie formatted requirements data could be used directly aiding the Architect to develop product type templates.

110.05 Validate Checkset before Submission through Manual QA/QC Process

Assumptions: Use of COBie format would permit automated checking of space and product program at this phase prior to submission.

110.06.30 Send Design Final Documents

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as delivery expense

Prepare Invitation to Bid (Post Design): 120 Request for Proposal

120.04 Send Request for Proposal (RFP) Package

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. A managed electronic collaboration system with a "bidding" module can handle distribution of Requests for Proposal, receiving questions, issuing addenda and receiving and securing the bids submitted by Contractors.

Respond to Pre-Proposal Inquires: 130 Inquiry Issue (Clarification)

130.04 Send Inquiry Issue (Clarification)

130.13 Send Inquiry Issue (Clarification) Response

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. A managed electronic collaboration system with a "bidding" module can handle receipt of bidder questions and issuing addenda.

Identify Discrepancies: 150 Inquiry Issue

150.04 Send Inquiry Issue (RFI)

150.13 Send Inquiry Issue (RFI) Response

Assumptions: Elimination of administrative costs associated with handling paper document transmittals as well as the delivery expense. Managed electronic collaboration systems typically have an RFI module that logs the questions and responses and tracks the time until a response is provided. These systems have proven to reduce RFI turnaround time.

Organize Submittal Information: 180 Submittal Package

180.02.20 Produce Submittal Information

Assumptions: COBie provides information in a concise and computable form allowing the Contractors and Subcontractors to be able to extract product requirements from the specifications.

180.03 Validate Submittal Information against Contract Documents

Assumptions: COBie supports automated checking of the data against the product specifications, saving time and reducing the number of Product Submittals rejected. This reduces rework.

180.07 Send Submittal Package

Assumptions: Elimination of administrative costs associated with handling paper document Submittals as well as the delivery expense. These costs are high, due to the large number of documents and the requirement for multiple copies.

Perform Submittal Review: 190 Submittal Issue

190.02.10 Send Copies of Submittal Package (Product Type Selection, System Layout) to Sub-Consultants

Assumptions: Elimination of administrative costs associated with handling paper document Submittals as well as the delivery expense. These costs are high, due to the large number of documents and the requirement for multiple copies.

190.02.20 Validate Submittal Package not sent to Sub-Consultants

Assumptions: COBie supports automated checking, saving time as the Submittal Reviewers must check the Product Submittal data against the specifications.

190.02.21 Mark-up Copies of Submittals with Comments

Assumptions: The reliance on electronic documents and data eliminates the need to mark up copies of submittals and reduce costs which are usu-

ally high, due to large number of documents and the requirement of multiple copies.

190.03.10 Send Copies of Submittal Issues

Assumptions: Elimination of administrative costs associated with handling paper document Submittals as well as the delivery expense.

190.06.10 Recreate Submittal Package (Product Type Selection, System Layout)

Assumptions: COBie supports automated validation product characteristics against the specification, lowering the number of Product Submittals rejected.

Execute Construction Activities: 210 Product Installation

210.05 Send Product Installation Report

Assumptions: Elimination of administrative costs associated with handling paper documents as well as the delivery expense.

Inspect and Approved Work: 230 Product Inspection

230.04 Reformat Product Inspection

Assumptions: COBie would provide a definitive list of items required per room or floor that could be "checked off" and automatically totaled. This would allow the Architect to reduce office time.

230.05 Send Product Inspection Report to Contractor

Assumptions: Elimination of administrative costs associated with handling paper documents as well as the delivery expense. Managed electronic collaboration systems can notify the Contractor if the Pay Request has been accepted or rejected and deliver the Observation Field Report with tracking.

Closeout: 250 Turnover Package

250.01 Compile Turnover Package

Assumptions: A managed electronic collaboration system stores and indexes all documents submitted as they are uploaded. This greatly reduces the time required to find the necessary documents and assemble the Turnover Package, saving the Contractor time, improving the completeness and quality of the Turnover Package, and making the Turnover Package available to the Owner at an earlier date.

250.03 Send Copies of Turnover Package

Assumptions: Reproduction savings from turnover of electronic documents and data and the elimination of paper and elimination of adminis-

trative costs associated with handling paper documents as well as the delivery expense.

250.07 Review Turnover Package

250.08 File Turnover Package

Assumptions: A managed electronic collaboration system stores and indexes all documents submitted as they are uploaded.

Automated tasks

Study Technical Feasibility: 030 Feasibility Study

030.06 Log Transmittal of Feasibility Study

030.08 Log Receipt of Feasibility Study

030.10.21 Log Transmittal of Feasibility Study Comments

030.12 Log Receipt of Review Comments

030.16 Log Transmittal of Revised Feasibility Study

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Develop Program – Space Program: 050 Space Program

050.03 Search for Space Program Criteria as Necessary

Assumptions: COBie-formatted data would permit data to be transferred directly from the Owner to the Architect or Planner's system. This ensures that the Architect won't need to search for the data received from the Owner.

050.04 Reformat Space Program Criteria into Room Data Sheets

Assumptions: COBie format would either eliminate the need to produce room data sheets or support automation of their production. This ensures that the Architect won't need to reformat the data received from the Owner.

050.06 Log Transmittal of Space Program

050.08 Log Receipt of Space Program

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Develop Program – Product Program: 060 Product Program

060.03 Search for Product Program Criteria as Necessary

Assumptions: COBie-formatted product standards would permit direct transfer from the Owner to the Architect or Planner's system. This ensures that the Architect won't need to search for the data received from the Owner.

060.05 Log Transmittal of Product Program

060.07 Log Receipt of Product Program

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Prepare Invitation to Bid and Receive Proposal (Pre-Design): 070 Request for Proposal (RFP)

070.04 Log Receipt of Request for Proposal (RFP) Package

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Explore Concepts – Design Early: 080 Design Early

080.08 Reformat Design Requirements

Assumptions: COBie-formatted requirements data permits direct transfer from the Owner to the design consultants' systems. This ensures that the Architect won't need to reformat the data received from the Owner.

080.04 Log Transmittal of Design Requirements

080.06 Log Receipt of Design Requirements

080.13.40 Log Transmittal of Design Early Documents

080.15 Log Receipt of Design Early Documents

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Develop Design – Design Schematic: 090 Design Schematic, Product Type Template & Product Type Candidate

090.06.40 Log Transmittal of Design Schematic Documents & Product Type Template Documents

090.08 Log Receipt of Design Schematic & Product Type Template Documents

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Develop Design: 100 Design Coordinated & Product Type Candidate

100.07.40 Log Transmittal of Design Coordinated and Product Type Candidate Documents

100.09 Log Receipt of Design Coordinated and Product Type Candidate Documents

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Finalize Design: 110 Design Final & Product Type Candidate

110.06.40 Log Transmittal of Design Final Documents

110.08 Log Receipt of Design Final Documents for Bidding Process

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Prepare Invitation to Bid (Post Design): 120 Request for Proposal

120.01 Receive Information from A/E to Develop Bid Documents

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Respond to Pre-Proposal Inquires: 130 Inquiry Issue (Clarification)

130.05 and 130.09 Log Transmittal of Inquiry Issue (Clarification)

130.07 and 130.11 Log Receipt of Inquiry Issue (Clarification)

130.08 Send Inquiry Issue (Clarification) to Architect

130.14 and 130.19Log Transmittal of Inquiry Issue (Clarification) Response

130.16 Log Receipt of Inquiry Issue (Clarification) Response

130.18 Send Inquiry Issue (Clarification) Response to Contractor

130.21 Log Receipt of Inquiry Issue (Clarification) Response

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents.

Identify Discrepancies: 150 Inquiry Issue

150.05 and 150.09 Log Transmittal of Inquiry Issue (RFI)

150.07 and 150.11 Log Receipt of Inquiry Issue (RFI)

150.08 Send Inquiry Issue (RFI) to Architect

150.14 and 150.19 Log Transmittal of Inquiry Issue (RFI) Response

150.16 Log Receipt of Response to Inquiry Issue (RFI)

150.18 Send Inquiry Issue (RFI) Response to Contractor

150.21 Log Receipt of Inquiry Issue (RFI) Response

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Organize Submittal Information: 180 Submittal Package

180.02.15 Log Receipt of Submittal Package from Sub-Contractors and Vendors

180.06 Stamp Submittal Package

180.08 and 180.13 Log Transmittal of Submittal Package

180.10 and 180.15 Log Receipt of Submittal Package

180.12 Send Submittal Package to Architect

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Perform Submittal Review: 190 Submittal Issue

190.02.11 Log Transmittal of Submittal Package (Product Type Selection, System Layout)

190.02.13 Log Receipt of Sub Consultants Submittals Mark-ups/Comments

190.03.20 Log Transmittal of Submittal Issue

190.05 Log Receipt of Submittal Issues

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Execute Construction Activities: 210 Product Installation

210.06 Log Transmittal of Product Installation Report

210.08 Log Receipt of Product Installation Report

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Inspect and Approved Work: 230 Product Inspection

230.06 Log Transmittal of Product Inspection Report

230.08 Log Receipt of Product Inspection Report

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Closeout: 250 Turnover Package

250.04 Log Transmittal of Turnover Package

250.06 Log Receipt of Turnover Package

Assumptions: Managed electronic collaboration systems will notify intended recipients when e-documents are released and automatically log both the issuing and viewing of those documents

Appendix E: Current and Expected Variable Definitions by LCie Process

Appendix C describes 210 cost variables in the life cycle processes. It also provides values for these variables, derived from published cost indices as well as project records provided by owners. Where the cost data were incomplete, the authors drew upon their professional experience to provide estimates.

The estimates provided for the Current LCie Processes assume paper-based communication and no use of data exchanges in standard structured form. The estimates provided for the improved LCie processes assume the use of an electronic collaboration system and a structured data format.

General Reproduction Variables

Avg. per Page Cost ($/page): Actual cost information from Architect's Invoices for pages up to 11"x17" in size from project analyzed.

- ***Current Life Cycle Process:*** Estimate $0.15 / page
- ***Expected Life Cycle Process:*** Estimate -/ page based on the reduction factor times the Current Life Cycle Process estimate.

Avg. per Sheet Copy Cost ($/page): Actual cost information from Architect's Invoices for pages from 11"x17" up to 30"x42" in size from project analyzed.

- ***Current Life Cycle Process:*** Estimate $3.00 / page
- ***Expected Life Cycle Process:*** Estimate -/ page based on the reduction factor times the Current Life Cycle Process estimate.

Organizational Variables

Owner's Administrative Rate: Rate for activities that cover handling of documents. Amount based on U.S. Bureau of Labor Statistics' NAICS 2011 average hourly rate for executive secretaries and administrative assistants. No overhead or profit was applied to this rate since this is an internal cost to the Owner.

- ***Current Life Cycle Process:*** Estimate $23.71 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Owner's Rep. Rate: Rate for activities that include validating documents.

Amount based on U.S. Bureau of Labor Statistics' NAICS 2011 average hourly rate for Architectural & Engineering Managers. No overhead or profit was applied to this rate since this is an internal cost to the Owner.

- ***Current Life Cycle Process:*** Estimate $62.20 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Owner's Rep. Administrative Rate: Rate for activities that cover handling of documents. Amount based on U.S. Bureau of Labor Statistics' NAICS 2011 average hourly rate for secretaries and administrative assistants. No overhead or profit was applied to this rate since this is an internal cost to the Owner.

- ***Current Life Cycle Process:*** Estimate $16.88 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Planner Rate: Rate for professional assisting owner in pre-design activities. Amount based on U.S. Bureau of Labor Statistics' NAICS 2011 average hourly rate for secretaries and administrative assistants. No overhead or profit was applied to this rate since this is an internal cost to the Owner.

- ***Current Life Cycle Process:*** Estimate $37.84 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Planner Administrative Rate: Rate for activities that cover Handling of documents. Amount based on U.S. Bureau of Labor Statistics' NAICS 2011 average hourly rate for secretaries and administrative assistants. No overhead or profit was applied to this rate since this is an internal cost to the Owner.

- ***Current Life Cycle Process:*** Estimate $16.88 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Licensed Professional Architect Rate: Rate for licensed Architect. Rates were indicated on Architect's monthly billing invoices. This is a blended rate for all architects based on 2008 actual fee billed on the project analyzed.

- ***Current Life Cycle Process:*** Estimate $109.99 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Specifier Rate: Rate for Specifier. Rate includes Professional Services, Overhead and Profit.

- ***Current Life Cycle Process:*** Estimate $109.99 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Architectural Drafter Rate: Rate drafter. Rates were indicated on Architect's monthly billing invoices. This rate is based on 2008 actual fee billed on the project analyzed.

- ***Current Life Cycle Process:*** Estimate $70.70 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Architect Administrative Rate: Rate for activities that cover Handling of documents. Amount based on U.S. Bureau of Labor Statistics' NAICS 2011 average hourly rate for secretaries and administrative assistants. The fee of $16.88 was marked up to match the percentages indicated on the Architect's invoice. (147.5% overhead and 10% profit.)

- ***Current Life Cycle Process:*** Estimate $45.96 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Construction Project Manager Rate: Amount based on U.S. Bureau of Labor Statistics' NAICS 2011 average hourly rate for Construction Managers. The fee of $45.75 was marked up to match average industry percentages for overhead and profit. (150% overhead and 10% profit.)

- ***Current Life Cycle Process:*** Estimate $125.81 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Assistant Construction Project Manager Rate: Amount based on Payscale.com's (2012) hourly rate for Assistant Project Managers. The fee of $27.01 was marked up to match average industry percentages for overhead and profit. (150% overhead and 10% profit.)

- ***Current Life Cycle Process:*** Estimate $70.53 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Contractor Administrative Rate: Amount based on U.S. Bureau of Labor Statistics' NAICS 2011 average hourly rate for secretaries and administrative assistants. The fee of $27.01 was marked up to match average industry percentages for overhead and profit. (150% overhead and 10% profit.)

- ***Current Life Cycle Process:*** Estimate $44.19 / hour
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Printing Variables

Small Format Printer: Printer capable of printing document sizes up to 11"x17". Print Speed:

- ***Current Life Cycle Process:*** Estimate 25 ppm
- ***Expected Life Cycle Process:*** Estimate 0ppm based on the reduction factor times the Current Life Cycle Process estimate.

Large Format Printer: Printer capable of printing document sizes from 11"x17" – 30"x42". Print Speed:

- ***Current Life Cycle Process:*** Estimate- 30"x42": 6 ppm, 24"x36": 9 ppm
- ***Expected Life Cycle Process:*** Estimate 0ppm based on the reduction factor times the Current Life Cycle Process estimate.

Study and Define Needs: 010 Facility Criteria

010.02.40 Copy Facility Criteria

Avg. Number of Pages in Facility Criteria: The average number of pages in Owner's initial analysis of project need and scope.

- ***Current Life Cycle Process:*** Estimate 20 pages based on information in Owner's facility planning criteria document from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Sets Required: The average number printed sets required.

- ***Current Life Cycle Process:*** Estimate 2 sets based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time required to print each set.

- ***Current Life Cycle Process:*** Estimate 1.6 minutes assuming use of small format printer indentified above.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Develop Design Criteria: 020 Discipline Specifications

020.02.40 Copy Discipline Specification

Avg. Number of Pages in Discipline Specification: The average number of pages in Equipment performance requirements during planning.

- ***Current Life Cycle Process:*** Estimate 549 pages based on information in Owner's design guidelines and design criteria documents from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Sets Required: The average number printed sets required.

- ***Current Life Cycle Process:*** Estimate 2 sets based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time required to print each set.

- ***Current Life Cycle Process:*** Estimate 22 minutes assuming use of small format printer indentified above.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Study Technical Feasibility: 030 Feasibility Study

030.04 Copy Feasibility Study and 030.14 Copy Revised Feasibility Study

Avg. Number of Options: The average number of pre-design options created by the planner for early analysis of concepts.

- ***Current Life Cycle Process:*** Estimate 3 options based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Sheets per Option: The average number of drawing sheets included in each option.

- ***Current Life Cycle Process:*** Estimate 8 sheets per option based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Pre-Design Narrative per Option: The average number of pages included in the pre-design narrative per option.

- ***Current Life Cycle Process:*** Estimate 10 total pages based on number of narrative topics (10) identified in UFC documentation. This assumes one page per topic at this stage in the process.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pre-Design Submittal Sets Required: The average number of pre-design drawing sets required for each submittal.

- ***Current Life Cycle Process:*** Estimate 2 sets based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time required to print each set.

- ***Current Life Cycle Process:*** Estimate 3 minutes assuming use of both small format and large format printers indentified above.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

030.05 Send Feasibility Study and 030.15 Send Revised Feasibility Study

Avg. Number of Transmittals: The average number of times options are sent by the Planner to the Owner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of feasibility study based on past experience with pre-design workflows.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Planner and Owner.

- ***Current Life Cycle Process:*** Estimate $20.10 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

030.06 Log Transmittal Feasibility Study and 030.16 Log Transmittal of Revised Feasibility Study

Avg. Number of Transmittals: The average number of times options are logged out by the Planner.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times feasibility study is sent.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task based on time to prepare package, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

030.08 Log Receipt Feasibility Study

Avg. Number of Transmittals: The average number of times options / comments are received by the Owner from the Planner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times feasibility study is received.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

030.10.20 Send Comments to Planner

Avg. Number of Transmittals: The average number of times options / comments are sent to the Planner from the Owner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times feasibility study is received.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Planner and Owner.

- ***Current Life Cycle Process:*** Estimate $20.10 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.

- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

030.10.21 Log Transmittal of Feasibility Study Comments

Avg. Number of Transmittals: The average number of times options / comments are sent/received by the Owner to/from the Planner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times feasibility study is received.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

030.12 Log Receipt of Review Comments

Avg. Number of Transmittals: The average number of times options / comments are sent/received by the Owner to/from the Planner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times feasibility study is received.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Communicate Results Decisions: 040 Project Definition

040.03.30 Copy Project Definition

Avg. Number of Pages in Project Definition: The average number of pages in Project Definition document. The Project Definition defines the project scope, budget requirements, site details, economic analysis and facility planning data.

- ***Current Life Cycle Process:*** Estimate 20 pages based on information in Owner's facility planning criteria document from project analyzed.

- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Sets Required: The average number printed sets required.
- ***Current Life Cycle Process:*** Estimate 2 sets based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.
- ***Expected Life Cycle Process:*** Estimate 0 sets based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time required to print each set.
- ***Current Life Cycle Process:*** Estimate 1.6 minutes assuming use of small format printer indentified above.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Develop Program – Space Program: 050 Space Program

050.03 Search for Space Program Criteria as Necessary

Number of Space Types per Building: The average number of space types found in building.
- ***Current Life Cycle Process:*** Estimate 27 space types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Searching for Space Program Criteria: The average time spent by Planner searching for Spatial Requirements.
- ***Current Life Cycle Process:*** Estimate 15 minutes per space types indentified in project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

050.04 Reformat Requirements into Room Data Sheets for Project

Number of Space Types per Building: The average number of space types found in building.
- ***Current Life Cycle Process:*** Estimate 27 space types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Reformatting Space Program Criteria into Room Da-

ta Sheets: The average time spent by Planner in evaluating information in Project Definition and identifying and creating a detailed spatial program in a usable format.

- ***Current Life Cycle Process:*** Estimate 9 minutes per room data sheet based on space types in project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

050.05 Send Copies of Space Program

Avg. Number of Pages in Space Program: The average number of pages in Owner's space program document.

- ***Current Life Cycle Process:*** Estimate 10 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Transmittals: The average number of times options are sent by the Planner to the Owner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of space program.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Planner and Owner.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Pre-Design Submittal Sets Required: The average number of pre-design drawing sets required for each submittal.

- ***Current Life Cycle Process:*** Estimate 2 set based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.
- ***Expected Life Cycle Process:*** Estimate 0 sets based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Planner in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 10 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 4 minutes based on the reduction factor times the Current Life Cycle Process estimate.

050.06 Log Transmittal of Space Program

Avg. Number of Transmittals: The average number of times documents are logged out by the Planner.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times space program is sent.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare package, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

050.08 Log Receipt Space Program

Avg. Number of Transmittals: The average number of times space program is received by the Owner from the Planner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times space program is received.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

050.09 Validate Space Program

Avg. Time for Owners Rep to Validate Space Program: The average time spent by Owner's Rep. in validating Space Program provided by Planner.

- ***Current Life Cycle Process:*** Estimate 1 hour for this task based on number of spaces in project analyzed.
- ***Expected Life Cycle Process:*** Estimate 6 minutes based on the reduction factor times the Current Life Cycle Process estimate.

050.10.10 Send Comments

Avg. Number of Transmittals: The average number of times comments are

sent by the Owner's Rep. to the Planner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of comments.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Planner and Owner.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Owner's Rep. in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 10 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 4 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The average number of times submitted documents are re-submitted.

- ***Current Life Cycle Process:*** Estimate 1 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

050.10.20 Log Transmittal of Space Program Comments

Avg. Number of Transmittals: The average number of times documents / comments are logged out by the Owner's Rep.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times space program comments are sent.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The average number of times submitted documents are re-submitted.

- ***Current Life Cycle Process:*** Estimate 1 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

050.12 Log Receipt Space Program Comments

Avg. Number of Transmittals: The average number of times documents / comments are received by the Planner from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times space program comments is received.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The average number of times submitted documents are re-submitted.

- ***Current Life Cycle Process:*** Estimate 1 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

050.13 Re - Search for Space Program Criteria as Necessary

Avg. Percentage of Errors in Space Program: The average percentage of errors found by Owners Rep in Space Program.

- ***Current Life Cycle Process:*** Estimate 30% based on number of comments received during early design phase for project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0% based on the reduction factor times the Current Life Cycle Process estimate.

Number of Space Types per Building: The average number of space types found in building.

- ***Current Life Cycle Process:*** Estimate 27 space types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Searching for Space Program Criteria: The average time spent by Planner recreating Space Program.

- ***Current Life Cycle Process:*** Estimate 5 minutes per space types indentified in project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes per space based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The average number of times submitted documents are re-submitted.

- ***Current Life Cycle Process:*** Estimate 1 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

050.14 Send Revised Copies of Space Program

Reference variables in section 050.05 Send Copies of Space Program*, in addition uses variable Avg. Number of Re-Submit Cycles from 050.13* Re - Search for Space Program Criteria as Necessary

050.15 Log Transmittal of Revised Space Program

Reference variables in section 050.06 Log Transmittal of Space Program*, in addition uses variable Avg. Number of Re-Submit Cycles from 050.13* Recreate Space Program.

Develop Program – Product Program: 060 Product Program

060.03 Search for Product Program Criteria as Necessary

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Searching for Product Program Criteria: The average time spent by Planner searching for product program criteria.

- ***Current Life Cycle Process:*** Estimate 10 minutes per product type based on equipment types in project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes per product type based on the reduction factor times the Current Life Cycle Process estimate.

060.04 Send Copies of Product Program to Owner for Review

Avg. Number of Pages in Product Program: The average number of pages in Product Program that documents Owners equipment specifications and performance.

- ***Current Life Cycle Process:*** Estimate 28 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Transmittals: The average number of times product program is sent by the Planner to the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of product program.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Planner and Owner.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Pre-Design Submittal Sets Required: The average number of pre-design drawing sets required for each submittal.

- ***Current Life Cycle Process:*** Estimate 2 sets based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.
- ***Expected Life Cycle Process:*** Estimate 0 sets based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Planner in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 10 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 4 minutes based on the reduction factor times the Current Life Cycle Process estimate.

060.05 Log Transmittal of Product Program

Avg. Number of Transmittals: The average number of times documents are logged out by the Planner.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times product program is sent.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.
- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare package, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

060.07 Log Receipt of Product Program

Avg. Number of Transmittals: The average number of times documents are received by the Owner's Rep. from the Planner times the number of recipients for each exchange.
- ***Current Life Cycle Process:*** Estimate 2 based on number of times product program is received.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.
- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

060.08 Validate Product Program

Avg. Time for Owners Rep to Validate Product Program: The average time spent by Owner's Rep. in validating product program provided by Planner.
- ***Current Life Cycle Process:*** Estimate 4 hours for this task based on number of products types in project analyzed.
- ***Expected Life Cycle Process:*** Estimate 24 minutes based on the reduction factor times the Current Life Cycle Process estimate.

060.09.10 Send Comments

Avg. Number of Transmittals: The average number of times documents / comments are sent by the Owner's Rep. to the Planner times the number of recipients for each exchange.
- ***Current Life Cycle Process:*** Estimate 2 transmittals of comments.

- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Planner and Owner.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Owner's Rep. in compiling documents / comments for transmittal.

- ***Current Life Cycle Process:*** Estimate 10 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 4 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The average number of times submitted documents are re-submitted

- ***Current Life Cycle Process:*** Estimate 1 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

060.09.20 Log Transmittal of Product program Comments

Avg. Number of Transmittals: The average number of times documents / comments are logged out by the Owner's Rep.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times product program comments are sent.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents / comments out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The average number of times submitted documents are re-submitted

- ***Current Life Cycle Process:*** Estimate 1 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

060.11 Log Receipt of Product Program Comments

Avg. Number of Transmittals: The average number of times documents / comments are received by the Planner from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times product program comments is received.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents / comments in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The average number of times submitted documents are re-submitted.

- ***Current Life Cycle Process:*** Estimate 1 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

060.12 Re - Search for Product Program Criteria as Necessary

Avg. Percentage of Errors in Product Program: The average numberof errors found in Planner's product program vs. the Owner's space requirements.

- ***Current Life Cycle Process:*** Estimate 30% based on number of comments received during early design phase for project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0% based on the reduction factor times the Current Life Cycle Process estimate.

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Searching for Product Program Criteria: The average time spent by Planner recreating Product program.

- ***Current Life Cycle Process:*** Estimate 5 minutes per product types indentified in project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The average number of times submitted documents are re-submitted.

- ***Current Life Cycle Process:*** Estimate 1 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

060.13 Send Revised Copies of Product Program

Reference variables in section 060.04 Send Copies of Product Program to Owner for Review*, in addition uses variable Avg. Number of Re-Submit Cycles from 060.12* Recreate Product Program

060.14 Log Transmittal of Revised Product Program

Reference variables in section 060.05 Log Transmittal of Product Program*, in addition uses variable Avg. Number of Re-Submit Cycles from 060.12 Re - Search for Product Program Criteria as Necessary*

Prepare Invitation to Bid and Receive Proposal (Pre-Design): 070 Request for Proposal (RFP)

070.02 Send Copies of Request for Proposal (RFP) Package

Avg. Number of Pages in Space Program: The average number of pages in Owner's space program document.

- ***Current Life Cycle Process:*** Estimate 10 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pages in Product Program: The average number of pages in Product Program that documents Owners equipment specifications and performance.

- ***Current Life Cycle Process:*** Estimate 28 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pages in Project Definition: The average number of pages in Project Definition document. The Project Definition defines the project scope, budget requirements, site details, economic analysis and facility planning data.

- ***Current Life Cycle Process:*** Estimate 20 pages based on information in Owner's facility planning criteria document from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pages in Front Matter: The average number of pages that precede the technical content of the RFP for Design and Construction Services.

- ***Current Life Cycle Process:*** Estimate 25 pages.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Transmittals: The average number of times RFP is sent by the Owner to Bidders times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 5 transmittals of RFP. Assume an average of five bidders.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Owner's Rep to Bidders.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of RFP Submittal Sets Required: The average number printed sets required.

- ***Current Life Cycle Process:*** Estimate 6 total sets based on copies required for bidders (5) and (1) copy for the Owner.
- ***Expected Life Cycle Process:*** Estimate 0 sets based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Owner's Rep. in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 12 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 5 minutes based on the reduction factor times the Current Life Cycle Process estimate.

070.04 Log Receipt of Request for Proposal (RFP) Package

Time to Log: The average time spent by Architect logging RFP package in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

070.07 Copy Proposal

Avg. Number of Letter-Sized Pages in Proposal: The average number of letter-sized pages in proposal.

- ***Current Life Cycle Process:*** Estimate 31 total pages. Based on government standard proposal form SF-330 (6 pages) and the assumption that each discipline (assume 5) participating in the proposal will contribute 5 additional pages each.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Drawing Sheets in Proposal: The average number drawing sheets included in proposal.

- ***Current Life Cycle Process:*** Estimate 2 drawings included in proposal containing examples of work related to RFP.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pre-Design Submittal Sets Required: The average number of pre-design drawing sets required for each submittal.

- ***Current Life Cycle Process:*** Estimate 2 total sets; (1) for the Owner and (1) for the Architect.
- ***Expected Life Cycle Process:*** Estimate 0 sets based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time spent printing documents.

- ***Current Life Cycle Process:*** Estimate 2 minutes per set based on printer specifications provided in the *Printing Variables* section of this appendix.
- ***Expected Life Cycle Process:*** Estimate 0 minutes per set based on the reduction factor times the Current Life Cycle Process estimate.

070.08 Send Proposal

Avg. Number of Transmittals: The average number of times proposal is sent by the Architect to the Owner.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of proposal.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Owner's Rep to Bidders.

- ***Current Life Cycle Process:*** Estimate $18.80 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.

- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Architect compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Explore Concepts – Design Early: 080 Design Early

080.03 Send Copies of Design Requirements

Avg. Number of Pages in Space Program: The average number of pages in Owner's space program document.

- ***Current Life Cycle Process:*** Estimate 10 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pages in Product Program: The average number of pages in Product Program that documents Owners equipment specifications and performance.

- ***Current Life Cycle Process:*** Estimate 28 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pages in Project Definition: The average number of pages in Project Definition document. The Project Definition defines the project scope, budget requirements, site details, economic analysis and facility planning data.

- ***Current Life Cycle Process:*** Estimate 20 pages based on information in Owner's facility planning criteria document from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Owner's Rep to Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Owner's Rep. in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.04 Log Transmittal of Design Requirements

Time to Log: The average time spent by Owner's Rep. logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare information, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.06 Log Receipt of Design Requirements

Time to Log: The time spent by Architect logging RFP package in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.08 Reformat Design Requirements

Number of Space Types per Building: The average number of space types found in building.

- ***Current Life Cycle Process:*** Estimate 27 space types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Reformatting Space Program: The average spent by Architect in documenting spatial requirements in a usable format.

- ***Current Life Cycle Process:*** Estimate 10 minutes for each space type in the project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes for each space type based on the reduction factor times the Current Life Cycle Process estimate.

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Reformatting Product Program: The average time spent by Architect documenting product type requirements in a usable format.

- ***Current Life Cycle Process:*** Estimate 15 minutes for each equipment type in project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes for each equipment type based on the reduction factor times the Current Life Cycle Process estimate.

Percentage of Time Spent by Licensed Professional Architect: The percentage of time spent by Licensed Architect reformatting Space Program and Equipment Types.

- ***Current Life Cycle Process:*** Estimate 90% based on time spent by Architect on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Percentage of Time Spent by Architectural Drafter: The percentage of time spent by Drafter reformatting Space Program and Equipment Types.

- ***Current Life Cycle Process:*** Estimate 10% based on time spent by Drafter on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

080.12 Validate Checkset Before Submission Through Manual QA/QC Process – Space and Equipment

Avg. Time Spent Evaluating Design Early Drawings Against Design Requirements – Space and Equipment: The average time spent by Architect in validating Design Early drawings against space and equipment requirements before submission to Owners Rep .

- ***Current Life Cycle Process:*** Estimate 16.3 hours based on project analyzed. The Architect spent 6,522 hours total on this phase of the design. Assume 5% (326 hours) of the time allotted for internal checking of the entire document. 16.3 hours assumes that 5% of the allotted checking time is set aside for checking space and equipment requirements.
- ***Expected Life Cycle Process:*** Estimate 1.7 hours based on the reduction factor times the Current Life Cycle Process estimate.

080.13.10 Make Corrections (Architect and/or Consultants)

Avg. Time Spent Making Corrections due to Non-Conformance with Space or Product Program: The average time spent by Architect making corrections to space and equipment documentation based on internal

validation.

- ***Current Life Cycle Process:*** Estimate 1.1 hours based on number comments received related to space and equipment (13) on project analyzed. Assume 5 minutes per comment.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.13.20 Copy Design Early Documents

Avg. Number of Sheets in Design Early Drawings: The average number Design Early drawing sheets.

- ***Current Life Cycle Process:*** Estimate 132 based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Design Early Narrative: The average number of letter-sized pages in the Design Early narrative.

- ***Current Life Cycle Process:*** Estimate 6 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Design Submittal Sets Required: The number of design phase drawing sets required.

- ***Current Life Cycle Process:*** Estimate 3 total sets based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 sets based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time spent printing documents.

- ***Current Life Cycle Process:*** Estimate 22 minutes per set based on printer specifications provided in the *Printing Variables* section of this appendix.
- ***Expected Life Cycle Process:*** Estimate 0 minutes per set based on the reduction factor times the Current Life Cycle Process estimate.

080.13.30 Send Design Early Documents

Avg. Number of Transmittals: The average number of times documents are sent by the Architect to the Owner.

- ***Current Life Cycle Process:*** Estimate 2 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Architect Rep to Owner's Rep.

- ***Current Life Cycle Process:*** Estimate $47.56 based on actual shipping cost in project analyzed.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Architect compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.13.40 Log Transmittal of Design Early Documents

Avg. Number of Transmittals: The average number of times documents are logged out by the Architect.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.15 Log Receipt of Design Early Documents

Avg. Number of Transmittals: The average number of times documents are received by the Owner's Rep. from the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based number of times Design Early Documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by Owner's Rep. logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.16 Validate Design Early Documents – Space and Equipment

Avg. Time to Review Design Early Drawings for conformance to Space and Product Program: The average time spent by Owner's Rep. in validating space and equipment documentation in Design Early Documents provided by Architect.

- ***Current Life Cycle Process:*** Estimate 11 hours based on number drawings in Design Early Documents in project analyzed. Assume 15 minutes per drawing or 33 hours total time. Assume 1/3 of this time allotted for checking space and equipment requirements.
- ***Expected Life Cycle Process:*** Estimate 1.1 hours based on the reduction factor times the Current Life Cycle Process estimate.

080.17.20 Send Comments to Design Team

Avg. Number of Transmittals: The average number of times comments are sent by the Owner's Rep. to the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of comments based on number of times documents were received in the project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Owner's Rep. to the Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Owner's Rep. in compiling documents / comments for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.17.30 Log Transmittal of Comments

Avg. Number of Transmittals: The average number of times documents / comments are sent by the Owner's Rep. to the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times comments were sent on project analyzed.

- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents / comments out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.19 Log Receipt of Comments

Avg. Number of Transmittals: The average number of times documents / comments are received by the Architect from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times comments were received on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents / comments in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

080.20 Make Corrections (Architect and/or Consultants)

Avg. Time Spent Making Corrections Due to Non-conformance with Space or Product Program: The average time spent by Architect making corrections to space and equipment documentation based on feedback from Owners Rep.

- ***Current Life Cycle Process:*** Estimate 1.1 hours based on number comments received related to space and equipment (13) on project analyzed. Assume 5 minutes per comment.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The Average number of times documentation is examined.

- ***Current Life Cycle Process:*** Estimate 2 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

080.21 Copy Revised Design Early Documents

Uses variables in section 080.13.20 Copy Design Early Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 080.20 Make Corrections (Architect and/or Consultants).

080.22 Send Revised Design Early Documents

Reference variables in section 080.13.30 Send Design Early Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 080.20 Make Corrections (Architect and/or Consultants).

080.23 Log Transmittal of Revised Design Early Documents

Reference variables in section 080.13.40 Log Transmittal of Design Early Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 080.20 Make Corrections (Architect and/or Consultants).

080.25 Log Receipt of Revised Design Early Documents

Reference variables in section 080.15 Log Receipt of Design Early Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 080.20 Make Corrections (Architect and/or Consultants).

080.26 Validate Revised Design Early Documents

Reference variables in section 080.16 Validate Design Early Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 080.20 Make Corrections (Architect and/or Consultants).

080.27 Send Comments to Design Team

Reference variables in section 080.17.20 Send Comments to Design Team, in addition uses variable Avg. Number of Re-Submit Cycles from 080.20 Make Corrections (Architect and/or Consultants).

080.28 Log Transmittal of Comments

Reference variables in section 080.17.30 Log Transmittal of Comments, in addition uses variable Avg. Number of Re-Submit Cycles from 080.20

Make Corrections (Architect and/or Consultants).

080.30 Log Receipt of Comments

Reference variables in section 080.19 Log Transmittal of Comments, in addition uses variable Avg. Number of Re-Submit Cycles from 080.20 Make Corrections (Architect and/or Consultants).

Develop Design – Design Schematic: 090 Design Schematic

090.02.10 Produce Design Schematic Documents

Avg. Number of Plan Drawings in Design Schematic Drawings: The average number of plans in submittal.

- ***Current Life Cycle Process:*** Estimate 26 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. QTO Time for Equipment Components: The average time spent performing quantity take-off of equipment shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 5 minutes based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 30 seconds based on the reduction factor times the Current Life Cycle Process estimate.

Avg. QTO Time for Spaces in Building: The average time spent performing quantity take-off of spaces shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 10 minutes based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 1 minute based on the reduction factor times the Current Life Cycle Process estimate.

Percentage of Time Spent by Licensed Professional Architect: Percentage of time spent by Licensed Architect to perform quantity take-off of all equipment and to calculate space areas shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 80% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Percentage of Time Spent by Architect Drafter: Percentage of time spent by Architectural Drafter to perform quantity take-off of all equipment and to calculate space areas shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 20% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

090.02.20 Produce Outline Specification / Product Type Templates

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Developing Equipment Type Templates: The average time spent by Architect in developing specifications for equipment types required for the project.

- ***Current Life Cycle Process:*** Estimate 15 minutes per product type. Assume 85 product types based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 4.5 minutes per product type based on the reduction factor times the Current Life Cycle Process estimate.

090.05 Validate Checkset before Submission through Manual QA/QC Process – Space and Equipment

Avg. Time Spent Evaluating Design Schematic Drawings Against Design Requirements – Space and Equipment: The average time spent by Architect in validating Design Schematic drawings against space and equipment requirements before submission to Owners Rep.

- ***Current Life Cycle Process:*** Estimate 45 hours based on project analyzed. The Architect spent 4,498 hours total on this phase of the design. Assume 10% (449 hours) of the time allotted for internal checking of the entire document. 45 hours assumes that 10% of the allotted checking time is set aside for checking space and equipment requirements.
- ***Expected Life Cycle Process:*** Estimate 4.5 hours based on the reduction factor times the Current Life Cycle Process estimate.

090.06.10 Make Corrections (Architect and/or Consultants)

Avg. Time spent making corrections due to non-conformance with Space or Product Program: The average time spent by Architect making corrections to space and equipment documentation based on internal validation.

- ***Current Life Cycle Process:*** Estimate 4.5 hours based on number comments received related to space and equipment (13) on project analyzed. Assume 5 minutes per comment.
- ***Expected Life Cycle Process:*** Estimate 0 hours based on the reduction factor times the Current Life Cycle Process estimate.

090.06.20 Copy Design Schematic Documents and Product Type Templates (Outline Specifications) Documents

Avg. Number of Sheets in Design Schematic Drawings: The average number of Design Schematic (Design Development) drawings.

- ***Current Life Cycle Process:*** Estimate 480 based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Design Schematic Narrative: The average number of letter-sized pages in the Design Schematic narrative.

- ***Current Life Cycle Process:*** Estimate 40 total pages based on number of narrative topics (10) identified in UFC documentation. This assumes four pages per topic at this stage in the process.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Design Schematic Specifications: The average number of letter-sized pages in the Design Schematic specifications.

- ***Current Life Cycle Process:*** Estimate 9 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Design Submittal Sets Required: The number of design phase drawing sets required.

- ***Current Life Cycle Process:*** Estimate 3 total sets based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 sets based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time spent printing documents.

- ***Current Life Cycle Process:*** Estimate 1.35 hours per set based on printer specifications provided in the *Printing Variables* section of this appendix.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

090.06.30 Send Design Schematic and Product Type Templates (Outline

Specifications) Documents

Avg. Number of Transmittals: The average number of times documents are sent by the Architect to the Owner.

- ***Current Life Cycle Process:*** Estimate 2 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Architect Rep to Owner's Rep.

- ***Current Life Cycle Process:*** Estimate $72.83 based on actual shipping cost in project analyzed.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Architect compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

090.06.40 Log Transmittal of Design Schematic and Product Type Templates (Outline Specifications) Documents

Avg. Number of Transmittals: The average number of times documents are logged out by the Architect.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

090.08 Log Receipt of Design Schematic and Product Type Templates (Outline Specifications) Documents

Avg. Number of Transmittals: The average number of times documents are received by the Owner's Rep. from the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based number of times Design Schematic Documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by Owner's Rep. logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

090.09 Validate Design Schematic Space and Product Type Templates (Outline Specifications) Documents

Avg. Time to Review Design Schematic Drawings for conformance to Space and Product Program: The average time spent by Owner's Rep. in validating Space and Product Type Templates (Outline Specifications) in Schematic Documents provided by Architect.

- ***Current Life Cycle Process:*** Estimate 40 hours based on number drawings in Design Schematic Documents in project analyzed. Assume 15 minutes per drawing or 120 hours total time. Assume 1/3 of this time allotted for checking space and equipment requirements.
- ***Expected Life Cycle Process:*** Estimate 4 hours based on the reduction factor times the Current Life Cycle Process estimate.

090.10.20 Send Comments to Design Team

Avg. Number of Transmittals: The average number of times comments are sent by the Owner's Rep. to the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of comments based on number of times documents were received in the project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Owner's Rep. to the Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Owner's Rep. in compiling documents / comments for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

090.10.30 Log Transmittal of Comments

Avg. Number of Transmittals: The average number of times documents / comments are sent by the Owner's Rep. to the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times comments were sent on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents / comments in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

090.12 Log Receipt of Comments

Avg. Number of Transmittals: The average number of times documents / comments are received by the Architect from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times comments were received on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents / comments in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

090.13 Make Corrections (Architect and/or Consultants)

Avg. Time Spent Making Corrections Due to Non-conformance with Space or Product Program: The average time spent by Architect making corrections to space and equipment documentation based on feedback from Owners Rep.

- ***Current Life Cycle Process:*** Estimate 4.5 hours based on number comments received related to space and equipment (54) on project analyzed. Assume 5 minutes per comment.
- ***Expected Life Cycle Process:*** Estimate 0 hours based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The Average number of times documentation is examined.

- ***Current Life Cycle Process:*** Estimate 2 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

090.14 Copy Revised Design Schematic and Product Type Templates (Outline Specifications) Documents

Reference variables in section 090.06.20 Copy Design Schematic Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 090.13 Make Corrections (Architect and/or Consultants).

090.15 Send Revised Design Schematic and Product Type Templates (Outline Specifications) Documents

Reference variables in section 090.06.30 Send Design Schematic Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 090.13 Make Corrections (Architect and/or Consultants).

090.16 Log Transmittal of Revised Design Schematic and Product Type Templates (Outline Specifications) Documents

Reference variables in section 090.06.40 Log Transmittal of Design Schematic Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 090.13 Make Corrections (Architect and/or Consultants).

090.18 Log Receipt of Revised Design Schematic and Product Type Template (Outline Specifications) Documents

Reference variables in section 090.08 Log Receipt of Design Schematic Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 090.13 Make Corrections (Architect and/or Consultants).

090.19 Validate Revised Design Schematic Space and Product Type Template (Outline Specifications) Documents

Reference variables in section 090.09 Validate Design Schematic & Product Type Template Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 090.13 Make Corrections (Architect and/or Consultants).

090.20 Send Comments to Design Team

Reference variables in section 090.10.20 Send Comments to Design Team, in addition uses variable Avg. Number of Re-Submit Cycles from 090.13 Make Corrections (Architect and/or Consultants).

090.21 Log Transmittal of Comments

Reference variables in section 090.10.30 Log Transmittal of Comments, in addition uses variable Avg. Number of Re-Submit Cycles from 090.13 Make Corrections (Architect and/or Consultants).

090.23 Log Receipt of Comments

Reference variables in section 090.12 Log Receipt of Comments, in addition uses variable Avg. Number of Re-Submit Cycles from 090.13 Make Corrections (Architect and/or Consultants).

Develop Design – Design Coordinated: 100 Design Coordinated

100.02.10 Produce Design Coordinated Documents

Avg. Number of Plan Drawings in Design Coordinated Drawings: Average number of plans in submittal.

- ***Current Life Cycle Process:*** Estimate 52 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. QTO Time for Equipment Components: The average time spent performing quantity take-off of equipment shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 5 minutes per plan drawing based on information obtained from project analyzed.

- ***Expected Life Cycle Process:*** Estimate 30 seconds based on the reduction factor times the Current Life Cycle Process estimate.

Avg. QTO Time for Spaces in Building: The average time spent performing quantity take-off of spaces shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 10 minutes per plan drawing based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 1 minute based on the reduction factor times the Current Life Cycle Process estimate.

Percentage of Time Spent by Licensed Professional Architect: Percentage of time spent by Licensed Architect to perform quantity take-off of all equipment and to calculate space areas shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 80% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Percentage of Time Spent by Architect Drafter: Percentage of time spent by Architectural Drafter to perform quantity take-off of all equipment and to calculate space areas shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 20% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

100.02.20 Produce Detailed Specification / Product Type Templates

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Developing Detailed Equipment (products) Type Templates: The average time spent by Architect in preparing a detailed specifications list based on equipment types

- ***Current Life Cycle Process:*** Estimate 2 hours per product type. Assume 85 product types based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 36 minutes based on the reduction factor times the Current Life Cycle Process estimate.

100.03 Search for Product Type Candidates

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Searching for Product Literature for Candidates: The average time spent by Architect in searching for product data.

- ***Current Life Cycle Process:*** Estimate 1 hour per product type based on experience searching for product data on recent project.
- ***Expected Life Cycle Process:*** Estimate 6 minutes based on the reduction factor times the Current Life Cycle Process estimate.

100.06 Validate Checkset Before Submission Through Manual QA/QC Process – Space and Equipment

Avg. Time Spent Evaluating Design Coordinated Drawings Against Design Requirements – Space and Equipment: The average time spent by Architect in validating Design Coordinated drawings against space and equipment requirements before submission to Owners Rep.

- ***Current Life Cycle Process:*** Estimate 52 hours based on project analyzed. The Architect spent 5,214 hours total on this phase of the design. Assume 10% (521 hours) of the time allotted for internal checking of the entire document. 52 hours assumes that 10% of the allotted checking time is set aside for checking space and equipment requirements.
- ***Expected Life Cycle Process:*** Estimate 5.2 hours based on the reduction factor times the Current Life Cycle Process estimate.

100.07.05 Make Corrections (Architect and/or Consultants)

Avg. Time Spent Making Corrections due to Non-Conformance with Space Program: The average time spent by Architect making corrections to space and equipment documentation based on internal validation.

- ***Current Life Cycle Process:*** Estimate 7.75 hours based on number comments received project analyzed. Assume 5 minutes per comment.
- ***Expected Life Cycle Process:*** Estimate 0 hours based on the reduction factor times the Current Life Cycle Process estimate.

100.07.10 Re-Search and Recreate Product Type Candidates and Detailed Specifications Based on QA/QC Results

Avg. Percent of Errors in Product Type Candidate: The average percentage of errors with product specification information.

- ***Current Life Cycle Process:*** Estimate that roughly 15% or 13% of the 85 specifications would have errors at this stage.
- ***Expected Life Cycle Process:*** Estimate 0% based on the reduction factor times the Current Life Cycle Process estimate.

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Searching for Product Literature for Candidates: The average time spent by Architect in searching for product data.

- ***Current Life Cycle Process:*** Estimate 1 hour per product type based on experience performing additional searches for product data on recent project.
- ***Expected Life Cycle Process:*** Estimate 6 minutes based on the reduction factor times the Current Life Cycle Process estimate.

100.07.20 Copy Design Coordinated and Product Type Candidate Documents

Avg. Number of Sheets in Design Coordinated Drawings: The average number of Design Coordinated drawings.

- ***Current Life Cycle Process:*** Estimate 626 based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Design Coordinated Narrative: The average number of letter-sized pages in the Design Coordinated narrative.

- ***Current Life Cycle Process:*** Estimate 40 total pages based on number of narrative topics (10) identified in UFC documentation. This assumes four pages per topic at this stage in the process.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Design Coordinated Specifications: The average number of letter-sized pages in the Design Coordinated specifications.

- ***Current Life Cycle Process:*** Estimate 9 pages based on project analyzed. No additional specifications were included with this submission.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Design Submittal Sets Required: The number of design phase drawing sets required.

- ***Current Life Cycle Process:*** Estimate 3 total sets based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time spent printing documents.

- ***Current Life Cycle Process:*** Estimate 2 hours per set based on printer specifications provided in the *Printing Variables* section of this appendix.
- ***Expected Life Cycle Process:*** Estimate 0 hours based on the reduction factor times the Current Life Cycle Process estimate.

100.07.30 Send Design Coordinated and Product Type Candidate Documents

Avg. Number of Transmittals: The average number of times documents are sent by the Architect to the Owner.

- ***Current Life Cycle Process:*** Estimate 2 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Architect Rep to Owner's Rep.

- ***Current Life Cycle Process:*** Estimate $76.81 based on actual shipping cost in project analyzed.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Architect compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

100.07.40 Log Transmittal of Design Coordinated and Product Type Candidate Documents

Avg. Number of Transmittals: The average number of times documents are logged out by the Architect.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

100.09 Log Receipt of Design Coordinated and Product Type Candidate Documents

Avg. Number of Transmittals: The average number of times documents are received by the Owner's Rep. from the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based number of times Design Coordinated Documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by Owner's Rep. logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

100.10 Validate Design Coordinated Space and Product Type Candidates

Avg. Time to Review Design Coordinated Drawings for conformance to Space and Product Program: The average time spent by Owner's Rep. in validating Space and Product Type Candidates in Schematic Coordinated Drawings provided by Architect.

- ***Current Life Cycle Process:*** Estimate 52 hours based on number drawings in Design Coordinated Documents in project analyzed. Assume 15 minutes per drawing or 156 hours total time. Assume 1/3 of this time allotted for checking space and equipment requirements.

- ***Expected Life Cycle Process:*** Estimate 5.2 hours based on the reduction factor times the Current Life Cycle Process estimate.

100.11.20 Send Comments to Design Team

Avg. Number of Transmittals: The average number of times comments are sent by the Owner's Rep. to the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of comments based on number of times documents were received in the project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Owner's Rep. to the Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate- based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Owner's Rep. in compiling documents / comments for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

100.11.30 Log Transmittal of Comments

Avg. Number of Transmittals: The average number of times documents / comments are sent by the Owner's Rep. to the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times comments were sent on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents / comments out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

100.13 Log Receipt of Comments

Avg. Number of Transmittals: The average number of times documents / comments are received by the Architect from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 based on number of times comments were received on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents / comments in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

100.14 Make Corrections (Architect and/or Consultants)

Avg. Time Spent Making Corrections Due to Non-Conformance with Space Program: The average time spent by Architect making corrections to space and equipment documentation based on feedback from the Owner.

- ***Current Life Cycle Process:*** Estimate 7.75 hours based on number comments received related to space and equipment (93) on project analyzed. Assume 5 minutes per comment.
- ***Expected Life Cycle Process:*** Estimate 0 hours based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Re-Submit Cycles: The Average number of times documentation is examined.

- ***Current Life Cycle Process:*** Estimate 2 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

100.15 Copy Revised Design Coordinated and Product Type Candidate Documents

Reference variables in section 100.07.20 Copy Design Coordinated Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 100.14 Make Corrections (Architect and/or Consultants).

100.16 Send Revised Design Coordinated and Product Type Candidate Documents

Reference variables in section 100.07.30 Send Design Coordinated Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 100.14

100.17 Log Transmittal of Revised Design Coordinated and Product Type Candidate Documents

Reference variables in section 100.07.40 Log Transmittal of Design Coordinated Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 100.14

100.19 Log Receipt of Revised Design Coordinated and Product Type Candidate Documents

Reference variables in section 100.09 Log Receipt of Design Coordinated Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 100.14

100.20 Validate Revised Design Coordinated and Product Type Candidate Documents

Reference variables in section 100.10 Validate Design Coordinated & Product Type Template Documents, in addition uses variable Avg. Number of Re-Submit Cycles from 100.14

100.21 Send Comments to Design Team

Reference variables in section 100.11.20 Send Comments to Design Team, in addition uses variable Avg. Number of Re-Submit Cycles from 100.14

100.22 Log Transmittal of Comments

Reference variables in section 100.11.30 Log Transmittal of Comments, in addition uses variable Avg. Number of Re-Submit Cycles from 100.14

100.24 Log Receipt of Comments

Reference variables in section 100.13 Log Receipt of Comments, in addition uses variable Avg. Number of Re-Submit Cycles from 100.14

Finalize Design – Design Final: 110 Design Final

110.02.10 Produce Design Final Documents

Avg. Number of Plan Drawings in Design Final Drawings: Average number of plans in submittal.

- ***Current Life Cycle Process:*** Estimate 164 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. QTO Time for Equipment Components: The average time spent performing quantity take-off of equipment shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 5 minutes per drawing plan based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 30 seconds based on the reduction factor times the Current Life Cycle Process estimate.

Avg. QTO Time for Spaces in Building: The average time spent performing quantity take-off of spaces shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 10 minutes per drawing plan based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 1 minute based on the reduction factor times the Current Life Cycle Process estimate.

Percentage of Time Spent by Licensed Professional Architect: Percentage of time spent by Licensed Architect to perform quantity take-off of all equipment and to calculate space areas shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 90% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Percentage of Time Spent by Architect Drafter: Percentage of time spent by Architectural Drafter to perform quantity take-off of all equipment and to calculate space areas shown on plan drawings.

- ***Current Life Cycle Process:*** Estimate 10% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

110.02.20 Produce Detailed Specification / Product Type Candidates

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Developing Detailed (products) Equipment Type Candidate: Time spent by Architect in preparing a detailed specifications list bases on equipment.

- ***Current Life Cycle Process:*** Estimate 1 hour per product type. Assume 85 product types based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 6 minutes per product type based on the reduction factor times the Current Life Cycle Process estimate.

110.05 Validate Checkset Before Submission Through Manual QA/QC Process

Avg. Time Spent Evaluating Design Final Drawings Against Design Requirements – Space and Equipment: The average time spent by Licensed Architect validating Space Program and Equipment Types before submission to Owner's Rep.

- ***Current Life Cycle Process:*** Estimate 48 hours based on project analyzed. The Architect spent 4,801 hours total on this phase of the design. Assume 10% (480 hours) of the time allotted for internal checking of the entire document. 48 hours assumes that 10% of the allotted checking time is set aside for checking space and equipment requirements.
- ***Expected Life Cycle Process:*** Estimate 4.8 hours based on the reduction factor times the Current Life Cycle Process estimate.

110.06.10 Make Corrections (Architect and/or Consultants)

Avg. Time Spent Making Corrections due to Non-Conformance with Space or Product Program: The average time spent by Architect making corrections to space and equipment documentation based on internal validation.

- ***Current Life Cycle Process:*** Estimate 1 hour based on number comments received related to space and equipment (13) on project analyzed. Assume 5 minutes per comment.
- ***Expected Life Cycle Process:*** Estimate 0 hours based on the reduction factor times the Current Life Cycle Process estimate.

110.06.20 Copy Design Final Documents

Avg. Number of Sheets in Design Final Drawings: The average number of Design Final drawing.

- ***Current Life Cycle Process:*** Estimate 899 based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Design Final Narrative: The average number of letter-sized pages in the Design Final narrative.

- ***Current Life Cycle Process:*** Estimate 40 total pages based on number of narrative topics (10) identified in UFC documentation. This assumes four pages per topic at this stage in the process.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Design Final Specifications: The average number of letter-sized pages in the Design Final specifications.

- ***Current Life Cycle Process:*** Estimate 1,635 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Design Submittal Sets Required: The number of design phase drawing sets required.

- ***Current Life Cycle Process:*** Estimate 3 total sets based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time spent printing documents.

- ***Current Life Cycle Process:*** Estimate 3.20 hours per set based on printer specifications provided in the *Printing Variables* section of this appendix.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

110.06.30 Send Design Final Documents

Avg. Number of Transmittals: The average number of times documents are sent by the Architect to the Owner.

- ***Current Life Cycle Process:*** Estimate 1 transmittal based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Architect Rep to Owner's Rep.

- ***Current Life Cycle Process:*** Estimate $249.15 utilizing fed-ex standard overnight rates for weight of printed documents in project analyzed.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Architect compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

110.06.40 Log Transmittal of Design Final Documents

Avg. Number of Transmittals: The average number of times documents are logged out by the Architect.

- ***Current Life Cycle Process:*** Estimate 1 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

110.08 Log Receipt of Design Final Documents for Bidding Process

Avg. Number of Transmittals: The average number of times documents are received by the Owner's Rep. from the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 1 based number of times Design Final Documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by Owner's Rep. logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Prepare Invitation to Bid (Post Design): 120 Request for Proposal

120.01 Receive Information from A/E to Develop Bid Documents

Time to Log: The time spent logging documents.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

120.03 Copy Request for Proposal (RFP) Package

Avg. Number of Pages in Front Matter: The average number of pages that precede the technical content of the RFP for Design and Construction Services.

- ***Current Life Cycle Process:*** Estimate 25 pages.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Sheets in Design Final Drawings: The average number of drawing sheets.

- ***Current Life Cycle Process:*** Estimate 899 based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Design Final Narrative: The average number of pages included in the Design Final narrative.

- ***Current Life Cycle Process:*** Estimate 40 total pages based on number of narrative topics (10) identified in UFC documentation. This assumes four pages per topic at this stage in the process.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Letter-Sized Pages in Design Final Specification: The average number of pages included in the Design Final specifications.

- ***Current Life Cycle Process:*** Estimate 1,635 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Request for Proposal Submittal Sets Required: The average number printed sets required.

- ***Current Life Cycle Process:*** Estimate 5 total sets. Assume an average of 5 total bidders.

- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time spent printing documents.

- ***Current Life Cycle Process:*** Estimate 3.21 hours per set based on printer specifications provided in the *Printing Variables* section of this appendix.
- ***Expected Life Cycle Process:*** Estimate 0 hours based on the reduction factor times the Current Life Cycle Process estimate.

120.04 Send Request for Proposal (RFP) Package

Avg. Number of Transmittals: The average number of times Proposal is sent by the Owner's Rep. to Bidders.

- ***Current Life Cycle Process:*** Estimate 5 transmittals of RFP.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents sent by Owner's Rep to Bidders.

- ***Current Life Cycle Process:*** Estimate $249.00 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Owner compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 10 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 4 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Respond to Pre-Proposal Inquiries: 130 Inquiry Issue

130.04 Send Inquiry Issue (Clarification)

Avg. Number of Transmittals: The average number of times Inquiry Issues and responses are sent and received between Owner's Rep, Architect and Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 3 based on actual number of addenda in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for mailing documents to the Owner's Rep. from the Contractor.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing fed-ex standard overnight rates. Estimate 10 letter sized pages each transmittal.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare Transmittals for Inquiry Issues: The average time spent by Contractor compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 10 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 4 minutes based on the reduction factor times the Current Life Cycle Process estimate.

130.05 Log Transmittal of Inquiry Issue (Clarification)

Avg. Number of Transmittals: The average number of times documents are logged out by the Contractor.

- ***Current Life Cycle Process:*** Estimate 3 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by the Contractor logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

130.07 Log Receipt of Inquiry Issue (Clarification)

Avg. Number of Transmittals: The average number of times documents are received by the Owner's Rep. from the Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 3 based number of addenda in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by Owner's Rep. logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

130.08 Send Inquiry Issue (Clarification)

Avg. Number of Transmittals: The average number of times Inquiry Issues are forwarded to the Architect from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 3 based on actual number of addenda in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for mailing documents/comments sent between Owner's Rep. to the Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing fed-ex standard overnight rates.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare Transmittals for Inquiry Issues: The average time spent by Owner's Rep. compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 2 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 45 seconds based on the reduction factor times the Current Life Cycle Process estimate.

130.09 Log Transmittal of Inquiry Issue (Clarification)

Avg. Number of Transmittals: The average number of times documents are logged out by the Owner's Rep.

- ***Current Life Cycle Process:*** Estimate 3 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by the Owner's Rep. logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

130.11 Log Receipt of Inquiry Issue (Clarification)

Avg. Number of Transmittals: The average number of times documents are received by the Architect from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 3 based number of addenda in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by Architect logging documents in.
- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

130.13 Send Inquiry Issue (Clarification) Response

Avg. Number of Transmittals: The average number of times Inquiry Issues responses are sent from Architect to Owner's Rep. times the number of recipients for each exchange.
- ***Current Life Cycle Process:*** Estimate 3 based on actual number of addenda in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for mailing documents to the Owner's Rep. from the Architect.
- ***Current Life Cycle Process:*** Estimate $16.50 utilizing fed-ex standard overnight rates. Estimate 10 letter sized pages each transmittal.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare Transmittals for Inquiry Issues: The average time spent by Architect compiling documents for transmittal.
- ***Current Life Cycle Process:*** Estimate 15 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 6 minutes based on the reduction factor times the Current Life Cycle Process estimate.

130.14 Log Transmittal of Response of Inquiry Issue (Clarification)

Avg. Number of Transmittals: The average number of times documents are logged out by the Architect.
- ***Current Life Cycle Process:*** Estimate 3 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by the Architect logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

130.16 Log Receipt of Response of Inquiry Issue (Clarification)

Avg. Number of Transmittals: The average number of times documents are received by the Owner's Rep. from the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 3 based number of addenda in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by Owner's Rep. logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

130.18 Send Inquiry Issue (Clarification) Response to Contractor

Avg. Number of Transmittals: The average number of times Inquiry Issues are forwarded to the Contractor from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 3 based on actual number of addenda in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for mailing documents/comments sent between Owner's Rep. to the Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing fed-ex standard overnight rates.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare Transmittals for Inquiry Issues: The average time spent by Owner's Rep. compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 2 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 45 seconds based on the reduction factor times the Current Life Cycle Process estimate.

130.19 Log Transmittal of Inquiry Issue (Clarification) Response

Avg. Number of Transmittals: The average number of times documents are logged out by the Owner's Rep.

- ***Current Life Cycle Process:*** Estimate 3 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by the Owner's Rep. logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

130.21 Log Receipt of Inquiry Issue (Clarification) Response

Avg. Number of Transmittals: The average number of times documents are received by the Contractor from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 3 based number of addenda in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by the Contractor logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Identify Discrepancies: 150 Inquiry Issue (RFI)

150.04 Send Inquiry Issue (RFI) related to Space and Equipment

Avg. Number of RFIs: The average number of formal questions (Request for Information) initiated by the Contractor related to Space and Equipment.

- ***Current Life Cycle Process:*** Estimate 160 based on actual number of RFI's in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for mailing documents to the Owner's Rep. from the Contractor.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing fed-ex standard overnight rates.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare Transmittals for Inquiry Issues (RFI): The average time spent by Contractor compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 10 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 4 minutes based on the reduction factor times the Current Life Cycle Process estimate.

150.05 Log Transmittal of Inquiry Issue (RFI)

Avg. Number of RFIs: The average number of times documents are logged out by the Contractor.

- ***Current Life Cycle Process:*** Estimate 160 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by the Contractor logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

150.07 Log Receipt of Inquiry Issue (RFI)

Avg. Number of RFIs: The average number of times documents are received by the Owner's Rep. from the Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 160 based on number of RFI's in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by Owner's Rep. logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

150.08 Send Inquiry Issue (RFI) to Architect

Avg. Number of RFIs: The average number of times Inquiry Issues are forwarded to the Architect from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 160 based on actual number of RFI's in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for mailing documents/comments sent between Owner's Rep. to the Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing fed-ex standard overnight rates.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare Transmittals for Inquiry Issues (RFI): The average time spent by Owner's Rep. compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 2 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 45 seconds based on the reduction factor times the Current Life Cycle Process estimate.

150.09 Log Transmittal of Inquiry Issue (RFI)

Avg. Number of RFIs: The average number of times documents are logged out by the Owner's Rep.

- ***Current Life Cycle Process:*** Estimate 160 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by the Owner's Rep. logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

150.11 Log Receipt of Inquiry Issue (RFI)

Avg. Number of RFIs: The average number of times documents are received by the Architect from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 160 based number of RFI's in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by Architect logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

150.13 Send Inquiry Issue (RFI) Response

Avg. Number of RFIs: The average number of times Inquiry Issues responses are sent from Architect to Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 160 based on actual number of RFI's in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for mailing documents to the Owner's Rep. from the Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing fed-ex standard overnight rates. Estimate 10 letter sized pages each transmittal.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare Transmittals for Inquiry Issues (RFI): The average time spent by Architect compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 10 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 4 minutes based on the reduction factor times the Current Life Cycle Process estimate.

150.14 Log Transmittal of Inquiry Issue (RFI) Response

Avg. Number of RFIs: The average number of times documents are logged out by the Architect.

- ***Current Life Cycle Process:*** Estimate 160 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by the Architect logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

150.16 Log Receipt of Response of Inquiry Issue (RFI)

Avg. Number of RFIs: The average number of times documents are received by the Owner's Rep. from the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 160 based number of RFI's in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent by Owner's Rep. logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

150.18 Send Inquiry Issue (RFI) Response to Contractor

Avg. Number of RFIs: The average number of times Inquiry Issues are forwarded to the Contractor from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 160 based on actual number of RFI's in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for mailing documents/comments sent between Owner's Rep. to the Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing fed-ex standard overnight rates. Estimate 10 letter sized pages each transmittal.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare Transmittals for Inquiry Issues (RFI): The average time spent by Owner's Rep. compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 2 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 45 seconds based on the reduction factor times the Current Life Cycle Process estimate.

150.19 Log Transmittal of Inquiry Issue (RFI) Response

Avg. Number of RFIs: The average number of times documents are logged out by the Owner's Rep.

- ***Current Life Cycle Process:*** Estimate 160 based on number of times documents were sent in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by the Owner's Rep. logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare comments, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

150.21 Log Receipt of Inquiry Issue (RFI) Response

Avg. Number of RFIs: The average number of times documents are received by the Contractor from the Owner's Rep. times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 160 based on number of RFI's in project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent by the Contractor logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Organize Submittal Information: 180 Submittal Package

180.02.15 Log Receipt of Product Data from Sub-Contractors and Vendors

Avg. Number of Transmittals: The average number of product submittal items sent by the Sub-Contractors and vendors to the Contractor.

- ***Current Life Cycle Process:*** Estimate 252 transmittals based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

180.02.20 Produce Submittal Information

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Organizing Equipment (Product) Type Information: The average time spent by Assistant Project Manager in producing submittal packages by organizing equipment type information.

- ***Current Life Cycle Process:*** Estimate 30 minutes per submittal item based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

180.03 Validate Submittal Information Against Contract Documents

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Evaluating Equipment (Product) Type Submittal Items Against Contract Documents: The average time spent by Construction Project Manager and Assistant Project Manager evaluating submittal items.

- ***Current Life Cycle Process:*** Estimate 1 hour per submittal item based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 6 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Percentage of Submittal Items Rejected: The percentage of submittal items rejected.

- ***Current Life Cycle Process:*** Estimate 20%.

- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Percentage of Time Spent by Construction Project Manager: The percentage of time spent by Project Manager in validating submittal information.

- ***Current Life Cycle Process:*** Estimate 10% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Percentage of Time Spent by Assistant (Construction) Project Manager: The percentage of time spent by Assistant Project Manager in validating submittal information.

- ***Current Life Cycle Process:*** Estimate 90% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

180.05 Copy Submittal Package

Avg. Number of Submittal Pages in a Submittal Item: The average number of letter-sized pages per submittal item.

- ***Current Life Cycle Process:*** Estimate 18 pages based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Submittal Sheets in a Submittal Item: The average number of drawings per submittal item.

- ***Current Life Cycle Process:*** Estimate 2 sheets based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Submittal Items in a Product Submittal Package: The average number of product Items per submittal package.

- ***Current Life Cycle Process:*** Estimate 3 items based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on information obtained from project analyzed.

- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Submittal Sets Required: The number of construction phase submittal sets required.

- ***Current Life Cycle Process:*** Estimate 3 sets based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time spent printing documents.

- ***Current Life Cycle Process:*** Estimate 1 minute per set based on printer specifications provided in the *Printing Variables* section of this appendix.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

180.06 Stamp Submittal Package

Avg. Number of Submittal Pages in a Submittal Item: The average number of letter-sized pages per submittal item.

- ***Current Life Cycle Process:*** Estimate 18 pages based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Submittal Sheets in a Submittal Item: The average number of drawings per submittal item.

- ***Current Life Cycle Process:*** Estimate 2 sheets based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Submittal Items in a Product Submittal Package: The average number of product Items per submittal package.

- ***Current Life Cycle Process:*** Estimate 3 items based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Submittal Sets Required: The number of construction phase submittal sets required.

- ***Current Life Cycle Process:*** Estimate 3 sets based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.

- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Sign Each Page: The average time spent by Construction Project Manager in signing each page.

- ***Current Life Cycle Process:*** Estimate 5 seconds per page based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 seconds based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Stamp Each Sheet: The average time spent by Assistant Project Manager in stamping each page.

- ***Current Life Cycle Process:*** Estimate 5 seconds per sheet based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 seconds based on the reduction factor times the Current Life Cycle Process estimate.

180.07 Send Submittal Package

Avg. Number of Transmittals: The average number of times a submittal is sent by the Contractor to the Owner's Rep times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 252 transmittals based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Contractor and Owner's Rep.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Architect Drafter in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 5 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 2 minutes based on the reduction factor times the Current Life Cycle Process estimate.

180.08 Log Transmittal of Submittal Package

Avg. Number of Transmittals: The average number of times a submittal is sent by the Contractor to the Owner's Rep times the number of recipients for

each exchange.

- ***Current Life Cycle Process:*** Estimate 252 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare package, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

180.10 Log Receipt of Submittal Package

Avg. Number of Transmittals: The average number of times a submittal is sent by the Contractor to the Owner's Rep times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 252 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

180.12 Send Submittal Package to Architect

Avg. Number of Transmittals: The average number of times a submittal is sent by the Owner's Rep to the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 252 transmittals based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Owner's Rep and Architect.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Owner's Rep in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 5 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 2 minutes based on the reduction factor times the Current Life Cycle Process estimate.

180.13 Log Transmittal of Submittal Package

Avg. Number of Transmittals: The average number of times a submittal is sent by the Owner's Rep to the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 252 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare package, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

180.15 Log Receipt of Submittal Package

Avg. Number of Transmittals: The average number of times a submittal is sent by the Owner's Rep to the Architect times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 252 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Perform Submittal Review: 190 Submittal Issue

190.02.10 Send Copies of Submittal Package (Product Type Selection,

System Layout) to Sub-Consultants

Avg. Number of Transmittals: The average number of times a submittal is sent by the Architect Drafter to the Sub-Consultants times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 6 transmittals based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Architect and Sub-Consultants.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Architect Drafter in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

190.02.11 Log Transmittal of Submittal Package (Product Type Selection, System Layout)

Avg. Number of Transmittals: The average number of times a submittal is sent by the Architect Drafter to the Sub-Consultants times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 6 transmittals based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare package, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

190.02.13 Log Receipt of Sub Consultants Submittals Mark-ups/Comments

Avg. Number of Transmittals: The average number of times a submittal is

sent by the Architect Drafter to the Sub-Consultants times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 6 transmittals based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

190.02.20 Validate Submittal Packages Not Sent to Sub-Consultants

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Evaluating Product Type Submittal Items Against Contract Documents: The average time spent by Licensed Architect in evaluating submittals.

- ***Current Life Cycle Process:*** Estimate 1 hour based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 6 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Percentage of Product Submittals Reviewed by Licensed Architect: The percentage of submittals that are product related reviewed by a Licensed Architect.

- ***Current Life Cycle Process:*** Estimate 8% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

190.02.21 Mark-up Copies of Submittals with Comments

Avg. Number of Submittal Pages in a Submittal Item: The average number of letter-sized pages per submittal item.

- ***Current Life Cycle Process:*** Estimate 18 pages based on information obtained from project analyzed.

- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Submittal Sheets in a Submittal Item: The average number of drawings per submittal item.

- ***Current Life Cycle Process:*** Estimate 2 sheets based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Submittal Items in a Submittal Package for Each Equipment (Product) Type: The average number of product Items per submittal package.

- ***Current Life Cycle Process:*** Estimate 3 items based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Transferring Comments per Page: The average time spent by Architect Drafter in marking up submittal with comments.

- ***Current Life Cycle Process:*** Estimate 2 minutes per page based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time Spent Transferring Comments per Sheet: The average time spent by Architect Drafter in marking up submittal with comments.

- ***Current Life Cycle Process:*** Estimate 5 minutes per sheet based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Number of Submittal Sets Required: The number of construction phase submittal sets required.

- ***Current Life Cycle Process:*** Estimate 3 sets based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

190.03.10 Send Copies of Submittal Issues

Avg. Number of Transmittals: The average number of times a submittal is sent by the Architect Drafter to the Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 6 transmittals based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Architect and Contractor.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Architect Drafter in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

190.03.20 Log Transmittal of Submittal Issues

Avg. Number of Transmittals: The average number of times a submittal is sent by the Architect Drafter to the Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 6 transmittals based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

190.05 Log Receipt of Submittal Issues

Avg. Number of Transmittals: The average number of times a submittal is

sent by the Licensed Architect to the Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 6 transmittals based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

190.06.10 Recreate Submittal Package (Product Type Selection, System Layout)

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Revising One Product Submittal Item: The average time spent by Contractor recreating Submittal Items.

- ***Current Life Cycle Process:*** Estimate 1 hour per product based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 6 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Percentage of Time Spent by Construction Project Manager: The percentage of time spent by Project Manager in recreating Submittal Package.

- ***Current Life Cycle Process:*** Estimate 80% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Percentage of Time Spent by Assistant (Construction) Project Manager: The percentage of time spent by Assistant Project Manager in recreating Submittal Package.

- ***Current Life Cycle Process:*** Estimate 20% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

190.07 2nd Review Cycle of Submittal Package (Product Type Selection, System Layout)

Percentage of Product Submittals rejected on 2nd Review: The percentage of submittals rejected upon review.

- ***Current Life Cycle Process:*** Estimate 43% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 4.3% based on the reduction factor times the Current Life Cycle Process estimate.

190.08 3rd Review Cycle of Submittal Package (Product Type Selection, System Layout)

Percentage of Product Submittals rejected on 3rd Review: The percentage of submittals rejected upon review.

- ***Current Life Cycle Process:*** Estimate 25% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0% based on the reduction factor times the Current Life Cycle Process estimate.

190.09 4th Review Cycle of Submittal Package (Product Type Selection, System Layout)

Percentage of Product Submittals rejected on 4th Review: The percentage of submittals rejected upon review.

- ***Current Life Cycle Process:*** Estimate 8% based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0% based on the reduction factor times the Current Life Cycle Process estimate.

Execute Construction Activities: 210 Product Installation

210.04 Reformat Product Installation Report

Number of Tagged Components: Total number of pieces of equipment that will have asset tags and will be managed by the owner.

- ***Current Life Cycle Process:*** Estimate 534 based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Re-formatting Product Installation Report in Office: Average time spent by Contractor in the office re-formatting report.

- ***Current Life Cycle Process:*** Estimate 20 minutes based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

210.05 Send Product Installation Report

Avg. Number of Transmittals: The average number of times a report is sent by the Contractor to the Architect / Owner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Contractor and Architect / Owner.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Contractor in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 5 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 2 minutes based on the reduction factor times the Current Life Cycle Process estimate.

210.06 Log Transmittal of Product Installation Report

Avg. Number of Transmittals: The average number of times a report is sent by the Contractor to the Architect / Owner times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare package, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

210.08 Log Receipt of Product Installation Report

Avg. Number of Transmittals: The average number of times a report is sent by the Licensed Architect to the Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Inspect and Approve Work: 230 Product Inspection

230.04 Reformat Product Inspection

Avg. Field Time Spent Documenting Report per Site Visit: The average time spent by a Licensed Architect in the field documenting data related to Installed Components.

- ***Current Life Cycle Process:*** Estimate 2.75 hours per visit based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 1.1 hours based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Site Visits per Month: The average number of times a Licensed Architect visits the site a month in order to inspect Installed Components.

- ***Current Life Cycle Process:*** Estimate 4 times per month based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Months of Construction: The average duration of the construction phase of a project.

- ***Current Life Cycle Process:*** Estimate 45 months based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Total Time Spent in the Office: The time spent in the office on a daily basis.

- ***Current Life Cycle Process:*** Estimate 8 hours a day based on industry standards.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Percentage of Office Time Spent Quantifying Products-in-Place: The average percentage of office time spent by Licensed Architect formatting

Product Inspection Report.

- ***Current Life Cycle Process:*** Estimate 75% of Total time spent in the office.
- ***Expected Life Cycle Process:*** Estimate 7.5% based on the reduction factor times the Current Life Cycle Process estimate.

230.05 Send Product Inspection Report to Contractor

Avg. Number of Transmittals: The average number of times report is sent by the Licensed Architect to the Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of Product Inspection Report.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Mailing Cost per Transmittal: The average cost for delivering the report between the Licensed Architect and Contractor.

- ***Current Life Cycle Process:*** Estimate $16.50 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Licensed Architect in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 5 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 2 minutes based on the reduction factor times the Current Life Cycle Process estimate.

230.06 Log Transmittal of Product Inspection Report

Avg. Number of Transmittals: The average number of times a report is sent by the Licensed Architect to the Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of Product Inspection Report.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare package, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

230.08 Log Receipt of Product Inspection Report

Avg. Number of Transmittals: The average number of times a report is sent by the Licensed Architect to the Contractor times the number of recipients for each exchange.

- ***Current Life Cycle Process:*** Estimate 2 transmittals of Product Inspection Report.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Time to Log: The average time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Close Out: 250 Turnover Package

250.01 Compile Turnover Package

Avg. Time Spent Searching and Assembling Operations & Maintenance Manuals: The average time spent by Contractor in compiling the Operations and Maintenance Manual.

- ***Current Life Cycle Process:*** Estimate 3 hours per manual based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 18 minutes per manual based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time Spent Searching and Assembling Commissioning Report: The average time spent by Contractor in compiling the Commissioning Report.

- ***Current Life Cycle Process:*** Estimate 30 minutes per report.
- ***Expected Life Cycle Process:*** Estimate 3 minutes per report based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time Spent Searching and Assembling Record Specifications: The average time spent by Contractor in compiling the Record Specifications.

- ***Current Life Cycle Process:*** Estimate 1.5 hours per drawing based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 9 minutes per drawing based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Sheets in Record (As-Built) Drawings: The average number of drawing sheets in As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 1048 sheets based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Searching and Assembling Record (As-Built) Drawings: The average time spent by Contractor in compiling As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 3 seconds per sheet based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 seconds per sheet based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Sheets in Final Approved Shop Drawings: The average number of drawing sheets in As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 2 sheets based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Searching and Assembling Final Approved Shop Drawings: The average time spent by Contractor in compiling As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 30 seconds per sheet based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 3 seconds per sheet based on the reduction factor times the Current Life Cycle Process estimate.

Percentage of Time Spent by Construction Project Manager: The percentage of time spent by Project Manager in compiling all documents related to the Turnover Package.

- ***Current Life Cycle Process:*** Estimate 10% based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Percentage of Time Spent by Assistant (Construction) Project Manager: The percentage of time spent by Assistant Project Manager in compiling all documents related to the Turnover Package.

- ***Current Life Cycle Process:*** Estimate 90% based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

250.02 Copy Turnover Package

Avg. Number of Pages In Operations & Maintenance Manuals: The average of pages in Operations and Maintenance Manual.

- ***Current Life Cycle Process:*** Estimate 3,580 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Unique Product Types: The average number of equipment types found in building.

- ***Current Life Cycle Process:*** Estimate 85 equipment types based on information obtained from project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pages In Commissioning Report: The average of pages in Commission Report.

- ***Current Life Cycle Process:*** Estimate 10 pages per component.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Components & Systems to be Commissioned: The average number of components and systems in the building to be commissioned.

- ***Current Life Cycle Process:*** Estimate 0 components and systems. This information was unavailable for the project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pages In Record Specifications: The average of pages in Record Specifications.

- ***Current Life Cycle Process:*** Estimate 1635 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Sheets in Record (As-Built) Drawings: The average number of drawing sheets in As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 1048 sheets based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Sheets in Final Approved Shop Drawings: The average number of drawing sheets in As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 2 sheets based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Number of Submittal Sets Required: The number of construction phase

submittal sets required.

- ***Current Life Cycle Process:*** Estimate 3 sets based on information in United Facility Criteria (UFC) documentation regarding participants involved in early planning activities.
- ***Expected Life Cycle Process:*** Estimate 0 based on the reduction factor times the Current Life Cycle Process estimate.

Avg. In-house Reproduction Time per Set: The average time required to print each set.

- ***Current Life Cycle Process:*** Estimate 9 hours per set assuming use of both small format and large format printers indentified above.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

250.03 Send Copies of Turnover Package

Avg. Mailing Cost per Transmittal: The average cost for delivering documents/comments sent between Contractor and Owner.

- ***Current Life Cycle Process:*** Estimate $350 utilizing Fed-Ex's standard overnight shipping cost based on weight of documents.
- ***Expected Life Cycle Process:*** Estimate - based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time to Prepare a Transmittal: The average time spent by Contractor in compiling documents for transmittal.

- ***Current Life Cycle Process:*** Estimate 30 minutes for this task.
- ***Expected Life Cycle Process:*** Estimate 12 minutes based on the reduction factor times the Current Life Cycle Process estimate.

250.04 Log Transmittal of Turnover Package

Time to Log: The time spent logging documents out.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to prepare package, verify information being sent, and enter into log spreadsheet.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

250.06 Log Receipt of Turnover Package

Time to Log: The time spent logging documents in.

- ***Current Life Cycle Process:*** Estimate 15 minutes for this task based on time to open package, verify information received, and enter into log spreadsheet.

- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

250.07 Review Turnover Package

Avg. Number of Pages In Operations & Maintenance Manuals: The average of pages in Operations and Maintenance Manual.

- ***Current Life Cycle Process:*** Estimate 3,580 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Reviewing Operations & Maintenance Manuals: The average time spent by Owner in reviewing the Operations and Maintenance Manual.

- ***Current Life Cycle Process:*** Estimate 6 seconds per page based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pages In Commissioning Report: The average of pages in Commission Report.

- ***Current Life Cycle Process:*** Estimate 10 pages.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Reviewing Commissioning Report: The average time spent Owner in reviewing the Commissioning Report.

- ***Current Life Cycle Process:*** Estimate 30 seconds per page.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Pages In Record Specifications: The average of pages in Record Specifications.

- ***Current Life Cycle Process:*** Estimate 1635 pages based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Reviewing Record Specifications: The average time spent by Owner in reviewing the Record Specifications.

- ***Current Life Cycle Process:*** Estimate 6 seconds per page based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 seconds based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Sheets in Record (As-Built) Drawings: The average number of drawing sheets in As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 1048 sheets based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Reviewing Record (As-Built) Drawings: The average time spent by Owner in reviewing the Record (As-Built) Drawings.

- ***Current Life Cycle Process:*** Estimate 30 seconds per sheet based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Number of Sheets in Final Approved Shop Drawings: The average number of drawing sheets in As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 2 sheets based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Reviewing Final Approved Shop Drawings: The average time spent by Owner in reviewing the Final Approved Drawings.

- ***Current Life Cycle Process:*** Estimate 30 seconds per sheet based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 seconds per sheet based on the reduction factor times the Current Life Cycle Process estimate.

250.08 File Turnover Package

Avg. Time Spent Filing Operations & Maintenance Manuals: The average time spent by Owner in filing the Operations and Maintenance Manual.

- ***Current Life Cycle Process:*** Estimate 5 minutes per document based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time Spent Filing Commissioning Report: The average time spent Owner in filing the Commissioning Report.

- ***Current Life Cycle Process:*** Estimate 5 minutes.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Time Spent Filing Record Specifications: The average time spent by Owner in filing the Record Specifications.

- ***Current Life Cycle Process:*** Estimate 5 minutes per document based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Sheets in Record (As-Built) Drawings: The average number of drawing sheets in As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 1048 sheets based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Filing Record (As-Built) Drawings: The average time spent by Owner in filing the Record (As-Built) Drawings.

- ***Current Life Cycle Process:*** Estimate 6 seconds per sheet based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Avg. Number of Sheets in Final Approved Shop Drawings: The average number of drawing sheets in As-Built Drawings.

- ***Current Life Cycle Process:*** Estimate 2 sheets based on project analyzed.
- ***Expected Life Cycle Process:*** Same as the Current Life Cycle Process estimate.

Avg. Time Spent Filing Final Approved Shop Drawings: The average time spent by Owner in filing the Final Approved Drawings.

- ***Current Life Cycle Process:*** Estimate 6 seconds per sheet based on project analyzed.
- ***Expected Life Cycle Process:*** Estimate 0 minutes based on the reduction factor times the Current Life Cycle Process estimate.

Appendix F: Assumptions for Short Form and the Program Analysis Form of the COBie Calculator

These are the assumptions used for the Short Form calculations.

Pre-Design Variables

Avg. Number of Pages in Space Program: Owners Space Program that documents spatial requirements covers 3 space types per letter sized page

Avg. Number of Pages in Product Program: Owners Product Program that documents equipment specifications and performance covers 3 product types per letter sized page

Submittal Process Variables

Average Number of Submittal Items in a Product Submittal Package: The average number of submittal Items related to product per submittal package assumes 3 items per package

Facility Criteria

Avg. Inhouse Reproduction Time: Average time spent in printing and making copies of letter-sized pages. Small format printer produces 25 letter-sized pages per min

Discipline Specification

Avg. Inhouse Reproduction Time: Average time spent in printing and making copies of letter-sized pages. Small format printer produces 25 letter-sized pages per min

Feasibility Study

Avg. Inhouse Reproduction Time: Average time spent in printing and making copies of letter-sized pages. Small format printer produces 25 letter-sized pages per min

Project Definition

Avg. Inhouse Reproduction Time: Average time spent in printing and making copies of letter-sized pages. Small format printer produces 25 letter-sized pages per min

Space Program

Avg. Time for Owners Rep to Validate Space Program: Owners Rep spends 2 mins per space type validating spatial requirements in Space Program provided by Planner against Owner standards

Avg. Time Spent Searching for Space Program Criteria: Architect / Planner spends an estimate of 15 mins per space type searching for Spatial requirements

Avg. Time Spent Reformatting Space Program Criteria into Room Data Sheets: Architect / Planner spends an estimate of 5 mins per space type in evaluating information in Project Definition and identifying and creating a detailed spatial program in a usable format.

Product Program

Avg. Time for Owners Rep to Validate Product Program: Owners Rep spends 3 mins validating each Product Type in Product Program provided by Planner against Owner standards

Avg. Time Spent Searching for Product Program Criteria: Architect / Planner spends an estimate of 5 mins searching for Product Program Criteria

Estimating Process Variables

Avg QTO Time for Equipment Components: Architect spends an estimate of 5 mins per plan performing quantity take-off of equipment shown on plan drawings.

Avg QTO Time for Spaces in building: Architect spends an estimate of 9 mins per plan performing quantity take-off of spaces shown on plan drawings.

Design Early

Avg. Number of Sheets in Design Early Drawings: Estimated number of Design Early drawings.

Avg. Time Spent Evaluating Design Early Drawings against Design Requirements - Space and Product Type: Architect spends 9 mins per space or product type validating Design Early documentation against space and equipment requirements before submission to Owners Rep

Avg. Time spent making corrections due to non-conformance with Space or Product Program: Architect spends 5 mins per correction related to space or product type in Design Early Drawings, due to non-conformance with Space or Product Program. Also assume 30% of space and product types would require corrections.

Avg. Time to Review Design Early Drawings for conformance to Space and Product Program: Owners Rep spends 15mins per sheet reviewing Design Early documentation with 33% (4mins/sheet) of that time related to checking for conformance to Space and Product Program

Avg. Inhouse Reproduction Time: Small format printer produces 25 letter-sized pages per min while Large Format printer produces 6 sheets per min.

Avg. Time Spent Reformatting Space Program: Architect spends an estimate of 10 mins per space type documenting spatial requirements in a usable format

Avg. Time Spent Reformatting Product Program: Architect spends an estimate of 15 mins per product type documenting product type requirements in a usable format

Design Schematic

Avg. Number of Sheets in Design Schematic Drawings: Estimated number of Design Schematic (Design Development) drawings

Avg. Number of Plan Drawings in Design Schematic Drawings: Estimated number of Plan Drawings in Design Schematic (Design Development) Drawings

Avg. Time Spent Evaluating Design Schematic Drawings against Design Requirements - Space and Equipment: Architect spends 24 mins per space or product type validating Design Early documentation against space and equipment requirements before submission to Owners Rep

Avg. Time spent making corrections due to non-conformance with Space or Product Program: Architect spends 5 mins per correction related to space or product type in Design Schematic Drawings, due to non-conformance with Space or Product Program. Also assume 45% of space and product types would require corrections.

Avg. Time to Review Design Schematic Drawings for conformance to Space and Product Program: Owners Rep spends 15mins per sheet reviewing Design Early documentation with 33% (4mins/sheet) of that time related to checking for conformance to Space and Product Program

Avg. Inhouse Reproduction Time: Small format printer produces 25 letter sized pages per min while Large Format printer produces 6 sheets per min.

Avg. Time Spent Developing Equipment (product) Type Template: Architect spends an estimate of 15 mins per product in developing outline specifications for equipment types required for the project

Design Coordinated

Avg. Number of Sheets in Design Coordinated Drawings: Estimated number of Design Coordinated drawings

Avg. Number of Plan Drawings in Design Coordinated Drawings: Estimated number of Plan Drawings in Design Coordinated Drawings

Avg. Time Spent Evaluating Design Coordinated Drawings against Design Requirements - Space and Equipment: Architect spends 27 mins per space or product type validating Design Early documentation against space and equipment requirements before submission to Owners Rep

Avg. Time Spent making Corrections due to Non-Conformance with Space Program: Architect spends 5 mins per correction related to space or product type in Design Coordinated Drawings, due to non-conformance with Space or Product Program. Also assume 25% of space and product types would require corrections.

Avg. Time to Review Design Coordinated Drawings for conformance to Space and Product Program: Owners Rep spends 15mins per sheet reviewing Design Early documentation with 33% (4mins/sheet) of that time related to checking for conformance to Space and Product Program

Avg. Inhouse Reproduction Time: Small format printer produces 25 letter-sized pages per min while Large Format printer produces 6 sheets per min.

Avg. Time Spent Developing Detailed Equipment (products) Type Template: Architect spends an estimate of 2 hours per product type in writing the equipment specifications.

Avg. Time Searching for Product Literature for Candidates: Architect spends an estimate of 1 hour per product type in searching for 3 products that meet the specifications.

Avg. Percent of Errors in Product Type Candidate: Estimate 15% of products identified do not meet the specifications.

Design Final

Avg. Number of Sheets in Design Final Drawings: Estimated number of Design Final drawings.

Avg. Number of Plan Drawings in Design Final Drawings: Estimated number of Plan Drawings in Design Final Drawings

Avg. Time Spent Evaluating Design Final Drawings against Design Requirements - Space and Equipment: Architect spends 25 mins per space or product type validating Design Early documentation against space and equipment requirements before submission to Owners Rep

Avg. Time Spent making Corrections due to Non-Conformance with Space or Product Program: Architect spends 5 mins per correction related to space or product type in Design Final Drawings, due to non-conformance with Space or Product Program. Also assume 10% of space and product types would require corrections.

Avg. Inhouse Reproduction Time: Small format printer produces 25 letter sized pages per min while Large Format printer produces 6 sheets per min.

Avg. Time Spent Developing Detailed Equipment (products) Type Candidate: Architect spends an estimate of 1 hour per product preparing a detailed specifications list based on product types

Request for Proposal

Avg. Inhouse Reproduction Time: Small format printer produces 25 letter sized pages per min while Large Format printer produces 6 sheets per min.

Submittal Package

Avg. Inhouse Reproduction Time: Small format printer produces 25 letter-sized pages per min while Large Format printer produces 6 sheets per min.

Average Time Spent Organizing Equipment (product) Type information: Contractor Asst. Project Manager spends an estimate of 10 mins per product in producing submittal packages from product data submitted by subcontractors.

Average Time Spent Evaluating Equipment (product) Type Submittal Items against Contract Documents: Contractor spends an estimate of 30mins evaluating submittal items

Submittal Process Variables

Avg. Number of Submittal Pages in a Product Submittal Item: Estimate 18 letter-sized pages per submittal item

Avg. Number of Submittal Sheets in a Product Submittal Item: Estimate 2 sheets per submittal item

Submittal Issue

Avg. Time Spent Evaluating Product Type Submittal Items against Contract Documents: Architect spends an estimate of 1 hour per product type in evaluating each product type submittal against contract documents

Avg. Time Spent Revising one Product Type Submittal Item: Contractor spends an estimate of 30 mins revising each Submittal Item to meet contract requirements and resubmit.

Turnover Package

Avg. Time Spent Searching and Assembling Record (As-Built) Drawings (hours / sheet): Contractor spends an estimate of 30 secs per sheet compiling Record (As-Built) Drawings

Avg. Time Spent Searching and Assembling Final Approved Shop Drawings (hours / sheet): Contractor spends an estimate of 30 secs per sheet compiling Final Approved Drawings

Avg. Time Spent Reviewing Operations & Maintenance Manuals (hours/page): Owner spends an estimate of 6 seconds per page in reviewing Operations & Maintenance Manuals

Avg. Time Spent Reviewing Commissioning Report (hours / page): Owner spends an estimate of 30 seconds per page in reviewing Commissioning Report

Avg. Time Spent Reviewing Record Specifications (hours / page): Owner spends an estimate of 6 seconds per page in reviewing Record Specifications

Avg. Time Spent Reviewing Record (As-Built) Drawings (hours/ sheet): Owner spends an estimate of 30 seconds per sheet in reviewing Record (As-Built) Drawings

Avg. Time Spent Reviewing Final Approved Shop Drawings (hours / sheet): Owner spends an estimate of 30 seconds per sheet in reviewing Final Approved Shop Drawings

Avg. Time Spent Filing Record (As-Built) Drawings (hours / sheet): Owner spends an estimate of 6 seconds per sheet in Filing Record (As-Built) Drawings

Avg. Time Spent Filing Final Approved Shop Drawings (hours / sheet): Owner spends an estimate of 6 seconds per sheet in Filing Final Approved Shop Drawings

Appendix G: COBie Calculator Template

Introduction Tab

COBie Calculator

Purpose: This research will identify the potential savings/cost for a project team if information is echanged using a COBie-based approach over the traditional “Paper-Based” approach.

Project Phase Color Coding:

Criteria	
Project Definition	
Requirement	
Bidding	
Design	
Construction	

Assumptions Tab Assumptions were made when developing the COBie Calculator. These assumptions should be modified based on your project variables in order to calculate the potential savings.

Information Attributes

L E G E N D		
Color	**Description**	**Allowed User Actions**
	user defined information unique to this worksheet	change on inputs worksheet in process specific variables section
	common user information, listed on assumptions worksheet	change on inputs worksheet
	calculated information	do not change this cell

Current Assumptions Tab

Inputs

Owner Project / Program Variables	Value	Unit	Definitions	Process
Avg. Number of Pages in Facility Criteria	0	pages	Estimated number of pages in Owners initial analysis of Project need and Scope.	10
Avg. Number of Pages in Discipline Specification	0	pages	Estimated number of pages in Equipment performance requirements during planning	20
Avg. Number of Pages in Project Definition	0	pages	Estimated number of pages in Project Definition document. The Project Definition defines the project scope, budget requirements, site details, economic analysis and facility planning data	40,70,80
Avg. Number of Pages in Front Matter	0	pages	Estimated number of pages that precede the technical content of the RFP for Design Services and Construction Services.	70, 120
Project Variables				
Number of Equipment (product) Types (Types / project)	0	types/project	Number of different equipment types that will be installed.	60,80,90,100,110,180,190, 250
Number of Tagged Components (components / project)	0	components/ project	Total number of pieces of equipment that will have asset tags and will be managed by the owner	210
Number of Space Types per Building	0	space types/ building	Average number of space types found in building.	50,80

Time to Log (hours / transmittal)	0	hours/ transmittal	Average Time spent logging documents In and Out	30,50,60,70,80, 90,100,110,120, 130,150,180,19 0,210,230,250

Pre-Design Variables

Avg. Number of Options	0	count	Average number of options created per project	30
Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)	0	sets/ sub-mittal	Average number of pre-design drawing sets re-quired for each submittal.	30,50,60,70
Avg. Number of Sheets per Option	0	pages	Average number of drawings per option.	30
Avg. Number of Letter-Sized Pages in Design Narrative per Option	0	pages	Average number of pages in narrative for each option.	30
Avg. Number of Pages in Space Program	0	pages	Typical number of pages in Space Program.	50,70,80
Avg. Number of Pages in Product Program	0	pages	Typical number of pages in Product Program that documents Owners equipment specifications and performance	60,70,80

Design Variables

Number of Design Submittal Sets Reqd. (sets / submit-tal)	0	sets / sub-mittal	Number of Design Phase drawing sets required	80,90,100,110
Avg. Number of Sheets in Design Early Drawings	0	drawings	Average number of Design Early or (Schematic Design) drawings for other disciplines	80
Avg. Number of Letter-Sized Pages in Design Early Narrative	0	pages	Average number of Letter-Sized Pages	80
Avg. Number of Sheets in Design Schematic Drawings	0	drawings	Average number of Design Schematic (Design Development) drawings	90

Avg. Number of Letter Sized Pages in Design Schematic Narrative	0	pages	Average number of pages in Design Schematic narrative	90
Avg. Number of Letter Sized Pages in a Design Schematic Specification	0	pages	Average number of pages in Design Schematic (Design Development) specifications.	90
Avg. Number of Sheets in Design Coordinated Drawings	0	drawings	Average number of Design Coordinated drawings	100
Avg. Number of Letter Sized Pages in a Design Coordinated Narrative	0	pages	Average number of pages in Design Coordinated narrative.	100
Avg. Number of Letter Sized Pages in a Design Coordinated Specification	0	pages	Average number of pages in Design Coordinated specifications.	100
Avg. Number of Sheets in Design Final Drawings	0	drawings	Average number of Design Final drawings.	110,120
Avg. Number of Letter Sized 'Pages in Design Final Narrative	0	pages	Average number of pages in Design Final narrative.	110,120
Avg. Number of Letter Sized Pages in Design Final Specification	0	pages	Average number of pages in Design Final specifications.	110,120

Estimating Process Variables

Avg QTO Time for Equipment Components (hours / plan drawing)	0.000	hours / plan drawing	Average time spent to take off all equipment pieces installed or specified in project.	90,100,110
Avg QTO Time for Spaces in building (hours / plan drawing)	0.000	hours / plan drawing	Average time spent to calculate areas.	90,100,110

Submittal Process Variables

Number of Submittal Sets Reqd. (sets / submittal)	0	sets / submittal	Number of construction phase submittal sets required	180,190,250

Avg. Number of Submittal Items in a Submittal Package for each Equipment (product) Type (submittal items/submittal package)	0	submittal items / submittal package	Average number of product Items per submittal package	180,190
Avg. Number of Submittal Pages in a Submittal Item (pages/submittal item)	0	pages/submittal item	Average number of letter-sized pages per submittal item	180,190
Avg. Number of Submittal Sheets in a Submittal Item (sheets/submittal item)	0	sheets/submittal item	Average number of drawings per submittal item	180,190

Organizational Variables

Owner Administrative Rate ($ / hour)	-	$ / hour	Rate for activities that cover Handling of documents	10,20,30,40,250
Owners Rep. Rate ($ / hour)	-	$ / hour	Rate for activities that include Validating of documents	50,60,80,90,100
Owners Rep. Administrative Rate ($ / hour)	-	$ / hour	Rate for activities that cover Handling of documents	50,60,70,80,90,100,110,120,130,150,180
Planner Rate ($ / hour)	-	$ / hour	Rate for professional assisting owner in Pre-design activities.	50,60
Planner Administrative Rate ($ / hour)	-	$ / hour	Rate for activities that cover Handling of documents	30,50,60
Licensed Professional Architect Rate ($ / hour)	-	$ / hour	Rate including Professional Services, Overhead and Profit	80,90,100,110,190,230

Specifier	-	$ / hour		
Architect Drafter Rate ($ / hour)	-	$ / hour	Rate including Professional Services, Overhead and Profit	70,80,90,100,110,130,150,180,190,210,230
Architect Administrative Rate ($ / hour)	-	$ / hour	Rate for activities that cover Handling of documents	
Construction Project Manager Rate ($ / hour)	-	$ / hour	Rate including Professional Services, Overhead and Profit	180,190,200,210,250
Assistant (Construction) Project Manager Rate ($ / hour)	-	$ / hour	Rate including Professional Services, Overhead and Profit	180,190,210,250
Contractor Administrative Rate ($ / hour)	-	$ / hour	Rate for activities that cover Handling of documents	130, 150, 180, 190, 210, 230, 250

General Repro/Postal Delivery Cost

Avg. Per Page Copy Cost ($ / page)	-	$ / sheet	-	10,20,30,40,50,60,70,80,90,100,110,120,180,250
Avg. Per Sheet Copy Cost ($ / sheet)	-	$ / sheet	-	30,70,80,90,100,110,120,180,250

Process Specific Variables

Facility Criteria

Avg. Number of Sets Required (sets / submittal)	0	sets / submittal	Average number of sets required
Avg. In-house Reproduction Time Per Set (hours/set)	0	hours/set	Average time spent in printing and making copies of Facility Criteria by Owner

Discipline Specification

Avg. Number of Sets Required (sets / submittal)	0	sets	Average number of sets required
Avg. In-house Reproduction Time Per Set (hours/set)	0	hours/set	Average time spent in printing and making copies of Discipline Specification by Owner
Feasibility Study			
Avg. Number of Transmittals	0	Transmit-tals	Average number of times options / comments are exchanged between the Planner and Owner times the number of recipients for each exchange
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours/ submittal set	Average time spent in printing and making copies of feasibility study by Planner
Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Trans-mittal	Average cost for delivering documents/comments sent between Planner and Owner
Avg. Time to Prepare Transmittal (hours / transmittal)	0.000	hours / transmittal	Average time spent in compiling documents for transmittal
Project Definition			
Avg. Number of Sets Required (sets / submittal)	0	sets	Average number of sets required
Avg. In-house Reproduction Time Per Set (hours/set)	0	hours/set	Average time spent in printing and making copies of Project Definition by Owner
Space Program			
Avg. Time Spent Recreating Space Program Criteria (hours/space)	0	hours / space	Average time spent by Planner recreating Space Program Criteria
Avg. Time Spent Reformatting Room Data Sheet (hours/space)	0	hours	Average time spent in evaluating information in Project Definition and identifying and creating a detailed spatial program
Avg. Time to Compare Space Program with Owner Standards (hours)	0	hours	Average time spent by Owners Rep in validating Space Program provided by planner

Avg. Percentage of errors in Space Program	0	%	Average percentage of errors found by Owners Rep in Space Program
Avg. Time Spent Recreating Space Program (hours/space)	0	hours / space	Average time spent by Planner recreating Space Program
Avg. Number of Re-Submit Cycles	0	Cycles	Average number of times submitted documents are re-submitted
Avg. Number of Transmittals	0	Transmit-tals	Average number of times Space Program / Comments are sent between the Planner and Owners Rep times the number of recipients for each exchange.
Avg. Mailing Cost per Transmittal ($ / Transmittal)	0	$ / Trans-mittal	Average cost for delivering documents/comments sent between Planner and Owners Rep
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	Average time spent in compiling documents for transmittal
Product Program			
Avg. Time Spent Recreating Product Program Criteria (hours / product)	0	hours / product	Average time spent by Planner recreating Product Program Criteria
Avg Time to Compare Product Program with Owner Standards (hours)	0	hour	Average time spent by Owners Rep in validating Product Program provided by Planner
Avg. Percentage of errors in Product Program	0	%	Average percentage of errors found by Owners Rep in Product Program
Avg. Time Spent Recreating Product Program (hours/space)	0	hours / space	Average time spent by Planner recreating Product Program
Avg. Number of Re-Submit Cycles	0	Cycles	Average number of times submitted documents are re-submitted

Avg. Number of Transmittals	0	Transmit-tals	Average number of times Product Program / Comments are sent between the Planner and Owners Rep times the number of recipients for each exchange.
Avg. Mailing Cost per Transmittal ($ / Transmittal)	0	$ / Trans-mittal	Average cost for mailing documents/comments sent between Planner and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	Average time spent in compiling documents for transmittal.
Request for Proposal			
Avg. Number of Letter Sized Pages in RFP (pages / proposal)	0	pages / proposal	Average number of Letter-Sized Pages
Avg. Number of Drawing Sheets in Proposal (sheets / proposal)	0	sheets / proposal	Average number of Drawings
Number of RFP copies Reqd. (sets / submittal)	0	sets / sub-mittal	Number of RFP copies required
Avg. Number of Transmittals - *Owners Rep documents to Bidders*	0	Transmit-tals	Average number of times Proposal is sent from the Owners Rep to the Bidders times the number of recipients for each exchange.
Avg. Number of Transmittals - *Architect to Owner*	0	Transmit-tals	Average number of times Proposal is sent from the Architect to the Owners Rep times the number of recipients for each exchange.
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	Average time spent in printing and making copies of Proposal by Architect
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep documents to Bidders*	0	$ / Trans-mittal	Average cost for mailing documents/comments sent between Owners Rep and Architect

Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Architect to Owners Rep*	0	$ / Transmittal	Average cost for mailing proposal between Architect and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal) - *Owners Rep*	0	hours / transmittal	Average time spent in compiling documents for transmittal / submission
Avg. Time to Prepare Transmittal (hours / transmittal) - *Architect*	0	hours / transmittal	Average time spent in compiling documents for transmittal / submission
Design Early			
Avg. Time Spent Reformatting Space Program Requirements(hours / space type)	0.00	hours / space type	Average time spent by Architect in reformatting spatial requirements
Avg. Time Spent Reformatting Equipment Type (hours /product)	0.00	hours / product	Average Time spent by Architect reformatting equipment types
Avg. Time Spent Evaluating Design Early Drawings against Design Requirements - Space and Equipment	0.00	hours	Average time spent by Architect in validating Design Early drawings before submission to Owners Rep
Avg. Time spent making corrections due to non-conformance with Space or Product Program	0.00	hours	Average time spent by Architect making corrections based on internal evaluation and feedback from Owners Rep.
Avg Time to Compare Design Early Documents with Owner Standards	0.00	hours	Average time spent by Owners Rep in validating Design Early documents
Avg. Number of Re-Submit Cycles	0.00	Cycles	Average number of times submitted documents are re-submitted
Percentage of Time Spent by Licensed Professional Architect	0.00	%	Percentage of time spent by Licensed Architect reformatting Space Program, Equipment Type and Project Definition
Percentage of Time Spent by Architect Drafter	0.00	%	Percentage of time spent by Architect Drafter reformatting Space Program, Equipment Type and Project Definition

Avg. Number of Transmittals	0.00	Transmit-tals	Average number of times drawings, narratives and comments are sent and received between the Architect / Planner and Owner times the number of recipients for each exchange
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0.00	hours / submittal set	Average time spent in printing and making copies of drawings and narratives by Architect / Planner
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep to Architect*	0.00	$ / Trans-mittal	Average cost for mailing documents/comments sent between Owners Rep and Architect
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Architect to Owners Rep*	0.00	$ / Trans-mittal	Average cost for mailing documents/comments between Architect and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0.00	hours / transmittal	Average time spent compiling copies of drawings, narratives and comments for transmittal by Architect and Owners Rep.
Design Schematic			
Avg. Number of Plan Drawings in Design Schematic Drawings	0	plans / drawing set	Average number of Plan Drawings
Avg. Time Spent Developing Equipment (product) Type Template (hours / product type)	0	hours / product type	Time spent by Architect in developing specifications for equipment types required for the project
Avg. Time Spent Evaluating Design Schematic Drawings against Design Requirements - Space and Equipment	0	hours	Average time spent by Architect in validating Design Schematic drawings before submission to Owners Rep
Avg. Time spent making corrections due to non-conformance with Space or Product Program	0	hours	Average time spent by Architect making corrections based on internal evaluation and feedback from Owners Rep.

Avg Time to Compare Design Schematic Documents with Owner Standards	0	hours	Average time spent by Owners Rep in validating Design Schematic documents
Avg. Number of Re-Submit Cycles	0	Cycles	Average number of times submitted documents are re-submitted
Percentage of Time Spent by Licensed Professional Architect	0	%	Percentage of time spent by Licensed Architect to take off all equipment pieces and to calculate areas
Percentage of Time Spent by Architect Drafter	0	%	Percentage of time spent by Architect Drafter to take off all equipment pieces and to calculate areas
Avg. Number of Transmittals	0	Transmittals	Average number of times schematic drawings, narratives, specifications and comments are sent and received between the Architect / Planner and Owner times the number of recipients for each exchange
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours/submittal set	Average time spent in printing and making copies of drawings, narratives and specifications by Architect / Planner
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep to Architect*	0	$ / Transmittal	Average cost for mailing documents/comments sent between Owners Rep and Architect
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Architect to Owners Rep*	0	$ / Transmittal	Average cost for mailing documents/comments between Architect and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	Average time spent compiling copies of schematic drawings, narratives, specifications and comments for transmittal by Architect and Owners Rep.

Design Coordinated

Avg. Number of Plan Drawings in Design Coordinate Drawings	0	plans / drawing set	Average number of Plan Drawings
Avg. Time Spent Developing Detailed Equipment (products) Type Template (hours / product)	0	hours / product	Time spent by Architect in preparing a detailed specifications list based on equipment types
Avg. Time Searching for Product Literature for Candidates (Hours/product)	0	hours / product	Average Time spent by Architect in searching for product data
Avg. Time Spent Evaluating Design Coordinated Drawings against Design Requirements - Space and Equipment	0	hours	Average time spent by Architect in validating Design Coordinated drawings before submission to Owners Rep
Avg. Time Spent making Corrections due to Non-Conformance with Space Program	0	hours	Average time spent by Architect making corrections based on internal evaluation and feedback from Owners Rep.
Avg. Percent of Errors in Product Type Candidate	0	%	Percentage of errors in Product Type List
Avg Time to Compare Design Coordinated & Product Type Candidate Documents with Owner Standards	0	hours	Average time spent by Owners Rep in validating Design Coordinated documents
Avg. Number of Re-Submit Cycles	0	Cycles	Average number of times submitted documents are re-submitted
Percentage of Time Spent by Licensed Professional Architect	0	%	Percentage of time spent by Licensed Architect to take off all equipment pieces and to calculate areas
Percentage of Time Spent by Architect Drafter	0	%	Percentage of time spent by Architect Drafter to take off all equipment pieces and to calculate areas
Avg. Number of Transmittals	0	Transmittals	Average number of times coordinated drawings, narratives, specifications and comments are sent and received between the Architect and Owners Rep times the number of recipients for each exchange

Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	Average time spent in printing and making copies of drawings, narratives and specifications by Architect
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep to Architect*	0	$ / Transmittal	Average cost for mailing documents/comments sent between Owners Rep and Architect
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Architect to Owners Rep*	0	$ / Transmittal	Average cost for mailing documents between Architect and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	Average time spent compiling copies of coordinated drawings, narratives, specifications and comments for transmittal by Architect and Owners Rep
Design Final			
Avg. Number of Plan Drawings in Design Final Drawings	0	plans / drawing set	Average number of Plan Drawings
Avg. Time Spent Developing Detailed Equipment (products) Type Candidate (hours / product)	0	hours / product	Time spent by Architect in preparing a detailed specifications list based on equipment types
Avg. Time Spent Evaluating Design Final Drawings against Design Requirements - Space and Equipment	0	hours	Average time spent by Architect in validating Design Final drawings before submission to Owners Rep
Avg. Time Spent making Corrections due to Non-Conformance with Space or Product Program	0	hours	Average time spent by Architect making corrections based on internal evaluation and feedback from Owners Rep.
Percentage of Time Spent by Licensed Professional Architect	0	%	Percentage of time spent by Licensed Architect to take off all equipment pieces and to calculate areas
Percentage of Time Spent by Architect Drafter	0	%	Percentage of time spent by Architect Drafter to take off all equipment pieces and to calculate areas

Avg. Number of Transmittals	0	Transmit-tals	Average number of times final drawings, narra-tives, specifications and comments are sent and received between the Architect and Owners Rep times the number of recipients for each exchange.
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	Average time spent in printing and making copies of drawings, narratives and specifications by Archi-tect / Planner
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep to Architect*	0	$ / Trans-mittal	Average cost for mailing documents/comments sent between Owners Rep and Architect
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Ar-chitect to Owners Rep*	0	$ / Trans-mittal	Average cost for mailing proposal between Archi-tect and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	Average time spent compiling copies of final draw-ings, narratives, specifications for transmittal by Architect
Request for Proposal			
Avg. Number of Transmittals	0	Transmit-tals	Average number of times RFP Package is sent from Owners Rep to Contractor times the number of recipients for purpose of bidding.
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	Average time spent in printing and making copies of RFP Package by Owners Rep.
Avg. Mailing Cost per Transmittal ($ / Transmittal)	0	$ / Trans-mittal	Average cost for mailing RFP by Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	Time spent compiling documents, drawings or specifications for transmittal by Owners Rep.
Avg. Number of Request for Proposal Submittal Sets Reqd.	0	submittal sets	Average number of RFP sets required for submis-sion

Inquiry Issue			
Avg. Number of Transmittals	0	Transmit-tals	Average number of times Inquiry Issues and re-sponses are sent and received between Owners Rep, Architect and Contractor times the number of recipients for each exchange
Avg. Mailing Cost per Transmittal ($ / Transmittal)	0	$ / Trans-mittal	Average cost for mailing documents/comments sent between Owners Rep, Architect, and Con-tractor
Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal) - *Contractor / Architect*	0	hours / transmittal	Time spent compiling documents, drawings or specifications for transmittal by Architect and Con-tractor
Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal) - *Owners Rep*	0	hours / transmittal	Time spent compiling documents, drawings or specifications for transmittal by Owners Rep.
Pre-Construction Plan			
Inquiry Issue (RFI)			
Avg. Number of RFIs	0	Transmit-tals	Average number of times Inquiry Issues (RFI) and responses are sent and received between Owners Rep, Architect and Contractor times the number of recipients for each exchange
Avg. Mailing Cost per Transmittal ($ / Transmittal)	0	$ / Trans-mittal	Average cost for mailing documents/comments sent between Owners Rep, Architect, and Con-tractor
Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal) - Contractor / Architect	0	hours / transmittal	Average Time spent compiling Inquiry Issues (RFI) for transmittal by Architect and Contractor

Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal) - *Owner*	0.00	hours / transmittal	Average Time spent compiling Inquiry Issues (RFI) for transmittal by Owners Rep
Product Type Selection			
System Layout			
Submittal Package			
Average Time Spent Organizing Equipment (product) Type information (hours / submittal item)	0.00	hours / submittal item	Average Time spent by asst. project manager in producing submittal information by organizing equipment type information
Average Time Spent Evaluating Equipment (product) Type Submittal Items against Contract Documents (hours / submittal item)	0.00	hours / submittal item	Average Time spent evaluating submittal items
Avg. Time to Sign each Page (hours / page)	0.00	hours/page	Average time required by Contractor to sign pages of Submittal Package
Avg. Time to Stamp each Sheet (hours / sheet)	0.00	hours/sheet	Average time required by Contractor to stamp sheets of Submittal Package
Percentage of Submittals Items rejected	0.00	%	Percentage of items rejected
Percentage of Time Spent by Construction Project Manager	0.00	%	Percentage of time spent by Construction Project Manager in validating Submittal Information
Percentage of Time Spent by Assistant (Construction) Project Manager	0.00	%	Percentage of time spent by Assistant Construction Project Manager in validating Submittal Information
Avg. Number of Transmittals	0.00	Transmittals	Average number of times Submittal Packages are sent and received between Owners Rep, Architect and Contractor times the number of recipients for each exchange

Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0.00	hours / submittal set	Average time spent in printing and making copies of Submittal Package by Contractor
Average Mailing Costs per Transmittal ($)	0.00	$ / Trans-mittal	Average cost for Mailing documents/transmittals sent between Owners Rep and Contractor
Avg. Time to Prepare Transmittal (hours / transmittal)	0.00	hours / transmittal	Average time spent compiling Submittal Package for transmittal by Architect / Contractor
Submittal Issue			
Avg. Time Spent Evaluating Product Type Submittal Items against Contract Documents (hours / product type submittal item)	0	hours / submittal item	Average Time spent by Architect in evaluating submittal package of equipment types
Avg. Time Spent Revising one Product Submittal Item (hours / product)	0	hours / product	Average Time spent by Contractor recreating Submittal Items
Percentage of Product Submittals reviewed by Licensed Architect	0	%	Percentage of submittals reviewed by Architect
Percentage of Product Submittals rejected on first re-view	0	%	Percentage of submittals rejected upon review
Percentage of Product Submittals rejected on second review	0	%	Percentage of submittals rejected upon review
Percentage of Product Submittals rejected on third re-view	0	%	Percentage of submittals rejected upon review
Avg. Time Spent Transferring Comments per Page	0	hours / page	Time spent by Architect in marking up submittal with comments
Avg. Time Spent Transferring Comments per Sheet	0	hours / sheet	Time spent by Architect in marking up submittal with comments
Percentage of Time Spent by Construction Project Manager	0	%	Percentage of time spent by Construction Project Manager in recreating Submittal Package
Percentage of Time Spent by Assistant (Construction) Project Manager	0	%	Percentage of time spent by Assistant Construc-tion Project Manager in recreating Submittal Pack-age

Avg. Number of Transmittals	0	Transmit-tals	Average number of times Submittal Packages (pages and sheets) are sent and received between Architect and Contractor times the number of re-cipients for each exchange
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	Average time spent compiling Submittal Package for transmittal by Architect
Avg. Mailing Cost per Transmittal	0	$ / Trans-mittal	Average cost for Mailing documents/transmittals between Architect / Planner and Contractor
Purchase Order			
Product Installation			
Avg. Time Spent Re-formatting Product Installation Re-port in Office (hours/ component)	0.00	hours / component	Average time spent by Contractor in the office re-formatting report
Avg. Number of Transmittals (Transmittals)	0	Transmit-tals	Average number of times Product Installation Re-ports are sent and received between Contractor and Architect / Owner times the number of recipi-ents for each exchange
Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Trans-mittal	Average cost for mailing Product Installation Re-port by Contractor
Avg. Time to Prepare a Transmittal (hours/transmittal)	0.000	hours / transmittal	Average time spent compiling Product Installation for transmittal by Assistant Construction Manager
Start-Up			
Product Inspection			
Avg. Field Time Spent Documenting Report per Site Visit (hours / visit)	0	hours / visit	Average time spent in the field documenting data during site visits.

Avg. Number of Site Visits per month	0	visits / month	Average number of times site is visited in a month
Avg Number of Months of Construction	0	months	Average construction duration of a project
Total Time Spent in Office	0	hours / day	Total time spent in the office on a daily basis
Avg. Percentage of Office Time Spent Quantifying products in place	0	%	Average percentage of time spent in the office documenting data recorded from the field.
Avg. Number of Transmittals	0	Transmit-tals	Average number of times Inspection Reports are sent and received between Architect and Contrac-tor times the number of recipients for each ex-change
Avg. Mailing Cost per Transmittal ($ / Transmittal)	0	$ / Trans-mittal	Average cost for mailing Inspection Reports by Architect
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	Average time spent compiling Inspection Report for transmittal by Architect
Punch list Issue			
Turnover Package			
Avg. Time Spent Searching and Assembling Operations & Maintenance Manuals (hours / document)	0	hours / document	Time spent compiling O&M Manual
Avg. Time Spent Searching and Assembling Commis-sioning Report (hours / document)	0	hours / document	Time spent compiling Commissioning Report
Avg. Time Spent Searching and Assembling Record Specifications (hours / document)	0	hours / document	Time spent compiling Record Specifications
Avg. Time Spent Searching and Assembling Record (As-Built) Drawings (hours / sheet)	0	hours / sheet	Time spent compiling Record (As-Built) Drawings

Avg. Time Spent Searching and Assembling Final Approved Shop Drawings (hours / sheet)	0	hours / sheet	Time spent compiling Final Approved Shop Drawings
Avg. Number of Pages in Operations & Maintenance Manuals (pages / product)	0	pages / component	Number of Pages in Operations & Maintenance Manuals
Avg. Number of Pages in Commissioning Report	0	pages / component	Number of Pages in Commissioning Report
Avg. Number of Components & Systems to be Commissioned	0	components	Number of Components to be commissioned
Avg. Number of Pages in Record Specifications	0	pages	Number of Pages in Record Specifications
Avg. Number of Sheets in Record (As-Built) Drawings	0	sheets	Number of Sheets in Record (As-Built) Drawings
Avg. Number of Sheets in Final Approved Shop Drawings	0	sheets	Number of Sheets in Final Approved Shop Drawings
Avg. Time Spent Reviewing Operations & Maintenance Manuals (hours/page)	0	hours / page	Time Spent Reviewing Operations & Maintenance Manuals
Avg. Time Spent Reviewing Commissioning Report (hours / page)	0	hours / page	Time Spent Reviewing Commissioning Report
Avg. Time Spent Reviewing Record Specifications (hours / page)	0	hours / page	Time Spent Reviewing Record Specifications
Avg. Time Spent Reviewing Record (As-Built) Drawings (hours/ sheet)	0	hours / sheet	Time Spent Reviewing Record (As-Built) Drawings
Avg. Time Spent Reviewing Final Approved Shop Drawings (hours / sheet)	0	hours / sheet	Time Spent Reviewing Final Approved Shop Drawings
Avg. Time Spent Filing Operations & Maintenance Manuals (hours/document)	0	hours / document	Time Spent Filing Operations & Maintenance Manuals
Avg. Time Spent Filing Commissioning Report (hours/document)	0	hours / document	Time Spent Filing Commissioning Report
Avg. Time Spent Filing Record Specifications (hours/document)	0	hours / document	Time Spent Filing Record Specifications

Avg. Time Spent Filing Record (As-Built) Drawings (hours / sheet)	0	hours / sheet	Time Spent Filing Record (As-Built) Drawings
Avg. Time Spent Filing Final Approved Shop Drawings(hours / sheet)	0	hours / sheet	Time Spent Filing Final Approved Shop Drawings
Percentage of Time Spent by Construction Project Manager	0	%	Percentage of time spent by Construction Project Manager in compiling Turnover Package
Percentage of Time Spent by Assistant (Construction) Project Manager	0	%	Percentage of time spent by Assistant Construction Project Manager in compiling Turnover Package
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	Average time spent in printing and making copies of Turnover Package by Contractor
Avg. Mailing Cost per Transmittal ($ / Transmittal)	0	$ / Transmittal	Average cost for mailing Turnover Package by Contractor
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	Average time spent compiling Turnover Package for transmittal by Contractor

Expected Assumptions Tab

NOTE: Red text indicates variables affected by the expected process.

Inputs

Owner Project / Program Variables	Current Value	Unit	Reduction Factor	**Expected Outcome**	Definitions	Process
Avg. Number of Pages in Facility Criteria	0	pages		**0.00**	Estimated number of pages in Owners initial analysis of Project need and Scope.	10
Avg. Number of Pages in Discipline Specification	0	pages		**0.00**	Estimated number of pages in Equipment performance requirements during planning	20
Avg. Number of Pages in Project Definition	0	pages		**0.00**	Estimated number of pages in Project Definition document. The Project Definition defines the project scope, budget requirements, site details, economic analysis and facility planning data	40,70,80
Avg. Number of Pages in Front Matter	0	pages		**0.00**	Estimated number of pages that precede the technical content of the RFP for Design Services and Construction Services.	70, 120

Project Variables

Number of Equipment (product) Types (Types / project)	0	types / project		**0.00**	Number of different equipment types that will be installed.	60,80,90,100,110,180,190,250
Number of Tagged Components (components / project)	0	components / project		**0.00**	Total number of pieces of equipment that will have asset tags and will be managed by the owner	210
Number of Space Types per Building	0	space types / building		**0.00**	Average number of space types found in building.	50,80
Time to Log (hours / transmittal)	0	hours / transmittal	100%	**0.00**	Average Time spent logging documents In and Out	30,50,60,70,80,90,100,110,120,130,150,180,190,210,230,250

Pre-Design Variables

Avg. Number of Options	0	count		**0.00**	Average number of options created per project	30
Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)	0	sets / submittal	100%	**0.00**	Average number of pre-design drawing sets required for each submittal.	30,50,60,70
Avg. Number of Sheets per Option	0	pages		**0.00**	Average number of drawings per option.	30
Avg. Number of Letter-Sized Pages in Design Narrative per Option	0	pages		**0.00**	Average number of pages in narrative for each option.	30
Avg. Number of Pages in Space Program	0	pages		**0.00**	Typical number of pages in Space Program.	50,70,80

Avg. Number of Pages in Product Program	0	pages		**0.00**	Typical number of pages in Product Program that documents Owners equipment specifications and performance	60,70,80

Design Variables

Number of Design Submittal Sets Reqd. (sets / submittal)	0	sets / submittal	100%	**0.00**	Number of Design Phase drawing sets required	80,90,100,110
Avg. Number of Sheets in Design Early Drawings	0	drawings		**0.00**	Average number of Design Early or (Schematic Design) drawings for other disciplines	80
Avg. Number of Letter-Sized Pages in Design Early Narrative	0	pages		**0.00**	Average number of Letter-Sized Pages	80
Avg. Number of Sheets in Design Schematic Drawings	0	drawings		**0.00**	Average number of Design Schematic (Design Development) drawings	90
Avg. Number of Letter Sized Pages in Design Schematic Narrative	0	pages		**0.00**	Average number of pages in Design Schematic narrative	90
Avg. Number of Letter Sized Pages in a Design Schematic Specification	0	pages		**0.00**	Average number of pages in Design Schematic (Design Development) specifications.	90
Avg. Number of Sheets in Design Coordinated Drawings	0	drawings		**0.00**	Average number of Design Coordinated drawings	100

Avg. Number of Letter Sized Pages in a Design Coordinated Narrative	0	pages		**0.00**	Average number of pages in Design Coordinated narrative.	100
Avg. Number of Letter Sized Pages in a Design Coordinated Specification	0	pages		**0.00**	Average number of pages in Design Coordinated specifications.	100
Avg. Number of Sheets in Design Final Drawings	0	drawings		**0.00**	Average number of Design Final drawings.	110,120
Avg. Number of Letter Sized 'Pages in Design Final Narrative	0	pages		**0.00**	Average number of pages in Design Final narrative.	110,120
Avg. Number of Letter Sized Pages in Design Final Specification	0	pages		**0.00**	Average number of pages in Design Final specifications.	110,120

Estimating Process Variables

Avg QTO Time for Equipment Components (hours / plan drawing)	0.000	hours / plan drawing	90%	**0.00**	Average time spent to take off all equipment pieces installed or specified in project.	90,100,110
Avg QTO Time for Spaces in building (hours / plan drawing)	0.00	hours / plan drawing	90%	**0.00**	Average time spent to calculate areas.	90,100,110

Submittal Process Variables

Number of Submittal Sets Reqd. (sets / submittal)	0	sets / submittal	100%	**0.00**	Number of construction phase submittal sets required	180,190,250
Avg. Number of Submittal Items in a Submittal Package for each Equipment (product) Type (submittal items/submittal package)	0	submittal items / submittal package		**0.00**	Average number of product Items per submittal package	180,190

Avg. Number of Submittal Pages in a Submittal Item (pages/submittal item)	0	pages/submittal item	**0.00**	Average number of letter-sized pages per submittal item	180,190
Avg. Number of Submittal Sheets in a Submittal Item (sheets/submittal item)	0	sheets/submittal item	**0.00**	Average number of drawings required	180,190

Organizational Variables

Owner Administrative Rate ($ / hour)	-	$ / hour	**-**	Rate for activities that cover Handling of documents	10,20,30,40,250
Owners Rep. Rate ($ / hour)	-	$ / hour	**-**	Rate for activities that include Validating of documents	50,60,80,90,100
Owners Rep. Administrative Rate ($ / hour)	-	$ / hour	**-**	Rate for activities that cover Handling of documents	50,60,70,80,90,100,110,120, 130,150,180
Planner Rate ($ / hour)	-	$ / hour	**-**	Rate for professional assisting owner in Predesign activities.	50,60
Planner Administrative Rate ($ / hour)	-	$ / hour	**-**	Rate for activities that cover Handling of documents	30,50,60
Licensed Professional Architect Rate ($ / hour)	-	$ / hour	**-**	Rate including Professional Services, Overhead and Profit	80,90,100,110,190,230
Specifier	-	$ / hour	**-**		
Architect Drafter Rate ($ / hour)	-	$ / hour	**-**	Rate including Professional Services, Overhead and Profit	70,80,90,100,110,130,150,180,190,210,230
Architect Administrative Rate ($ / hour)	-	$ / hour	**-**	Rate for activities that cover Handling of documents	

Construction Project Manager Rate ($ / hour)	-	$ / hour		-	Rate including Professional Services, Overhead and Profit	180,190,200,210,250
Assistant (Construction) Project Manager Rate ($ / hour)	-	$ / hour		-	Rate including Professional Services, Overhead and Profit	180,190,210,250
Contractor Administrative Rate ($ / hour)	-	$ / hour		-	Rate for activities that cover Handling of documents	130, 150, 180, 190, 210, 230, 250

General Repro/Postal Delivery Cost

Avg. Per Page Copy Cost ($ / page)	-	$ / sheet	100%	-	-	**10,20,30,40,50,60,70,80,90,100,110,120,180,250**
Avg. Per Sheet Copy Cost ($ / sheet)	-	$ / sheet	100%	-	-	**30,70,80,90,100,110,120,180,250**

Process Specific Variables

Facility Criteria			***Reduction Factor***	**Expected Outcome**	
Avg. Number of Sets Required (sets / submittal)	0	sets / submittal	100%	**0.00**	Average number of sets required
Avg. In-house Reproduction Time Per Set (hours/set)	0	hours/set	100%	**0.00**	Average time spent in printing and making copies of Facility Criteria by Owner

Discipline Specification

Avg. Number of Sets Required (sets / submittal)	0	sets / submittal	100%	**0.00**	Average number of sets required
Avg. In-house Reproduction Time Per Set (hours/set)	0	hours/set	100%	**0.00**	Average time spent in printing and making copies of Discipline Specification by Owner
Feasibility Study					
Avg. Number of Transmittals	0	Transmittals	-	**0.00**	Average number of times options / comments are exchanged between the Planner and Owner times the number of recipients for each exchange
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	100%	**0.00**	Average time spent in printing and making copies of feasibility study by Planner
Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Transmittal	100%	**0.00**	Average cost for delivering documents/comments sent between Planner and Owner
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	60%	**0.00**	Average time spent in compiling documents for transmittal
Project Definition					
Avg. Number of Sets Required (sets / submittal)	0	sets	100%	**0.00**	Average number of sets required
Avg. In-house Reproduction Time Per Set (hours/set)	0	hours/set	100%	**0.00**	Average time spent in printing and making copies of Project Definition by Owner

Space Program

Avg. Time Spent Recreating Space Program Criteria (hours/space)	0	hours / space	100%	**0.00**	Average time spent by Planner recreating Space Program Criteria
Avg. Time Spent Reformatting Room Data Sheet (hours/space)	0.000	hours	100%	**0.00**	Average time spent in evaluating information in Project Definition and identifying and creating a detailed spatial program
Avg. Time to Compare Space Program with Owner Standards (hours)	0	hours	90%	**0.00**	Average time spent by Owners Rep in validating Space Program provided by planner
Avg. Percentage of errors in Space Program	0%	%	100%	**0.00**	Average percentage of errors found by Owners Rep in Space Program
Avg. Time Spent Recreating Space Program (hours/space)	0	hours / space	100%	**0.00**	Average time spent by Planner recreating Space Program
Avg. Number of Re-Submit Cycles	0	Cycles	100%	**0.00**	Average number of times submitted documents are re-submitted
Avg. Number of Transmittals	0	Transmittals	-	**0.00**	Average number of times Space Program / Comments are sent between the Planner and Owners Rep times the number of recipients for each exchange.

Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Transmittal	100%	**-**	Average cost for delivering documents/comments sent between Planner and Owners Rep
Avg. Time to Prepare Transmittal (hours / transmittal)	0.00	hours / transmittal	60%	**0.00**	Average time spent in compiling documents for transmittal
Product Program					
Avg. Time Spent Recreating Product Program Criteria (hours / product)	0	hours / product	100%	**0.00**	Average time spent by Planner recreating Product Program Criteria
Avg Time to Compare Product Program with Owner Standards (hours/product)	0	hour	90%	**0.00**	Average time spent by Owners Rep in validating Product Program provided by Planner
Avg. Percentage of errors in Product Program	0%	%	100%	**0.00**	Average percentage of errors found by Owners Rep in Product Program
Avg. Time Spent Recreating Product Program (hours/product)	0.000	hours / product	100%	**0.00**	Average time spent by Planner recreating Product Program
Avg. Number of Re-Submit Cycles	0	Cycles	100%	**0.00**	Average number of times submitted documents are re-submitted
Avg. Number of Transmittals	0	Transmittals	-	**0.00**	Average number of times Product Program / Comments are sent between the Planner and Owners Rep times the number of recipients for each exchange.

Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Transmittal	100%	-	Average cost for mailing documents/comments sent between Planner and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0.00	hours / transmittal	60%	0.00	Average time spent in compiling documents for transmittal.
Request for Proposal					
Avg. Number of Letter Sized Pages in RFP (pages / proposal)	0	pages / proposal		0.00	Average number of Letter-Sized Pages
Avg. Number of Drawing Sheets in Proposal (sheets / proposal)	0	sheets / proposal		0.00	Average number of Drawings
Number of RFP copies Reqd. (sets / submittal)	0	sets / submittal	100%	0.00	Number of RFP copies required
Avg. Number of Transmittals - *Owners Rep documents to Bidders*	0	Transmittals	-	0.00	Average number of times Proposal is sent from the Owners Rep to the Bidders times the number of recipients for each exchange.
Avg. Number of Transmittals - *Architect to Owner*	0	Transmittals	-	0.00	Average number of times Proposal is sent from the Architect to the Owners Rep times the number of recipients for each exchange.
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	100%	0.00	Average time spent in printing and making copies of Proposal by Architect

Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep documents to Bidders*	-	$ / Transmittal	100%	**-**	Average cost for mailing proposal between Architect and Owners Rep.
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Architect to Owners Rep*	-	$ / Transmittal	100%	**-**	Average cost for mailing proposal between Architect and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal) - *Owners Rep*	0	hours / transmittal	60%	**0.00**	Average time spent in compiling documents for transmittal / submission
Avg. Time to Prepare Transmittal (hours / transmittal) - *Architect*	0	hours / transmittal	60%	**0.00**	Average time spent in compiling documents for transmittal / submission
Design Early					
Avg. Time Spent Reformatting Space Program Requirements(hours / space type)	0.00	hours / space type	100%	**0.00**	Average time spent by Architect in reformatting spatial requirements
Avg. Time Spent Reformatting Equipment Type (hours /product)	0	hours / product	100%	**0.00**	Average Time spent by Architect reformatting equipment types
Avg. Time Spent Evaluating Design Early Drawings against Design Requirements - Space and Equipment	0	hours	90%	**0.00**	Average time spent by Architect in validating Design Early drawings before submission to Owners Rep
Avg. Time spent making corrections due to non-conformance with Space or Product Program	0	hours	100%	**0.00**	Average time spent by Architect making corrections based on internal evaluation and feedback from Owners Rep.

Avg Time to Compare Design Early Documents with Owner Standards	0	hours	90%	**0.00**	Average time spent by Owners Rep in validating Design Early documents
Avg. Number of Re-Submit Cycles	0	Cycles	100%	**0.00**	Average number of times submitted documents are re-submitted
Percentage of Time Spent by Licensed Professional Architect	0%	%	-	**0%**	Percentage of time spent by Licensed Architect reformatting Space Program, Equipment Type and Project Definition
Percentage of Time Spent by Architect Drafter	0%	%	-	**0%**	Percentage of time spent by Architect Drafter reformatting Space Program, Equipment Type and Project Definition
Avg. Number of Transmittals	0	Transmittals	-	**0.00**	Average number of times drawings, narratives and comments are sent and received between the Architect / Planner and Owner times the number of recipients for each exchange
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	100%	**0.00**	Average time spent in printing and making copies of drawings and narratives by Architect / Planner
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep to Architect*	-	$ / Transmittal	100%	**-**	Average cost for mailing documents/comments sent between Owners Rep and Architect

Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Architect to Owners Rep*	-	$ / Transmittal	100%	**-**	Average cost for mailing documents/comments between Architect and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	60%	**0.00**	Average time spent compiling copies of drawings, narratives and comments for transmittal by Architect and Owners Rep.
Design Schematic					
Avg. Number of Plan Drawings in Design Schematic Drawings	0	plans / drawing set	-	**0.00**	Average number of Plan Drawings
Avg. Time Spent Developing Equipment (product) Type Template (hours / product type)	0	hours / product type	70%	**0.00**	Time spent by Architect in developing product requirement for equipment types required for the project
Avg. Time Spent Evaluating Design Schematic Drawings against Design Requirements - Space and Equipment	0	hours	90%	**0.00**	Average time spent by Architect in validating Design Schematic drawings before submission to Owners Rep
Avg. Time spent making corrections due to non-conformance with Space or Product Program	0.0	hours	100%	**0.00**	Average time spent by Architect making corrections based on internal evaluation and feedback from Owners Rep.
Avg Time to Compare Design Schematic Documents with Owner Standards	0	hours	90%	**0.00**	Average time spent by Owners Rep in validating Design Schematic documents

Avg. Number of Re-Submit Cycles	0	Cycles	100%	**0.00**	Average number of times submitted documents are re-submitted
Percentage of Time Spent by Licensed Professional Architect	0%	%	-	**0%**	Percentage of time spent by Licensed Architect to take off all equipment pieces and to calculate areas
Percentage of Time Spent by Architect Drafter	0%	%	-	**0%**	Percentage of time spent by Architect Drafter to take off all equipment pieces and to calculate areas
Avg. Number of Transmittals	0	Transmittals	-	**0.00**	Average number of times schematic drawings, narratives, specifications and comments are sent and received between the Architect / Planner and Owner times the number of recipients for each exchange
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0.00	hours/submittal set	100%	**0.00**	Average time spent in printing and making copies of drawings, narratives and specifications by Architect / Planner
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep to Architect*	-	$ / Transmittal	100%	**-**	Average cost for mailing documents/comments sent between Owners Rep and Architect

Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Architect to Owners Rep*	-	$ / Transmittal	100%	**-**	Average cost for mailing documents/comments between Architect and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	60%	**0.00**	Average time spent compiling copies of schematic drawings, narratives, specifications and comments for transmittal by Architect and Owners Rep.
Design Coordinated					
Avg. Number of Plan Drawings in Design Coordinate Drawings	0	plans / drawing set	-	**0.00**	Average number of Plan Drawings
Avg. Time Spent Developing Detailed Equipment (products) Type Template (hours / product)	0	hours / product	70%	**0.00**	Time spent by Architect in preparing a detailed product requirement list based on equipment types
Avg. Time Searching for Product Literature for Candidates (Hours/product)	0	hours / product	90%	**0.00**	Average Time spent by Architect in searching for product data
Avg. Time Spent Evaluating Design Coordinated Drawings against Design Requirements - Space and Equipment	0	hours	90%	**0.00**	Average time spent by Architect in validating Design Coordinated drawings before submission to Owners Rep
Avg. Time Spent making Corrections due to Non-Conformance with Space Program	0.00	hours	100%	**0.00**	Average time spent by Architect making corrections based on internal evaluation and feedback from Owners Rep.

Avg. Percent of Errors in Product Type Candidate	0%	%	100%	**0.00**	Percentage of errors in Product Type List
Avg Time to Compare Design Coordinated & Product Type Candidate Documents with Owner Standards	0	hours	90%	**0.00**	Average time spent by Owners Rep in validating Design Coordinated documents
Avg. Number of Re-Submit Cycles	0	Cycles	100%	**0.00**	Average number of times submitted documents are re-submitted
Percentage of Time Spent by Licensed Professional Architect	0%	%	-	**80%**	Percentage of time spent by Licensed Architect to take off all equipment pieces and to calculate areas
Percentage of Time Spent by Architect Drafter	0%	%	-	**20%**	Percentage of time spent by Architect Drafter to take off all equipment pieces and to calculate areas
Avg. Number of Transmittals	0	Transmittals	-	**0.00**	Average number of times coordinated drawings, narratives, specifications and comments are sent and received between the Architect and Owners Rep times the number of recipients for each exchange
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	100%	**0.00**	Average time spent in printing and making copies of drawings, narratives and specifications by Architect

Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep to Architect*	-	$ / Transmittal	100%	-	Average cost for mailing documents/comments sent between Architect and Owners Rep
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Architect to Owners Rep*	-	$ / Transmittal	100%	-	Average cost for mailing documents between Architect and Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	60%	**0.00**	Average time spent compiling copies of coordinated drawings, narratives, specifications and comments for transmittal by Architect and Owners Rep
Design Final					
Avg. Number of Plan Drawings in Design Final Drawings	0	plans / drawing set	-	**0.00**	Average number of Plan Drawings
Avg. Time Spent Developing Detailed Equipment (products) Type Candidate (hours / product)	0	hours / product	90%	**0.00**	Time spent by Architect in preparing a detailed product requirement list based on equipment types
Avg. Time Spent Evaluating Design Final Drawings against Design Requirements - Space and Equipment	0	hours	90%	**0.00**	Average time spent by Architect in validating Design Final drawings before submission to Owners Rep
Avg. Time Spent making Corrections due to Non-Conformance with Space or Product Program	0.00	hours	100%	**0.00**	Average time spent by Architect making corrections based on internal evaluation and feedback from Owners Rep.

Percentage of Time Spent by Licensed Professional Architect	0%	%	-	**0%**	Percentage of time spent by Licensed Architect to take off all equipment pieces and to calculate areas
Percentage of Time Spent by Architect Drafter	0%	%	-	**0%**	Percentage of time spent by Architect Drafter to take off all equipment pieces and to calculate areas
Avg. Number of Transmittals	0	Transmittals	-	**0.00**	Average number of times final drawings, narratives, specifications and comments are sent and received between the Architect and Owners Rep times the number of recipients for each exchange.
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	100%	**0.00**	Average time spent in printing and making copies of drawings, narratives and specifications by Architect / Planner
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Owners Rep to Architect*	-	$ / Transmittal	100%	**-**	Average cost for mailing documents/comments sent between Architect and Owners Rep
Avg. Mailing Cost per Transmittal ($ / Transmittal) - *Architect to Owners Rep*	-	$ / Transmittal	100%	**-**	Average cost for mailing proposal between Architect and Owners Rep.

Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmit-tal	60%	**0.00**	Average time spent compiling copies of final drawings, narra-tives, specifications for transmittal by Architect
Request for Proposal					
Avg. Number of Transmittals	0	Transmittals	-	**0.00**	Average number of times RFP Package is sent from Owners Rep to Contractor times the number of recipients for purpose of bidding.
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0.0	hours / submit-tal set	100%	**0.00**	Average time spent in printing and making copies of RFP Pack-age by Owners Rep.
Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Transmittal	100%	**-**	Average cost for mail-ing RFP by Owners Rep.
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmit-tal	60%	**0.00**	Time spent compiling documents, drawings or specifications for transmittal by Owners Rep.
Avg. Number of Request for Proposal Submittal Sets Reqd.	0	submittal sets	100%	**0.00**	Average number of RFP sets required for submission
Inquiry Issue					
Avg. Number of Transmittals	0	Transmittals	-	**0.00**	Average number of times Inquiry Issues and responses are sent & received be-tween Owners Rep, Arch and Cont. times the nos of recipients for each exchange

Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Transmittal	100%	**-**	Average cost for mailing documents/comments sent between Owners Rep, Architect, and Contractor
Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal) - *Contractor / Architect*	0.00	hours / transmittal	60%	**0.00**	Time spent compiling documents, drawings or specifications for transmittal by Architect and Contractor
Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal) - *Owners Rep*	0	hours / transmittal	60%	**0.00**	Time spent compiling documents, drawings or specifications for transmittal by Owners Rep.
Pre-Construction Plan					
Inquiry Issue (RFI)					
Avg. Number of RFIs	0	Transmittals	-	**0.00**	Average number of times Inquiry Issues (RFI) and responses are sent and received between Owners Rep, Architect and Contractor times the number of recipients for each exchange
Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Transmittal	100%	**-**	Average cost for mailing documents/comments sent between Owners Rep, Architect, and Contractor

Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal) - Contractor / Architect	0.00	hours / transmittal	60%	**0.00**	Average Time spent compiling Inquiry Issues (RFI) for transmittal by Architect and Contractor
Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal) - *Owner*	0.00	hours / transmittal	60%	**0.00**	Average Time spent compiling Inquiry Issues (RFI) for transmittal by Owners Rep
Product Type Selection					
Time Spent Validating Equipment (products) Type against Template (hours / product)	0	hours / product	90%	**0.00**	Time spent by Contractor in comparing equipment specifications against submittal information
System Layout					
Submittal Package					
Avg. Time Spent Organizing Equipment (product) Type information (hours / submittal item)	0.00	hours / submittal item	60%	**0.00**	Time spent by asst. project manager in producing submittal information by organizing equipment type information
Avg. Time Spent Evaluating Equipment (product) Type Submittal Items against Contract Documents (hours / submittal item)	0	hours / submittal item	90%	**0.00**	Time spent evaluating submittal items
Avg. Time to Sign each Page (hours/page)	0.000	hours/page	100%	**0.00**	Average time required by Contractor to sign pages of Submittal Package
Avg. Time to Stamp each Sheet (hours / sheet)	0.000	hours/sheet	100%	**0.00**	Average time required by Contractor to stamp sheets of Submittal Package

Percentage of Submittals Items rejected	0%	%	-	**0%**	Percentage of items rejected
Percentage of Time Spent by Construction Project Manager	0%	%	-	**0%**	Percentage of time spent by Construction Project Manager in validating Submittal Information
Percentage of Time Spent by Assistant (Construction) Project Manager	0%	%	-	**0%**	Percentage of time spent by Assistant Construction Project Manager in validating Submittal Information
Avg. Number of Transmittals	0	Transmittals	-	**0**	Average number of times Submittal Packages are sent and received between Owners Rep, Architect and Contractor times the number of recipients for each exchange
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0	hours / submittal set	100%	**0**	Average time spent in printing and making copies of Submittal Package by Contractor
Average Mailing Costs per Transmittal ($)	-	$ / Transmittal	100%	**-**	Average cost for Mailing documents/transmittals sent between Owners Rep and Contractor
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	60%	**0.00**	Average time spent compiling Submittal Package for transmittal by Architect / Contractor

Submittal Issue

Avg. Time Spent Evaluating Product Type Submittal Items against Contract Documents (hours / product type submittal item)	0	hours / submittal item	90%	**0.00**	Average Time spent by Architect in evaluating submittal package of equipment types
Avg. Time Spent Revising one Product Submittal Item (hours / product)	0	hours / product	90%	**0.00**	Average Time spent by Contractor recreating Submittal Items
Percentage of Product Submittals reviewed by Licensed Architect	0%	%	-	**0%**	Percentage of submittals reviewed by Architect
Percentage of Product Submittals rejected on first review	0%	%	90%	**0.00%**	Percentage of submittals rejected upon review
Percentage of Product Submittals rejected on second review	0%	%	100%	**0%**	Percentage of submittals rejected upon review
Percentage of Product Submittals rejected on third review	0%	%	100%	**0%**	Percentage of submittals rejected upon review
Avg. Time Spent Transferring Comments per Page	0.000	hours / submittal package	100%	**0**	Time spent by Architect in marking up submittal with comments
Avg. Time Spent Transferring Comments per Sheet	0.000	hours / submittal package	100%	**0**	Time spent by Architect in marking up submittal with comments
Percentage of Time Spent by Construction Project Manager	0%	%	-	**0%**	Percentage of time spent by Construction Project Manager in recreating Submittal Package
Percentage of Time Spent by Assistant (Construction) Project Manager	0%	%	-	**0%**	Percentage of time spent by Assistant Construction Project Manager in recreating Submittal Package

Avg. Number of Transmittals	0	Transmittals	-	**0**	Average number of times Submittal Packages (pages and sheets) are sent and received between Architect and Contractor times the number of recipients for each exchange
Avg. Time to Prepare Transmittal (hours / transmittal)	0.000	hours / transmittal	60%	**0.00**	Average time spent compiling Submittal Package for transmittal by Architect
Avg. Mailing Cost per Transmittal	-	$ / Transmittal	100%	**-**	Average cost for Mailing documents/transmittals between Architect / Planner and Contractor
Purchase Order					
Product Installation					
Avg. Time Spent Re-formatting Product Installation Report in Office (hours/ component)	0.00	hours / component	100%	**0.00**	Average time spent by Contractor in the office re-formatting report
Avg. Number of Transmittals (Transmittals)	0	Transmittals	-	**0.00**	Average number of times Product Installation Reports are sent and received between Contractor and Architect / Owner times the number of recipients for each exchange
Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Transmittal	100%	**-**	Average cost for mailing Product Installation Report by Contractor

Avg. Time to Prepare a Transmittal (hours/transmittal)	0.000	hours / transmit-tal	60%	**0.00**	Average time spent compiling Product In-stallation for transmittal by Assistant Construc-tion Manager
Start-Up					
Product Inspection					
Avg. Field Time Spent Documenting Report per Site Visit (hours / visit)	0	hours / visit	60%	**0.00**	Average time spent in the field documenting data during site visits.
Avg. Number of Site Visits per month	0	visits / month	-	0.00	Average number of times site is visited in a month
Avg Number of Months of Construction	0	months	-	0.00	Average duration of project
Total Time Spent in Office (hours / day)	0	hours / day	-	**0.00**	Total time spent in the office on a daily basis
Avg. Percentage of Office Time Spent Quantifying products in place	0%	%	90%	**0.00%**	Average percentage of time spent in the office documenting data rec-orded from the field.
Avg. Number of Transmittals	0	Transmittals	-	0.00	Average number of times Product Inspec-tion Reports are sent and received between Architect and Contrac-tor times the number of recipients for each exchange
Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Transmittal	100%	**-**	Average cost for mail-ing Inspection Reports by Architect

Avg. Time to Prepare Transmittal (hours / transmittal)	0.000	hours / transmit-tal	60%	**0.00**	Average time spent compiling Inspection Report for transmittal by Architect
Punch list Issue					
Turnover Package					
Avg. Time Spent Searching and Assembling Opera-tions & Maintenance Manuals (hours / document)	0	hours / docu-ment	90%	**0.00**	Time spent compiling O&M Manual
Avg. Time Spent Searching and Assembling Commis-sioning Report (hours / document)	0	hours / docu-ment	90%	**0.00**	Time spent compiling Commissioning Report
Avg. Time Spent Searching and Assembling Record Specifications (hours / document)	0	hours / docu-ment	90%	**0.00**	Time spent compiling Record Specifications
Avg. Time Spent Searching and Assembling Record (As-Built) Drawings (hours / sheet)	0	hours / sheet	90%	**0.00**	Time spent compiling Record (As-Built) Drawings
Avg. Time Spent Searching and Assembling Final Ap-proved Shop Drawings (hours / sheet)	0.0000	hours / sheet	90%	**0.0000**	Time spent compiling Final Approved Shop Drawings
Avg. Number of Pages in Operations & Maintenance Manuals (pages / product)	0	pages / compo-nent	-	**0.00**	Number of Pages in Operations & Mainte-nance Manuals
Avg. Number of Pages in Commissioning Report	0	pages / compo-nent	-	**0.00**	Number of Pages in Commissioning Report
Avg. Number of Components & Systems to be Com-missioned	0	components	-	**0.00**	Number of Compo-nents to be commis-sioned
Avg. Number of Pages in Record Specifications	0	pages	-	**0.00**	Number of Pages in Record Specifications
Avg. Number of Sheets in Record (As-Built) Drawings	0	sheets	-	**0.00**	Number of Sheets in Record (As-Built) Drawings

Avg. Number of Sheets in Final Approved Shop Drawings	0	sheets	-	**0.00**	Number of Sheets in Final Approved Shop Drawings
Avg. Time Spent Reviewing Operations & Maintenance Manuals (hours/page)	0.0000	hours / page	0%	**0.0000**	Time Spent Reviewing Operations & Maintenance Manuals
Avg. Time Spent Reviewing Commissioning Report (hours / page)	0.0000	hours / page	0%	**0.0000**	Time Spent Reviewing Commissioning Report
Avg. Time Spent Reviewing Record Specifications (hours / page)	0.0000	hours / page	100%	**0**	Time Spent Reviewing Record Specifications
Avg. Time Spent Reviewing Record (As-Built) Drawings (hours/ sheet)	0.0000	hours / sheet	0%	**0.000**	Time Spent Reviewing Record (As-Built) Drawings
Avg. Time Spent Reviewing Final Approved Shop Drawings (hours / sheet)	0.0000	hours / sheet	100%	**0.000**	Time Spent Reviewing Final Approved Shop Drawings
Avg. Time Spent Filing Operations & Maintenance Manuals (hours/document)	0.000	hours / document	100%	**0.000**	Time Spent Filing Operations & Maintenance Manuals
Avg. Time Spent Filing Commissioning Report (hours/document)	0	hours / document	100%	**0.000**	Time Spent Filing Commissioning Report
Avg. Time Spent Filing Record Specifications (hours/document)	0.000	hours / document	100%	**0.000**	Time Spent Filing Record Specifications
Avg. Time Spent Filing Record (As-Built) Drawings (hours / sheet)	0.0000	hours / sheet	100%	**0.000**	Time Spent Filing Record (As-Built) Drawings
Avg. Time Spent Filing Final Approved Shop Drawings(hours / sheet)	0.0000	hours / sheet	100%	**0.000**	Time Spent Filing Final Approved Shop Drawings
Percentage of Time Spent by Construction Project Manager	0%	%	-	**0%**	Percentage of time spent by Construction Project Manager in compiling Turnover Package

Percentage of Time Spent by Assistant (Construction) Project Manager	0%	%	-	**0%**	Percentage of time spent by Assistant Construction Project Manager in compiling Turnover Package
Avg. In-house Reproduction Time Per Submittal Set (hours/submittal set)	0.000	hours / submittal set	100%	**0.000**	Average time spent in printing and making copies of Turnover Package by Contractor
Avg. Mailing Cost per Transmittal ($ / Transmittal)	-	$ / Transmittal	100%	**-**	Average cost for mailing Turnover Package by Contractor
Avg. Time to Prepare Transmittal (hours / transmittal)	0	hours / transmittal	60%	**0.00**	Average time spent compiling Turnover Package for transmittal by Contractor

Summary Tab

Cost Summary				
OmniClass Project Phase (Table31)	Current Process	Expected Process	Savings	% Savings
LCie 01 - Facility Criteria	$ -	$ -	$ -	0%
LCie 02 - Design Specification	$ -	$ -	$ -	0%
LCie 03 - Feasibility Study	$ -	$ -	$ -	0%
LCie 04 - Project Definition	$ -	$ -	$ -	0%
LCie 05 - Space Program	$ -	$ -	$ -	0%
LCie 06 - Product Program	$ -	$ -	$ -	0%
LCie 07 - Request for Proposal	$ -	$ -	$ -	0%
LCie 08 - Design Early	$ -	$ -	$ -	0%
LCie 09 - Design Schematic	$ -	$ -	$ -	0%
LCie 10 -Design Coordinated	$ -	$ -	$ -	0%
LCie 11 - Design Final	$ -	$ -	$ -	0%
LCie 12 - Request for Proposal	$ -	$ -	$ -	0%
LCie 13 - Inquiry Issue	$ -	$ -	$ -	0%
LCie 14 - Pre-Construction Plan	$ -	$ -	$ -	0%
LCie 15 - Inquiry Issue (RFI)	$ -	$ -	$ -	0%
LCie 16 - Product Type Selection	$ -	$ -	$ -	0%
LCie 17 - System Layout	$ -	$ -	$ -	0%
LCie 18 - Submittal Package	$ -	$ -	$ -	0%
LCie 19 - Submittal Issue	$ -	$ -	$ -	0%
LCie 20 - Purchase Order	$ -	$ -	$ -	0%
LCie 21 - Product Installation	$ -	$ -	$ -	0%
LCie 22 - Start-Up	$ -	$ -	$ -	0%
LCie 23 - Product Inspection	$ -	$ -	$ -	0%
LCie 24 - Punchlist Issue	$ -	$ -	$ -	0%
LCie 25 - Turnover Package	$ -	$ -	$ -	0%
Total	$ -	$ -	$ -	

Breakdown by Role				
Cost Summary - Owner / Owners Rep				
OmniClass Project Phase	**Current Process**	**Expected Process**	**Savings**	**% Savings by Role**
LCie 01 - Facility Criteria	$ -	$ -	$ -	0%
LCie 02 - Design Specification	$ -	$ -	$ -	0%
LCie 03 - Feasibility Study	$ -	$ -	$ -	0%
LCie 04 - Project Definition	$ -	$ -	$ -	0%
LCie 05 - Space Program	$ -	$ -	$ -	0%
LCie 06 - Product Program	$ -	$ -	$ -	0%
LCie 07 - Request for Proposal	$ -	$ -	$ -	0%
LCie 08 - Design Early	$ -	$ -	$ -	0%
LCie 09 - Design Schematic	$ -	$ -	$ -	0%
LCie 10 -Design Coordinated	$ -	$ -	$ -	0%
LCie 11 - Design Final	$ -	$ -	$ -	0%
LCie 12 - Request for Proposal	$ -	$ -	$ -	0%
LCie 13 - Inquiry Issue	$ -	$ -	$ -	0%
LCie 14 - Pre-Construction Plan	$ -	$ -	$ -	0%
LCie 15 - Inquiry Issue (RFI)	$ -	$ -	$ -	0%
LCie 16 - Product Type Selection	$ -	$ -	$ -	0%
LCie 17 - System Layout	$ -	$ -	$ -	0%
LCie 18 - Submittal Package	$ -	$ -	$ -	0%
LCie 19 - Submittal Issue	$ -	$ -	$ -	0%
LCie 20 - Purchase Order	$ -	$ -	$ -	0%
LCie 21 - Product Installation	$ -	$ -	$ -	0%
LCie 22 - Start-Up	$ -	$ -	$ -	0%
LCie 23 - Product Inspection	$ -	$ -	$ -	0%
LCie 24 - Punchlist Issue	$ -	$ -	$ -	0%
LCie 25 - Turnover Package	$ -	$ -	$ -	
Total	**$ -**	**$ -**	**$ -**	

Cost Summary - Architect				
OmniClass Project Phase	**Current Process**	**Expected Process**	**Savings**	**% Savings by Role**
LCie 01 - Facility Criteria	$ -	$ -	$ -	0%
LCie 02 - Design Specification	$ -	$ -	$ -	0%
LCie 03 - Feasibility Study	$ -	$ -	$ -	0%
LCie 04 - Project Definition	$ -	$ -	$ -	0%
LCie 05 - Space Program	$ -	$ -	$ -	0%
LCie 06 - Product Program	$ -	$ -	$ -	0%
LCie 07 - Request for Proposal	$ -	$ -	$ -	0%
LCie 08 - Design Early	$ -	$ -	$ -	0%
LCie 09 - Design Schematic	$ -	$ -	$ -	0%
LCie 10 -Design Coordinated	$ -	$ -	$ -	0%
LCie 11 - Design Final	$ -	$ -	$ -	0%
LCie 12 - Request for Proposal	$ -	$ -	$ -	0%
LCie 13 - Inquiry Issue	$ -	$ -	$ -	0%
LCie 14 - Pre-Construction Plan	$ -	$ -	$ -	0%
LCie 15 - Inquiry Issue (RFI)	$ -	$ -	$ -	0%
LCie 16 - Product Type Selection	$ -	$ -	$ -	0%
LCie 17 - System Layout	$ -	$ -	$ -	0%
LCie 18 - Submittal Package	$ -	$ -	$ -	0%
LCie 19 - Submittal Issue	$ -	$ -	$ -	0%
LCie 20 - Purchase Order	$ -	$ -	$ -	0%
LCie 21 - Product Installation	$ -	$ -	$ -	0%
LCie 22 - Start-Up	$ -	$ -	$ -	0%
LCie 23 - Product Inspection	$ -	$ -	$ -	0%
LCie 24 - Punchlist Issue	$ -	$ -	$ -	0%
LCie 25 - Turnover Package	$ -	$ -	$ -	0%
Total	**$ -**	**$ -**	**$ -**	

Cost Summary - Contractor				
OmniClass Project Phase	**Current Process**	**Expected Process**	**Savings**	**% Savings by Role**
LCie 01 - Facility Criteria	$ -	$ -	$ -	0%
LCie 02 - Design Specification	$ -	$ -	$ -	0%
LCie 03 - Feasibility Study	$ -	$ -	$ -	0%
LCie 04 - Project Definition	$ -	$ -	$ -	0%
LCie 05 - Space Program	$ -	$ -	$ -	0%
LCie 06 - Product Program	$ -	$ -	$ -	0%
LCie 07 - Request for Proposal	$ -	$ -	$ -	0%
LCie 08 - Design Early	$ -	$ -	$ -	0%
LCie 09 - Design Schematic	$ -	$ -	$ -	0%
LCie 10 -Design Coordinated	$ -	$ -	$ -	0%
LCie 11 - Design Final	$ -	$ -	$ -	0%
LCie 12 - Request for Proposal	$ -	$ -	$ -	0%
LCie 13 - Inquiry Issue	$ -	$ -	$ -	0%
LCie 14 - Pre-Construction Plan	$ -	$ -	$ -	0%
LCie 15 - Inquiry Issue (RFI)	$ -	$ -	$ -	0%
LCie 16 - Product Type Selection	$ -	$ -	$ -	0%
LCie 17 - System Layout	$ -	$ -	$ -	0%
LCie 18 - Submittal Package	$ -	$ -	$ -	0%
LCie 19 - Submittal Issue	$ -	$ -	$ -	0%
LCie 20 - Purchase Order	$ -	$ -	$ -	0%
LCie 21 - Product Installation	$ -	$ -	$ -	0%
LCie 22 - Start-Up	$ -	$ -	$ -	0%
LCie 23 - Product Inspection	$ -	$ -	$ -	0%
LCie 24 - Punchlist Issue	$ -	$ -	$ -	0%
LCie 25 - Turnover Package	$ -	$ -	$ -	0%
Total	**$ -**	**$ -**	**$ -**	

LCie Process Tabs

Process Name	Facility Criteria
OmniClass Stage	31-10 11 14 Project Description Phase
OmniClass Role	34-21 14 00 Owner
Description	Standard facility information must be available in order to determine the basic requirements for a potential project. The owner indentifies the need and either develops technical criteria for the facility if none exist or utilizes existing technical criteria if available. If it does exist, this information must be checked for relevancy every five years to remain consistent with overall needs.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

010.01	Identify Need			
010.02.10	Review Existing Facility Criteria			
010.02.30	Produce Facility Criteria			
COPYING/ ELEC.DOC.	**010.02.40**	**Copy Facility Criteria** (UFC Criteria)		
	0	Avg. Number of Pages in Facility Criteria		
	0	Avg. Number of Sets Required (sets / submittal)		
	0	Avg. Per Page Copy Cost ($ / page)		
	0.000	Avg. In-house Reproduction Time Per Set (hours/set)		
	0	Owner Administrative Rate ($ / hour)	$0.00	
		Reproduction Costs	$0.00	
		SubTotal		$0.00
			Current Process Total	$0.00

Expected Process

010.01	Identify Need			
010.02.10	Review Existing Facility Criteria			
010.02.30	Produce Facility Criteria			
COPYING/ ELEC.DOC.	**010.02.40**	**Copy Facility Criteria** (UFC Criteria)		
	0	Avg. Number of Pages in Facility Criteria		
	0	Avg. Number of Sets Required (sets / submittal)		
	0	Avg. Per Page Copy Cost ($ / page)		
	0	Avg. In-house Reproduction Time Per Set (hours/set)		
	0	Owner Administrative Rate ($ / hour)	$0.00	
		Reproduction Costs	$0.00	
		SubTotal		$0.00
			Expected Process Total	$0.00

Process Name	Discipline Specifications
OmniClass Stage	
OmniClass Role	
Description	Specification information for equipment based on facility criteria is generated early in the planning process by the Owner. This information must be check for relevancy every five years to remain consistent with overall needs.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

020.01	Identify Need			
020.02.10	Review Existing Discipline Specification			
020.02.30	Produce Discipline Specification			
COPYING/ ELEC.DOC.	**020.02.40**	**Copy Discipline Specification**		
	0	Avg. Number of Pages in Discipline Specification		
	0	Avg. Number of Sets Required (sets / submittal)		
	$0.00	Avg. Per Page Copy Cost ($ / page)		
	0	Avg. In-house Reproduction Time Per Set (hours/set)		
	$0.00	Owner Administrative Rate ($ / hour)	$0.00	
		Reproduction Costs	$0.00	
		SubTotal		$0.00
			Current Process Total	$0.00

Expected Process

020.01	Identify Need			
020.02.10	Review Existing Discipline Specification			
020.02.30	Produce Discipline Specification			
COPYING/ ELEC.DOC.	**020.02.40**	**Copy Discipline Specification**		
	0	Avg. Number of Pages in Discipline Specification		
	0	Avg. Number of Sets Required (sets / submittal)		
	$0.00	Avg. Per Page Copy Cost ($ / page)		
	0	Avg. In-house Reproduction Time Per Set (hours/set)		
	$0.00	Owner Administrative Rate ($ / hour)	$0.00	
		Reproduction Costs	$0.00	
		SubTotal		$0.00
			Expected Process Total	$0.00

Process Name	Feasibility Study
OmniClass Stage	
OmniClass Role	
Description	The Feasibility Study allows the Owner to evaluate different options (typically three) based on the identified requirements before finalizing specific information about the project. The Architect or Planner develops the study based on the information contained in the Facility Criteria and Discipline Specification information exchanges.

Information Attributes

		Owner	Architect/ Planner	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

030.01 Receive Facility Criteria and Discipline Specifications

030.02 Review Facility Criteria and Discipline Specifications Data

030.03 Produce Feasibility Study

COPYING/ ELEC.DOC. **030.04 Copy Feasibility Study**

0	Avg. Number of Options	
0	Avg. Number of Sheets per Option	
0	Avg. Number of Letter-Sized Pages in Design Narrative per Option	
0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)	
$0.00	Avg. Per Page Copy Cost ($ / page)	
$0.00	Avg. Per Sheet Copy Cost ($ / sheet)	
0	Avg. In-house Reproduction Time Per Set (hours/set)	
$ -	Planner Administrative Rate ($ / hour)	$0.00
	Reproduction Costs	$0.00

Expected Process

030.01 Receive Facility Criteria and Discipline Specifications

030.02 Review Facility Criteria and Discipline Specifications Data

030.03 Produce Feasibility Study

COPYING/ ELEC.DOC. **030.04 Copy Feasibility Study**

0	Avg. Number of Options	
0	Avg. Number of Sheets per Option	
0	Avg. Number of Letter-Sized Pages in Design Narrative per Option	
0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)	
$0.00	Avg. Per Page Copy Cost ($ / page)	
$0.00	Avg. Per Sheet Copy Cost ($ / sheet)	
0.00	Avg. In-house Reproduction Time Per Set (hours/set)	
$ -	Planner Administrative Rate ($ / hour)	$0.00
	Reproduction Costs	$0.00

HANDLING/ ELEC.DOC.	030.05	Send Feasibility Study			HANDLING/ ELEC.DOC.	030.05	Send Feasibility Study	
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)	
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
	0.000	Avg. Time to Prepare a Transmittal (hours/transmittal)				0.000	Avg. Time to Prepare a Transmittal (hours/transmittal)	
	$0.00	Planner Administrative Rate ($ / hour)	$0.00			$0.00	Planner Administrative Rate ($ / hour)	$0.00	
		Mailing Costs	$0.00				Mailing Costs	$0.00	
		SubTotal		**$0.00**			**SubTotal**		**$0.00**
HANDLING/ ELEC.DOC.	030.06	Log Transmittal of Feasibility Study			HANDLING/ ELEC.DOC.	030.06	Log Transmittal of Feasibility Study	
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)	
	0.00	Time to Log (hours / transmittal)				0	Time to Log (hours / transmittal)	
	$0.00	Planner Administrative Rate ($ / hour)	$0.00			$0.00	Planner Administrative Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**			**SubTotal**		**$0.00**
	030.07	Receive Feasibility Study				030.07	Receive Feasibility Study	
HANDLING/ ELEC.DOC.	030.08	Log Receipt of Feasibility Study			HANDLING/ ELEC.DOC.	030.08	Log Receipt of Feasibility Study	
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)	
	0	Time to Log (hours / transmittal)				0	Time to Log (hours / transmittal)	
	$0.00	Owner Administrative Rate ($ / hour)	$0.00			$0.00	Owner Administrative Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**			**SubTotal**		**$0.00**
	030.09	Review Feasibility Study				030.09	Review Feasibility Study	
HANDLING/ ELEC.DOC.	030.10.20	Send Comments to Planner			HANDLING/ ELEC.DOC.	030.10.20	Send Comments to Planner	
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)	
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)				0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)	
	$0.00	Owner Administrative Rate ($ / hour)	$0.00			$0.00	Owner Administrative Rate ($ / hour)	$0.00	
		Mailing Costs	$0.00				Mailing Costs	$0.00	
		SubTotal		**$0.00**			**SubTotal**		**$0.00**
HANDLING/ ELEC.DOC.	030.10.21	Log Transmittal of Feasibility Study Comments			HANDLING/ ELEC.DOC.	030.10.21	Log Transmittal of Feasibility Study Comments	
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)	
	0	Time to Log (hours / transmittal)				0	Time to Log (hours / transmittal)	
	$0.00	Owner Administrative Rate ($ / hour)	$0.00			$0.00	Owner Administrative Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**			**SubTotal**		**$0.00**

	030.11	Receive Feasibility Review Comments			
HANDLING/ ELEC.DOC.	030.12	**Log Receipt of Review Comments**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
	030.13	Revise Feasibility Study			
COPYING/ ELEC.DOC.	030.14	**Copy Revised Feasibility Study**			
	0	Avg. Number of Options			
	0	Avg. Number of Sheets per Option			
	0	Avg. Number of Letter-Sized Pages in Design Narrative per Option			
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		Reproduction Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	030.15	**Send Revised Feasibility Study**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	030.16	**Log Transmittal of Revised Feasibility Study**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
			Current Process Total	**$0.00**	

	030.11	Receive Feasibility Review Comments			
HANDLING/ ELEC.DOC.	030.12	**Log Receipt of Review Comments**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
	030.13	Revise Feasibility Study			
COPYING/ ELEC.DOC.	030.14	**Copy Revised Feasibility Study**			
	0	Avg. Number of Options			
	0	Avg. Number of Sheets per Option			
	0	Avg. Number of Letter-Sized Pages in Design Narrative per Option			
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		Reproduction Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	030.15	**Send Revised Feasibility Study**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	030.16	**Log Transmittal of Revised Feasibility Study**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
			Expected Process Total	**$0.00**	

Process Name Project Definition
OmniClass Stage 31-10 11 14 Project Description Phase
OmniClass Role 34-21 14 00 Owner

Description Initial criteria about a project must be established in order to evaluate the project feasibility. The Owner evaluates the Facility Criteria, Discipline Specification, and Feasibility Study to determine whether or not to move forward with the project.

Information Attributes

		Owner	Architect/ Planner	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

040.01 Review Information for Facility Criteria, Discipline Specifications, and Feasibility Study

040.02 Evaluate Total Risk

040.03.10 Produce Project Definition

COPYING/ ELEC.DOC. **040.03.30 Copy Project definition**

0	Avg. Number of Pages in Project Definition	
0	Avg. Number of Sets Required (sets / submittal)	
$0.00	Avg. Per Page Copy Cost ($ / page)	
0	Avg. In-house Reproduction Time Per Set (hours/set)	
$0.00	Owner Administrative Rate ($ / hour)	$0.00
	Reproduction Costs	$0.00
	SubTotal	**$0.00**
	Current Process Total	**$0.00**

Expected Process

040.01 Review Information for Facility Criteria, Discipline Specifications, and Feasibility Study

040.02 Evaluate Total Risk

040.03.10 Produce Project Definition

COPYING/ ELEC.DOC. **040.03.30 Copy Project definition**

0	Avg. Number of Pages in Project Definition	
0	Avg. Number of Sets Required (sets / submittal)	
$0.00	Avg. Per Page Copy Cost ($ / page)	
0	Avg. In-house Reproduction Time Per Set (hours/set)	
$0.00	Owner Administrative Rate ($ / hour)	$0.00
	Reproduction Costs	$0.00
	SubTotal	**$0.00**
	Expected Process Total	**$0.00**

Process Name	Space Program
OmniClass Stage	31-10 14 21 Project Programming Phase
OmniClass Role	34-21 17 00 Planner
Description	Once the Project Definition has been established and approved, further development of the project requirements can occur. The Architect or Planner evaluates information contained in the Project Definition information exchange to identify space needs based on the facility type. If no standard facility space criteria exist, it must be created by referencing similar facility types.

Information Attributes

	Owner	Planner/ Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

	050.01	Utilize Project Definition to Develop Space Program Criteria			
	050.02	Evaluate Space Program Information			
RECREATING/ COBie	050.03	**Recreate Space Program Criteria as Necessary**			
	0	Number of Space Types per Building			
	0	Avg. Time Spent Recreating Space Program Criteria (hours /space)			
	$0.00	Planner Rate ($ / hour)	$0.00		
		SubTotal			**$0.00**
REFORMATTING/ COBie	050.04	**Reformat Requirements into Room Data Sheets for Project**			
	0	Number of Space Types per Building			
	0.000	Avg. Time Spent Reformatting Room Data Sheet (hours)			
	$0.00	Planner Rate ($ / hour)	$0.00		
		SubTotal			**$0.00**

Expected Process

	050.01	Utilize Project Definition to Develop Space Program Criteria			
	050.02	Evaluate Space Program Information			
RECREATING/ COBie	050.03	**Recreate Space Program Criteria as Necessary**			
	0	Number of Space Types per Building			
	0.000	Avg. Time Spent Recreating Space Program Criteria (hours /space)			
	$0.00	Planner Rate ($ / hour)	$0.00		
		SubTotal			**$0.00**
REFORMATTING/ COBie	050.04	**Reformat Requirements into Room Data Sheets for Project**			
	0	Number of Space Types per Building			
	0.00	Avg. Time Spent Reformatting Room Data Sheet (hours)			
	$0.00	Planner Rate ($ / hour)	$0.00		
		SubTotal			**$0.00**

COPYING & HANDLING/ ELEC.DOC.	050.05	Send Copies of Space Program			
	-	Avg. Number of Pages in Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		Copying Costs	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	050.06	Log Transmittal of Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
	050.07	Receive Space Program			
HANDLING/ ELEC.DOC.	050.08	Log Receipt of Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
VALIDATING/ COBie	050.09	Validate Space Program			
	-	Avg time to Compare Space Program with Owner Standards			
	$0.00	Owners Rep. Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	050.10.10	Send Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	

COPYING & HANDLING/ ELEC.DOC.	050.05	Send Copies of Space Program			
	-	Avg. Number of Pages in Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		Copying Costs	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	050.06	Log Transmittal of Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
	050.07	Receive Space Program			
HANDLING/ ELEC.DOC.	050.08	Log Receipt of Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
VALIDATING/ COBie	050.09	Validate Space Program			
	0.00	Avg time to Compare Space Program with Owner Standards			
	$0.00	Owners Rep. Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	050.10.10	Send Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0.00	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	

HANDLING/ ELEC.DOC.	050.10.20	Log Transmittal of Space Program Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	050.11	Receive Comments			
HANDLING/ ELEC.DOC.	050.12	Log Receipt of Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
RECREATING/ COBie	050.13	Recreate Space Program			
	0%	Avg. Percentage of errors in Space Program			
	0	Number of Space Types per Building			
	0	Avg. Time Spent Recreating Space Program (hours/space)			
	0	Avg. Number of Review Cycles			
	$0.00	Planner Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
COPYING & HANDLING/ ELEC.DOC.	050.14	Send Revised Copies of Space Program			
	0	Avg. Number of Pages in Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		Copying Costs	$0.00		
		Mailing Costs	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	050.15	Log Transmittal of Revised Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
			Current Process Total	$0.00	

HANDLING/ ELEC.DOC.	050.10.20	Log Transmittal of Space Program Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0.00	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	050.11	Receive Comments			
HANDLING/ ELEC.DOC.	050.12	Log Receipt of Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0.00	Avg. Number of Review Cycles			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
RECREATING/ COBie	050.13	Recreate Space Program			
	0%	Avg. Percentage of errors in Space Program			
	0	Number of Space Types per Building			
	0.000	Avg. Time Spent Recreating Space Program (hours/space)			
	0.00	Avg. Number of Review Cycles			
	$0.00	Planner Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
COPYING & HANDLING/ ELEC.DOC.	050.14	Send Revised Copies of Space Program			
	0	Avg. Number of Pages in Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0.00	Avg. Number of Review Cycles			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		Copying Costs	$0.00		
		Mailing Costs	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	050.15	Log Transmittal of Revised Space Program			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0.00	Avg. Number of Review Cycles			
	$0.00	Planner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
			Expected Process Total	$0.00	

Process Name Product Program
OmniClass Stage 31-10 14 21 Project Programming Phase
OmniClass Role 34-21 17 00 Planner

Description The Architect or Planner evaluates information contained in the Project Definition information exchange to identify product needs based on the facility type. If no standard facility product criteria exist, it must be created by referencing similar facility types.

Information Attributes

	Owner	Planner/ Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

060.01 Utilize Project Definition & Space Requirements to Determine Product Program

060.02 Evaluate Product Program Information

RECREATING/ COBie — **060.03 Recreate Product Program Criteria as Necessary**

0	Number of Equipment (product) Types (Types / project)	
0	Avg. Time Spent Recreating Product Program Criteria(hours / product)	
$0.00	Planner Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

HANDLING/ ELEC.DOC. — **060.04 Send Copies of Product Program to Owner for Review**

-	Avg. Number of Pages in Product Program	
0	Avg. Number of Transmittals (Transmittals)	
$0.00	Avg. Per Page Copy Cost ($ / page)	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)	
0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$ -	Planner Administrative Rate ($ / hour)	$0.00
	Copying Costs	$0.00
	Mailing Costs	$0.00
	SubTotal	**$0.00**

Expected Process

060.01 Utilize Project Definition & Space Requirements to Determine Product Program

060.02 Evaluate Product Program Information

RECREATING/ COBie — **060.03 Recreate Product Program Criteria as Necessary**

0	Number of Equipment (product) Types (Types / project)	
0.000	Avg. Time Spent Recreating Product Program Criteria(hours / product)	
$0.00	Planner Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

HANDLING/ ELEC.DOC. — **060.04 Send Copies of Product Program to Owner for Review**

-	Avg. Number of Pages in Product Program	
0	Avg. Number of Transmittals (Transmittals)	
$0.00	Avg. Per Page Copy Cost ($ / page)	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)	
0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$ -	Planner Administrative Rate ($ / hour)	$0.00
	Copying Costs	$0.00
	Mailing Costs	$0.00
	SubTotal	**$0.00**

HANDLING/ ELEC.DOC.	060.05	Log Transmittal of Product Program					
		0	Avg. Number of Transmittals (Transmittals)				
		0	Time to Log (hours / transmittal)				
		$ -	Planner Administrative Rate ($ / hour)	$0.00			
			SubTotal		$0.00		
	060.06	Receive Product Program					
HANDLING/ ELEC.DOC.	060.07	Log Receipt of Product Program					
		0	Avg. Number of Transmittals (Transmittals)				
		0	Time to Log (hours / transmittal)				
		$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00			
			SubTotal		$0.00		
VALIDATING/ COBie	060.08	Validate Product Program					
		-	Avg Time to Compare Product Program with Owner Standards (hours)				
		$ -	Owners Rep. Rate ($ / hour)	$0.00			
			SubTotal		$0.00		
HANDLING/ ELEC.DOC.	060.09.10	Send Comments					
		0	Avg. Number of Transmittals (Transmittals)				
		$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				
		0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)				
		0	Avg. Number of Review Cycles				
		$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00			
			Mailing Costs	$0.00			
			SubTotal		$0.00		
HANDLING/ ELEC.DOC.	060.09.20	Log Transmittal of Product Program Comments					
		0	Avg. Number of Transmittals (Transmittals)				
		0	Time to Log (hours / transmittal)				
		0	Avg. Number of Review Cycles				
		$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00			
			SubTotal		$0.00		
	060.10	Receive Comments					

HANDLING/ ELEC.DOC.	060.05	Log Transmittal of Product Program					
		0	Avg. Number of Transmittals (Transmittals)				
		0	Time to Log (hours / transmittal)				
		$ -	Planner Administrative Rate ($ / hour)	$0.00			
			SubTotal		$0.00		
	060.06	Receive Product Program					
HANDLING/ ELEC.DOC.	060.07	Log Receipt of Product Program					
		0	Avg. Number of Transmittals (Transmittals)				
		0	Time to Log (hours / transmittal)				
		$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00			
			SubTotal		$0.00		
VALIDATING/ COBie	060.08	Validate Product Program					
		0.000	Avg Time to Compare Product Program with Owner Standards (hours)				
		$ -	Owners Rep. Rate ($ / hour)	$0.00			
			SubTotal		$0.00		
HANDLING/ ELEC.DOC.	060.09.10	Send Comments					
		0	Avg. Number of Transmittals (Transmittals)				
		$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				
		0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)				
		0.00	Avg. Number of Review Cycles				
		$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00			
			Mailing Costs	$0.00			
			SubTotal		$0.00		
HANDLING/ ELEC.DOC.	060.09.20	Log Transmittal of Product Program Comments					
		0	Avg. Number of Transmittals (Transmittals)				
		0	Time to Log (hours / transmittal)				
		0.00	Avg. Number of Review Cycles				
		$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00			
			SubTotal		$0.00		
	060.10	Receive Comments					

HANDLING/ ELEC.DOC.	060.11	Log Receipt of Product Program					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Planner Administrative Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
RECREATING/ COBie	060.12	Recreate Product Program					
	0%	Avg. Percent of errors in Product Program					
	0	Number of Equipment (product) Types (Types / project)					
	0.00	Avg. Time Spent Recreating Product Program (hours / product)					
	0	Avg. Number of Review Cycles					
	$0.00	Planner Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
COPYING & HANDLING/ ELEC.DOC.	060.13	Send Revised Copies of Product Program					
	-	Avg. Number of Pages in Product Program					
	0	Avg. Number of Transmittals (Transmittals)					
	$0.00	Avg. Per Page Copy Cost ($ / page)					
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)					
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)					
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)					
	0	Avg. Number of Review Cycles					
	$ -	Planner Administrative Rate ($ / hour)	$0.00				
		Copying Costs	$0.00				
		Mailing Costs	$0.00				
		SubTotal		$0.00			
HANDLING/ ELEC.DOC.	060.14	Log Transmittal of Revised Product Program					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Planner Administrative Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
			Current Process Total	$0.00			

HANDLING/ ELEC.DOC.	060.11	Log Receipt of Product Program					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0.00	Avg. Number of Review Cycles					
	$0.00	Planner Administrative Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
RECREATING/ COBie	060.12	Recreate Product Program					
	0%	Avg. Percent of errors in Product Program					
	0	Number of Equipment (product) Types (Types / project)					
	0.00	Avg. Time Spent Recreating Product Program (hours / product)					
	0.00	Avg. Number of Review Cycles					
	$0.00	Planner Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
COPYING & HANDLING/ ELEC.DOC.	060.13	Send Revised Copies of Product Program					
	-	Avg. Number of Pages in Product Program					
	0	Avg. Number of Transmittals (Transmittals)					
	$0.00	Avg. Per Page Copy Cost ($ / page)					
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)					
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)					
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)					
	0.00	Avg. Number of Review Cycles					
	$ -	Planner Administrative Rate ($ / hour)	$0.00				
		Copying Costs	$0.00				
		Mailing Costs	$0.00				
		SubTotal		$0.00			
HANDLING/ ELEC.DOC.	060.14	Log Transmittal of Revised Product Program					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0.00	Avg. Number of Review Cycles					
	$0.00	Planner Administrative Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
			Expected Process Total	$0.00			

Process Name	Request For Proposal
OmniClass Stage	31-10 14 21 Project Programming Phase
OmniClass Role	34-21 17 00 Planner
Description	Once the major criteria have been determined, the Owner prepares and distributes a *Request for Proposal (RFP)* .

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -

Process

Current Process

070.01 Produce Request for Proposal Documents

COPYING & HANDLING/ ELEC.DOC. — **070.02 Send Copies of Request for Proposal (RFP) Package**

0	Avg. Number of Pages in Space Program
0	Avg. Number of Pages in Product Program
0	Avg. Number of Pages in Project Definition
0	Avg. Number of Pages in Front Matter
0	Avg. Number of Transmittals (Transmittals)
$0.00	Avg. Per Page Copy Cost ($ / page)
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)
0	Number of RFP Submittal sets Reqd.
0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)

$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
	Copying Cost	$0.00	
	Mailing Cost	$0.00	
	SubTotal		**$0.00**

070.03 Receive Request for Proposal (RFP) Package

HANDLING/ ELEC.DOC. — **070.04 Log Receipt of Request for Proposal (RFP) Package**

0	Time to Log (hours / transmittal)		
$0.00	Architect Drafter Rate ($ / hour)	$0.00	
	SubTotal		**$0.00**

070.05 Review Request for Proposal (RFP) Package

Expected Process

070.01 Produce Request for Proposal Documents

COPYING & HANDLING/ ELEC.DOC. — **070.02 Send Copies of Request for Proposal (RFP) Package**

0	Avg. Number of Pages in Space Program
0	Avg. Number of Pages in Product Program
0	Avg. Number of Pages in Project Definition
0	Avg. Number of Pages in Front Matter
0	Avg. Number of Transmittals (Transmittals)
$0.00	Avg. Per Page Copy Cost ($ / page)
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)
0	Number of RFP Submittal sets Reqd.
0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)

$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
	Copying Cost	$0.00	
	Mailing Cost	$0.00	
	SubTotal		**$0.00**

070.03 Receive Request for Proposal (RFP) Package

HANDLING/ ELEC.DOC. — **070.04 Log Receipt of Request for Proposal (RFP) Package**

0	Time to Log (hours / transmittal)		
$0.00	Architect Drafter Rate ($ / hour)	$0.00	
	SubTotal		**$0.00**

070.05 Review Request for Proposal (RFP) Package

	070.06	Produce Proposal			
COPYING/ ELEC.DOC.	070.07	**Copy Proposal**			
	0	Avg. Number of Letter Sized Pages in Proposal			
	0	Avg. Number of Drawing Sheets in Proposal			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)			
	0	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Reproduction Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	070.08	**Send Proposal**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	
			Current Process Total	**$0.00**	

	070.06	Produce Proposal			
COPYING/ ELEC.DOC.	070.07	**Copy Proposal**			
	0	Avg. Number of Letter Sized Pages in Proposal			
	0	Avg. Number of Drawing Sheets in Proposal			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0	Avg. Pre-Design Submittal Sets Reqd. (sets / submittal)			
	0	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Reproduction Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	070.08	**Send Proposal**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	
			Expected Process Total	**$0.00**	

Process Name Design Early
OmniClass Stage 31-20 10 14 Conceptual Design Phase
OmniClass Role 34-25 21 00 Architect

Description The Architect utilizes the specific information produced during pre-design to develop a solution that reflects the requirements stated in the Project Definition, Space Program, and Product Program. The Architect performs a QA/QC check before submitting to the owner. After receiving the submission, the Owner's Representative reviews and provides comments to the Architect. The Architect and Consultants are then required to update the documents based on the comments. After revisions are made, the Architect resubmits.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$0.00	$ -
Expected process cost:	$ -	$ -	$0.00	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

080.01 Receive NTP

080.02 Request Design Requirements

HANDLING/ELEC.DOC. — 080.03 Send Copies of Design Requirements

-	Avg. Number of Pages in Space Program	
-	Avg. Number of Pages in Product Program	
-	Avg. Number of Pages in Project Definition	
$0.00	Avg. Per Page Copy Cost ($ / page)	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00
	Copying Cost	$0.00
	Mailing Cost	$0.00
	SubTotal	**$0.00**

HANDLING/ELEC.DOC. — 080.04 Log Transmittal of Design Requirements

0	Time to Log (hours / transmittal)	
$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

Expected Process

080.01 Receive NTP

080.02 Request Design Requirements

HANDLING/ELEC.DOC. — 080.03 Send Copies of Design Requirements

-	Avg. Number of Pages in Space Program	
-	Avg. Number of Pages in Product Program	
-	Avg. Number of Pages in Project Definition	
$0.00	Avg. Per Page Copy Cost ($ / page)	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00
	Copying Cost	$0.00
	Mailing Cost	$0.00
	SubTotal	**$0.00**

HANDLING/ELEC.DOC. — 080.04 Log Transmittal of Design Requirements

0	Time to Log (hours / transmittal)	
$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

	080.05	Receive Design Requirements						
HANDLING/ ELEC.DOC.	080.06	Log Receipt of Design Requirements						
	0	Time to Log (hours / transmittal)						
	$0.00	Architect Drafter Rate ($ / hour)	$0.00					
		SubTotal		$0.00				
	080.07	Review Design Requirements						
REFORMATTING/ COBie	080.08	Reformat Design Requirements						
	0	Number of Space Types per Building						
	0.00	Avg. Time Spent Reformatting Space Program Requirements(hours / space type)						
	0	Number of Equipment (product) Types (Types / project)						
	0	Avg. Time Spent Reformatting Equipment Type (hours /product)						
	0%	Percentage of Time Spent by Licensed Professional Architect						
	0%	Percentage of Time Spent by Architect Drafter						
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00					
		SubTotal		$0.00				
	080.09	Produce Design Early Documents						
	080.10	Receive Consultant's Early Design Documents						
	080.11	Produce Checkset of Design Early Documents						
VALIDATING/ COBie	080.12	Validate Checkset before Submission through manual QA/QC Process						
	0	Avg. Time Spent Evaluating Design Early Drawings against Design Requirements - Space and Equipment						
	$ -	Licensed Professional Architect Rate ($ / hour)	$0.00					
		SubTotal		$0.00				
RECREATING/ COBie	080.13.10	Make Corrections (Architect and/or Consultants)						
	0.00	Avg. Time spent making corrections due to non-conformance with Space or Product Program						
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00					
		SubTotal		$0.00				
COPYING/ ELEC.DOC.	080.13.20	Copy Design Early Documents						
	-	Avg. Number of Sheets in Design Early Drawings						
	-	Avg. Number of Letter-Sized Pages in Design Early Narrative						
	-	Number of Design Submittal Sets Reqd. (sets / submittal)						
	$0.00	Avg. Per Page Copy Cost ($ / page)						
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)						
	0	Avg. In-house Reproduction Time Per Set (hours/set)						
	$0.00	Architect Drafter Rate ($ / hour)	$0.00					
		Copying Cost	$0.00					
		SubTotal		$0.00				

	080.05	Receive Design Requirements						
HANDLING/ ELEC.DOC.	080.06	Log Receipt of Design Requirements						
	0	Time to Log (hours / transmittal)						
	$0.00	Architect Drafter Rate ($ / hour)	$0.00					
		SubTotal		$0.00				
	080.07	Review Design Requirements						
REFORMATTING/ COBie	080.08	Reformat Design Requirements						
	0	Number of Space Types per Building						
	0.00	Avg. Time Spent Reformatting Space Program Requirements(hours / space type)						
	0	Number of Equipment (product) Types (Types / project)						
	0.00	Avg. Time Spent Reformatting Equipment Type (hours /product)						
	0%	Percentage of Time Spent by Licensed Professional Architect						
	0%	Percentage of Time Spent by Architect Drafter						
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00					
		SubTotal		$0.00				
	080.09	Produce Design Early Documents						
	080.10	Receive Consultant's Early Design Documents						
	080.11	Produce Checkset of Design Early Documents						
VALIDATING/ COBie	080.12	Validate Checkset before Submission through manual QA/QC Process						
	0.00	Avg. Time Spent Evaluating Design Early Drawings against Design Requirements - Space and Equipment						
	$ -	Licensed Professional Architect Rate ($ / hour)	$0.00					
		SubTotal		$0.00				
RECREATING/ COBie	080.13.10	Make Corrections (Architect and/or Consultants)						
	0.00	Avg. Time spent making corrections due to non-conformance with Space or Product Program						
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00					
		SubTotal		$0.00				
COPYING/ ELEC.DOC.	080.13.20	Copy Design Early Documents						
	-	Avg. Number of Sheets in Design Early Drawings						
	-	Avg. Number of Letter-Sized Pages in Design Early Narrative						
	0	Number of Design Submittal Sets Reqd. (sets / submittal)						
	$0.00	Avg. Per Page Copy Cost ($ / page)						
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)						
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)						
	$0.00	Architect Drafter Rate ($ / hour)	$0.00					
		Copying Cost	$0.00					
		SubTotal		$0.00				

HANDLING/ ELEC.DOC.	080.13.30	Send Design Early Documents			HANDLING/ ELEC.DOC.	080.13.30	Send Design Early Documents
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)
	0	Avg. Time to Prepare a Transmittal (hours/transmittal)				0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)
	$ -	Architect Drafter Rate ($ / hour)	$0.00			$ -	Architect Drafter Rate ($ / hour)	$0.00	
		Mailing Cost	$0.00				Mailing Cost	$0.00	
		SubTotal		$0.00			SubTotal		$0.00
HANDLING/ ELEC.DOC.	080.13.40	Log Transmittal of Design Early Documents			HANDLING/ ELEC.DOC.	080.13.40	Log Transmittal of Design Early Documents
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)
	0	Time to Log (hours / transmittal)				0	Time to Log (hours / transmittal)
	$0.00	Architect Drafter Rate ($ / hour)	$0.00			$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		SubTotal		$0.00			SubTotal		$0.00
	080.14	Receive Design Early Documents				080.14	Receive Design Early Documents
HANDLING/ ELEC.DOC.	080.15	Log Receipt of Design Early Documents			HANDLING/ ELEC.DOC.	080.15	Log Receipt of Design Early Documents
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)
	0	Time to Log (hours / transmittal)				0	Time to Log (hours / transmittal)
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00			$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
		SubTotal		$0.00			SubTotal		$0.00
/ALIDATING/ COBie	080.16	Validate Design Early Documents			VALIDATING/ COBie	080.16	Validate Design Early Documents
	-	Avg Time to Compare Design Early Documents with Owner Standards				0.00	Avg Time to Compare Design Early Documents with Owner Standards
	$0.00	Owners Rep. Rate ($ / hour)	$0.00			$0.00	Owners Rep. Rate ($ / hour)	$0.00	
		SubTotal		$0.00			SubTotal		$0.00
HANDLING/ ELEC.DOC.	080.17.20	Send Comments to Design Team			HANDLING/ ELEC.DOC.	080.17.20	Send Comments to Design Team
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)
	$ -	Avg. Mailing Cost per Transmittal ($ / Transmittal)				$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)				0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00			$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
		Mailing Cost	$0.00				Mailing Cost	$0.00	
		SubTotal		$0.00			SubTotal		$0.00
HANDLING/ ELEC.DOC.	080.17.30	Log Transmittal of Comments			HANDLING/ ELEC.DOC.	080.17.30	Log Transmittal of Comments
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)
	0	Time to Log (hours / transmittal)				0	Time to Log (hours / transmittal)
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00			$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
		SubTotal		$0.00			SubTotal		$0.00

	080.18	Receive Review Comments				080.18	Receive Review Comments	
HANDLING/ ELEC.DOC.	080.19	**Log Receipt of Comments**			HANDLING/ ELEC.DOC.	080.19	**Log Receipt of Comments**	
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)	
	0	Time to Log (hours / transmittal)				0	Time to Log (hours / transmittal)	
	$0.00	Architect Drafter Rate ($ / hour)	$0.00			$0.00	Architect Drafter Rate ($ / hour)	$0.00
		SubTotal		**$0.00**			**SubTotal**	**$0.00**
RECREATING/ COBie	080.20	**Make Corrections (Architect and/or Consultants)**			RECREATING/ COBie	080.20	**Make Corrections (Architect and/or Consultants)**	
	0.00	Avg. Time spent making corrections due to non-conformance with Space or Product Program				0.00	Avg. Time spent making corrections due to non-conformance with Space or Product Program	
	0	Avg. Number of Review Cycles				0	Avg. Number of Review Cycles	
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00			$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00
		SubTotal		**$0.00**			**SubTotal**	**$0.00**
COPYING/ ELEC.DOC.	080.21	**Copy Revised Design Early Documents**			COPYING/ ELEC.DOC.	080.21	**Copy Revised Design Early Documents**	
	-	Avg. Number of Sheets in Design Early Drawings				-	Avg. Number of Sheets in Design Early Drawings	
	-	Avg. Number of Letter-Sized Pages in Design Early Narrative				-	Avg. Number of Letter-Sized Pages in Design Early Narrative	
	-	Number of Design Submittal Sets Reqd. (sets / submittal)				0	Number of Design Submittal Sets Reqd. (sets / submittal)	
	$0.00	Avg. Per Page Copy Cost ($ / page)				$0.00	Avg. Per Page Copy Cost ($ / page)	
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)				$0.00	Avg. Per Sheet Copy Cost ($ / sheet)	
	0	Avg. In-house Reproduction Time Per Set (hours/set)				0.00	Avg. In-house Reproduction Time Per Set (hours/set)	
	0	Avg. Number of Review Cycles				0	Avg. Number of Review Cycles	
	$0.00	Architect Drafter Rate ($ / hour)	$0.00			$0.00	Architect Drafter Rate ($ / hour)	$0.00
		Copying Cost	$0.00				Copying Cost	$0.00
		SubTotal		**$0.00**			**SubTotal**	**$0.00**
HANDLING/ ELEC.DOC.	080.22	**Send Revised Design Early Documents**			HANDLING/ ELEC.DOC.	080.22	**Send Revised Design Early Documents**	
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)	
	$ -	Avg. Mailing Cost per Transmittal ($ / Transmittal)				$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)				0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)	
	0	Avg. Number of Review Cycles				0	Avg. Number of Review Cycles	
	$0.00	Architect Drafter Rate ($ / hour)	$0.00			$0.00	Architect Drafter Rate ($ / hour)	$0.00
		Mailing Cost	$0.00				Mailing Cost	$0.00
		SubTotal		**$0.00**			**SubTotal**	**$0.00**
HANDLING/ ELEC.DOC.	080.23	**Log Transmittal of Revised Design Early Documents**			HANDLING/ ELEC.DOC.	080.23	**Log Transmittal of Revised Design Early Documents**	
	0	Avg. Number of Transmittals (Transmittals)				0	Avg. Number of Transmittals (Transmittals)	
	0	Time to Log (hours / transmittal)				0	Time to Log (hours / transmittal)	
	0	Avg. Number of Review Cycles				0	Avg. Number of Review Cycles	
	$0.00	Architect Drafter Rate ($ / hour)	$0.00			$0.00	Architect Drafter Rate ($ / hour)	$0.00
		SubTotal		**$0.00**			**SubTotal**	**$0.00**
	080.24	Receive Design Early Documents				080.24	Receive Design Early Documents	

	080.24	Receive Design Early Documents					
HANDLING/ ELEC.DOC.	080.25	**Log Receipt of Revised Design Early Documents**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
VALIDATING/ COBie	080.26	**Validate Revised Design Early Documents**					
	-	Avg Time to Compare Design Early Documents with Owner Standards					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
HANDLING/ ELEC.DOC.	080.27	**Send Comments to Design Team**					
	0	Avg. Number of Transmittals (Transmittals)					
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)					
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00				
		Mailing Cost	$0.00				
		SubTotal		$0.00			
HANDLING/ ELEC.DOC.	080.28	**Log Transmittal of Comments**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
	080.29	Receive Review Comments					
HANDLING/ ELEC.DOC.	080.30	**Log Receipt of Comments**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
			Current Process Total	$0.00			

	080.24	Receive Design Early Documents					
HANDLING/ ELEC.DOC.	080.25	**Log Receipt of Revised Design Early Documents**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
VALIDATING/ COBie	080.26	**Validate Revised Design Early Documents**					
	0	Avg Time to Compare Design Early Documents with Owner Standards					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
HANDLING/ ELEC.DOC.	080.27	**Send Comments to Design Team**					
	0	Avg. Number of Transmittals (Transmittals)					
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)					
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00				
		Mailing Cost	$0.00				
		SubTotal		$0.00			
HANDLING/ ELEC.DOC.	080.28	**Log Transmittal of Comments**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
	080.29	Receive Review Comments					
HANDLING/ ELEC.DOC.	080.30	**Log Receipt of Comments**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00				
		SubTotal		$0.00			
			Expected Process Total	$0.00			

Process Name Design Schematic, Product Type Template, & Product Type Candidate
OmniClass Stage 31-20 10 17 Schematic Design Phase
OmniClass Role 34-25 21 00 Architect

Description The Architect further develops the approved Design Early deliverable documents to produce the Design Schematic documents. The Architect performs a QA/QC check before submitting to the Owner. After receiving the submission, the Owner's Representative reviews and provides comments to the Architect. The Architect and Consultants are then required to update the documents based on the comments. After revisions are made the Architect resubmits.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

090.01 Receive Design Early Approval Document from Owner's Rep

RECREATING/ COBie — 090.02.10 Produce Design Schematic Documents

-	Avg. Number of Plan Drawings in Design Schematic Drawings	
0.000	Avg QTO Time for Equipment Components (hours / plan drawing)	
0.000	Avg QTO Time for Spaces in building (hours / plan drawing)	
0%	Percentage of Time Spent by Licensed Professional Architect	
0%	Percentage of Time Spent by Architect Drafter	
$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00
$0.00	Architect Drafter Rate ($ / hour)	$0.00
	SubTotal	$0.00

REFORMATTING/ COBie — 090.02.20 Produce Outline Specification / Product Types Template

0	Number of Equipment (product) Types (Types / project)	
0.00	Avg. Time Spent Developing Equipment (product) Type Template (hours / product type)	
$ -	Specifier	$0.00
	SubTotal	$0.00

090.03 Receive Consultant's Design Schematic Documents

Expected Process

090.01 Receive Design Early Approval Document from Owner's Rep

RECREATING/ COBie — 090.02.10 Produce Design Schematic Documents

-	Avg. Number of Plan Drawings in Design Schematic Drawings	
0.00	Avg QTO Time for Equipment Components (hours / plan drawing)	
0.00	Avg QTO Time for Spaces in building (hours / plan drawing)	
0%	Percentage of Time Spent by Licensed Professional Architect	
0%	Percentage of Time Spent by Architect Drafter	
$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00
$0.00	Architect Drafter Rate ($ / hour)	$0.00
	SubTotal	$0.00

REFORMATTING/ COBie — 090.02.20 Produce Outline Specification / Product Types Template

0	Number of Equipment (product) Types (Types / project)	
0.00	Avg. Time Spent Developing Equipment (product) Type Template (hours / product type)	
$ -	Specifier	$0.00
	SubTotal	$0.00

090.03 Receive Consultant's Design Schematic Documents

	090.04	Produce Checkset of Design Schematic Documents		
VALIDATING/ COBie	090.05	**Validate Checkset before Submission through manual QA/QC Process**		
	0	Avg. Time Spent Evaluating Design Schematic Drawings against Design Requirements - Space and Equipment		
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
RECREATING/ COBie	090.06.10	**Make Corrections (Architect and/or Consultants)**		
	0.00	Avg. Time spent making corrections due to non-conformance with Space or Product Program		
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
COPYING/ ELEC.DOC.	090.06.20	**Copy Design Schematic Documents**		
	-	Avg. Number of Sheets in Design Schematic Drawings		
	0	Avg. Number of Letter Sized Pages in Design Schematic Narrative		
	-	Avg. Number of Letter Sized Pages in a Design Schematic Specification		
	-	Number of Design Submittal Sets Reqd. (sets / submittal)		
	$0.00	Avg. Per Page Copy Cost ($ / page)		
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)		
	0	Avg. In-house Reproduction Time Per Set (hours/set)		
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		Copying Cost	$0.00	
		SubTotal		**$0.00**
HANDLING/ ELEC.DOC.	090.06.30	**Send Copies of Design Schematic Documents**		
	0	Avg. Number of Transmittals (Transmittals)		
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)		
	0	Avg. Time to Prepare a Transmittal (hours/transmittal)		
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		Mailing Cost	$0.00	
		SubTotal		**$0.00**
HANDLING/ ELEC.DOC.	090.06.40	**Log Transmittal of Design Schematic Documents**		
	0	Avg. Number of Transmittals (Transmittals)		
	0	Time to Log (hours / transmittal)		
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
	090.07	Receive Design Schematic & Product Type Template		

	090.04	Produce Checkset of Design Schematic Documents		
VALIDATING/ COBie	090.05	**Validate Checkset before Submission through manual QA/QC Process**		
	0.00	Avg. Time Spent Evaluating Design Schematic Drawings against Design Requirements - Space and Equipment		
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
RECREATING/ COBie	090.06.10	**Make Corrections (Architect and/or Consultants)**		
	0.00	Avg. Time spent making corrections due to non-conformance with Space or Product Program		
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
COPYING/ ELEC.DOC.	090.06.20	**Copy Design Schematic Documents**		
	-	Avg. Number of Sheets in Design Schematic Drawings		
	0	Avg. Number of Letter Sized Pages in Design Schematic Narrative		
	-	Avg. Number of Letter Sized Pages in a Design Schematic Specification		
	0	Number of Design Submittal Sets Reqd. (sets / submittal)		
	$0.00	Avg. Per Page Copy Cost ($ / page)		
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)		
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)		
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		Copying Cost	$0.00	
		SubTotal		**$0.00**
HANDLING/ ELEC.DOC.	090.06.30	**Send Copies of Design Schematic Documents**		
	0	Avg. Number of Transmittals (Transmittals)		
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)		
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)		
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		Mailing Cost	$0.00	
		SubTotal		**$0.00**
HANDLING/ ELEC.DOC.	090.06.40	**Log Transmittal of Design Schematic Documents**		
	0	Avg. Number of Transmittals (Transmittals)		
	0	Time to Log (hours / transmittal)		
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
	090.07	Receive Design Schematic & Product Type Template		

HANDLING/ ELEC.DOC.	090.08	Log Receipt of Design Schematic & Product Type Template Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			$0.00
VALIDATING/ COBie	090.09	Validate Design Schematic & Product Type Template Documents			
	-	Avg Time to Compare Design Schematic Documents with Owner Standards			
	$0.00	Owners Rep. Rate ($ / hour)	$0.00		
		SubTotal			$0.00
HANDLING/ ELEC.DOC.	090.10.20	Send Comments to Design Team			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal			$0.00
HANDLING/ ELEC.DOC.	090.10.30	Log Transmittal of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			$0.00
	090.11	Receive Review Comments			
HANDLING/ ELEC.DOC.	090.12	Log Receipt of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal			$0.00
RECREATING/ COBie	090.13	Make Corrections (Architect and/or Consultants)			
	0.00	Avg. Time spent making corrections due to non-conformance with Space or Product Program			
	0	Avg. Number of Review Cycles			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
					$0.00

HANDLING/ ELEC.DOC.	090.08	Log Receipt of Design Schematic & Product Type Template Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			$0.00
VALIDATING/ COBie	090.09	Validate Design Schematic & Product Type Template Documents			
	0	Avg Time to Compare Design Schematic Documents with Owner Standards			
	$0.00	Owners Rep. Rate ($ / hour)	$0.00		
		SubTotal			$0.00
HANDLING/ ELEC.DOC.	090.10.20	Send Comments to Design Team			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal			$0.00
HANDLING/ ELEC.DOC.	090.10.30	Log Transmittal of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			$0.00
	090.11	Receive Review Comments			
HANDLING/ ELEC.DOC.	090.12	Log Receipt of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal			$0.00
RECREATING/ COBie	090.13	Make Corrections (Architect and/or Consultants)			
	0.00	Avg. Time spent making corrections due to non-conformance with Space or Product Program			
	0	Avg. Number of Review Cycles			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
					$0.00

COPYING/ ELEC.DOC.	090.14	Copy Revised Design Schematic Documents			
	-	Avg. Number of Sheets in Design Schematic Drawings			
	0	Avg. Number of Letter Sized Pages in Design Schematic Narrative			
	-	Avg. Number of Letter Sized Pages in a Design Schematic Specification			
	-	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0	Avg. In-house Reproduction Time Per Set (hours/set)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	090.15	Send Revised Design Schematic Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	090.16	Log Transmittal of Revised Design Schematic Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
	090.17	Receive Design Early Documents			
HANDLING/ ELEC.DOC.	090.18	Log Receipt of Design Schematic & Product Type Template Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	

COPYING/ ELEC.DOC.	090.14	Copy Revised Design Schematic Documents			
	-	Avg. Number of Sheets in Design Schematic Drawings			
	0	Avg. Number of Letter Sized Pages in Design Schematic Narrative			
	-	Avg. Number of Letter Sized Pages in a Design Schematic Specification			
	0	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	090.15	Send Revised Design Schematic Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	090.16	Log Transmittal of Revised Design Schematic Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
	090.17	Receive Design Early Documents			
HANDLING/ ELEC.DOC.	090.18	Log Receipt of Revised Design Schematic Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	

VALIDATING/ COBie	090.19	Validate Revised Design Schematic Documents					
	0	Avg Time to Compare Design Schematic Documents with Owner Standards					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
HANDLING/ ELEC.DOC.	090.20	Send Comments to Design Team					
	0	Avg. Number of Transmittals (Transmittals)					
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)					
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00			
		Mailing Cost		$0.00			
		SubTotal			$0.00		
HANDLING/ ELEC.DOC.	090.21	Log Transmittal of Comments					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
	090.22	Receive Review Comments					
HANDLING/ ELEC.DOC.	090.23	Log Receipt of Comments					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Architect Drafter Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
			Current Process Total		$0.00		

VALIDATING/ COBie	090.19	Validate Revised Design Schematic Documents					
	0.00	Avg Time to Compare Design Schematic Documents with Owner Standards					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
HANDLING/ ELEC.DOC.	090.20	Send Comments to Design Team					
	0	Avg. Number of Transmittals (Transmittals)					
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)					
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00			
		Mailing Cost		$0.00			
		SubTotal			$0.00		
HANDLING/ ELEC.DOC.	090.21	Log Transmittal of Comments					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
	090.22	Receive Review Comments					
HANDLING/ ELEC.DOC.	090.23	Log Receipt of Comments					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	0	Avg. Number of Review Cycles					
	$0.00	Architect Drafter Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
			Expected Process Total		$0.00		

Process Name Design Coordinated & Product Type Candidate
OmniClass Stage 31-20 20 11 Detailed Design Phase
OmniClass Role 34-25 21 00 Architect

Description The Architect further develops the approved Design Schematic deliverable documents to produce the Design Coordinated documents. In addition, the building systems are coordinated to eliminate spatial interferences. This is a major coordination submittal before the final delivery package. The Architect performs a QA/QC check before distributing to the Owner's Representative. After receiving the submission, the Owner's Representative reviews and provides comments to the Architect. The Architect and Consultants are then required to update the documents based on the comments. After revisions are made, the Architect resubmits.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -

Process

Current Process

100.01 Receive Design Schematic Approval Document from Owner

RECREATING/ COBie — **100.02.10 Produce Design Coordinated Documents**

-	Avg. Number of Plan Drawings in Design Coordinated Drawings	
0.00	Avg QTO Time for Equipment Components (hours / plan drawing)	
0.00	Avg QTO Time for Spaces in building (hours / plan drawing)	
0%	Percentage of Time Spent by Licensed Professional Architect	
0%	Percentage of Time Spent by Architect Drafter	
$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00
$0.00	Architect Drafter Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

REFORMATTING/ COBie — **100.02.20 Produce Detailed Specification / Product Type Template**

0	Number of Equipment (product) Types (Types / project)	
0	Avg. Time Spent Developing Detailed Equipment (products) Type Template (hours / product)	
$0.00	Specifier	$0.00
	SubTotal	**$0.00**

Expected Process

100.01 Receive Design Schematic Approval Document from Owner

RECREATING/ COBie — **100.02.10 Produce Design Coordinated Documents**

-	Avg. Number of Plan Drawings in Design Coordinated Drawings	
0.00	Avg QTO Time for Equipment Components (hours / plan drawing)	
0.00	Avg QTO Time for Spaces in building (hours / plan drawing)	
80%	Percentage of Time Spent by Licensed Professional Architect	
20%	Percentage of Time Spent by Architect Drafter	
$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00
$0.00	Architect Drafter Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

REFORMATTING / COBie — **100.02.20 Produce Detailed Specification / Product Type Template**

0	Number of Equipment (product) Types (Types / project)	
0	Avg. Time Spent Developing Detailed Equipment (products) Type Template (hours / product)	
$0.00	Specifier	$0.00
	SubTotal	**$0.00**

SEARCHING/ COBie	100.03	Search for Product Type Candidates			
	0	Number of Equipment (product) Types (Types / project)			
	0	Avg. Time Searching for Product Literature for Candidates (Hours/product)			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	100.04	Receive Consultant's Design Coordinated Documents			
	100.05	Produce Checkset of Design Coordinated Documents			
VALIDATING/ COBie	100.06	Validate Checkset before Submission through manual QA/QC Process			
	-	Avg. Time Spent Evaluating Design Coordinated Drawings against Design Requirements - Space and Equipment			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
RECREATING/ COBie	100.07.05	Make Corrections (Architect and/or Consultants)			
	0.00	Avg. Time spent making corrections due to non-conformance with Space Program			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
SEARCHING & RECREATING/ COBie	100.07.10	Re- Search and Recreate Product Type Candidates and Detailed Specifications based on QA/QC Results			
	0%	Avg. Percent of Errors in Product Type Candidate			
	0	Number of Equipment (product) Types (Types / project)			
	0	Avg. Time Searching for Product Literature for Candidates (Hours/product)			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
COPYING/ ELEC.DOC.	100.07.20	Copy Design Coordinated Documents			
	-	Avg. Number of Sheets in Design Coordinated Drawings			
	0	Avg. Number of Letter Sized Pages in a Design Coordinated Narrative			
	-	Avg. Number of Letter Sized Pages in a Design Coordinated Specification			
	-	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		$0.00	

SEARCHING/ COBie	100.03	Search for Product Type Candidates			
	0	Number of Equipment (product) Types (Types / project)			
	0.00	Avg. Time Searching for Product Literature for Candidates (Hours/product)			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	100.04	Receive Consultant's Design Coordinated Documents			
	100.05	Produce Checkset of Design Coordinated Documents			
VALIDATING/ COBie	100.06	Validate Checkset before Submission through manual QA/QC Process			
	0.00	Avg. Time Spent Evaluating Design Coordinated Drawings against Design Requirements - Space and Equipment			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
RECREATING/ COBie	100.07.05	Make Corrections (Architect and/or Consultants)			
	0.00	Avg. Time spent making corrections due to non-conformance with Space Program			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
SEARCHING & RECREATING/ COBie	100.07.10	Re- Search and Recreate Product Type Candidates and Detailed Specifications based on QA/QC Results			
	0%	Avg. Percent of Errors in Product Type Candidate			
	0	Number of Equipment (product) Types (Types / project)			
	0.00	Avg. Time Searching for Product Literature for Candidates (Hours/product)			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
COPYING/ ELEC.DOC.	100.07.20	Copy Design Coordinated Documents			
	-	Avg. Number of Sheets in Design Coordinated Drawings			
	0	Avg. Number of Letter Sized Pages in a Design Coordinated Narrative			
	-	Avg. Number of Letter Sized Pages in a Design Coordinated Specification			
	0	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		$0.00	

HANDLING/ELEC.DOC.	100.07.30	Send Design Coordinated Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ELEC.DOC.	100.07.40	Log Transmittal of Design Coordinated Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	100.08	Receive Design Coordinated & Product Type Candidate Documents			
HANDLING/ELEC.DOC.	100.09	Log Receipt of Design Coordinated & Product Type Candidate Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
VALIDATING/COBie	100.10	Validate Design Coordinated & Product Type Candidate Documents			
	0.00	Avg Time to Compare Design Coordinated & Product Type Candidate Documents with Owner Standards			
	$0.00	Owners Rep. Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
HANDLING/ELEC.DOC.	100.11.20	Send Comments to Design Team			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		$0.00	

HANDLING/ELEC.DOC.	100.07.30	Send Design Coordinated Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ELEC.DOC.	100.07.40	Log Transmittal of Design Coordinated Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	100.08	Receive Design Coordinated & Product Type Candidate Documents			
HANDLING/ELEC.DOC.	100.09	Log Receipt of Design Coordinated & Product Type Candidate Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
VALIDATING/COBie	100.10	Validate Design Coordinated & Product Type Candidate Documents			
	0.00	Avg Time to Compare Design Coordinated & Product Type Candidate Documents with Owner Stan			
	$0.00	Owners Rep. Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
HANDLING/ELEC.DOC.	100.11.20	Send Comments to Design Team			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		$0.00	

HANDLING/ ELEC.DOC.	100.11.30	Log Transmittal of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	100.12	Receive Review Comments			
HANDLING/ ELEC.DOC.	100.13	Log Receipt of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
RECREATING/ COBie	100.14	Make Corrections (Architect and/or Consultants)			
	0.00	Avg. Time spent making corrections due to non-conformance with Space Program			
	0	Avg. Number of Review Cycles			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
				$0.00	
COPYING/ ELEC.DOC.	100.15	Copy Revised Design Coordinated & Product Type Candidate Documents			
	-	Avg. Number of Sheets in Design Coordinated Drawings			
	0	Avg. Number of Letter Sized Pages in a Design Coordinated Narrative			
	-	Avg. Number of Letter Sized Pages in a Design Coordinated Specification			
	-	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0	Avg. In-house Reproduction Time Per Set (hours/set)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	100.16	Send Revised Design Coordinated & Product Type Candidate Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		$0.00	

HANDLING/ ELEC.DOC.	100.11.30	Log Transmittal of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	100.12	Receive Review Comments			
HANDLING/ ELEC.DOC.	100.13	Log Receipt of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
RECREATING/ COBie	100.14	Make Corrections (Architect and/or Consultants)			
	0.00	Avg. Time spent making corrections due to non-conformance with Space Program			
	0	Avg. Number of Review Cycles			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
				$0.00	
COPYING/ ELEC.DOC.	100.15	Copy Revised Design Coordinated & Product Type Candidate Documents			
	-	Avg. Number of Sheets in Design Coordinated Drawings			
	0	Avg. Number of Letter Sized Pages in a Design Coordinated Narrative			
	-	Avg. Number of Letter Sized Pages in a Design Coordinated Specification			
	0	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	100.16	Send Revised Design Coordinated & Product Type Candidate Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		$0.00	

HANDLING/ ELEC.DOC.	100.17	Log Transmittal of Revised Design Coordinated & Product Type Candidate Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	100.18	Receive Design Early Documents			
HANDLING/ ELEC.DOC.	100.19	Log Receipt of Revised Design Coordinated & Product Type Candidate Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
VALIDATING/ COBie	100.20	Validate Revised Design Coordinated & Product Type Candidate Documents			
	-	Avg Time to Compare Design Coordinated & Product Type Candidate Documents with Owner Standards			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	100.21	Send Comments to Design Team			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	100.22	Log Transmittal of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	

HANDLING/ ELEC.DOC.	100.17	Log Transmittal of Revised Design Coordinated & Product Type Candidate Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	100.18	Receive Design Early Documents			
HANDLING/ ELEC.DOC.	100.19	Log Receipt of Revised Design Coordinated & Product Type Candidate Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
VALIDATING/ COBie	100.20	Validate Revised Design Coordinated & Product Type Candidate Documents			
	0.00	Avg Time to Compare Design Coordinated & Product Type Candidate Documents with Owner Standards			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	100.21	Send Comments to Design Team			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	100.22	Log Transmittal of Comments			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	

	100.23	Receive Review Comments			
HANDLING/ ELEC.DOC.	100.24	**Log Receipt of Comments**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal			$0.00
				Current Process Total	$0.00

	100.23	Receive Review Comments			
HANDLING/ ELEC.DOC.	100.24	**Log Receipt of Comments**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	0	Avg. Number of Review Cycles			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal			$0.00
				Expected Process Total	$0.00

Process Name	Design Final & Product Type Template
OmniClass Stage	31-20 20 24 Product Selection Phase
	31-20 20 27 Material Selection Phase
	31-20 20 31 Equipment Selection Phase
OmniClass Role	34-25 41 00 Specifier
Description	The Design Final package is the final set of contract documents ready for bid solicitation by the Government. This final design deliverable does not require another review by the Owner's Representative.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

110.01 Receive Design Coordinated Documents Approval from Owner

RECREATING/ COBie	110.02.10	**Produce Design Final Documents**		
	-	Avg. Number of Plan Drawings in Design Final Drawings		
	0.000	Avg QTO Time for Equipment Components (hours / plan drawing)		
	0.000	Avg QTO Time for Spaces in building (hours / plan drawing)		
	0%	Percentage of Time Spent by Licensed Professional Architect		
	0%	Percentage of Time Spent by Architect Drafter		
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00	
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
REFORMATTING / COBie	110.02.20	**Produce Detailed Specification / Product Type Candidates**		
	0	Number of Equipment (product) Types (Types / project)		
	0	Avg. Time Spent Developing Detailed Equipment (products) Type Candidate (hours / product)		
	$0.00	Specifier	$0.00	
		SubTotal		**$0.00**

110.03 Receive Consultant's Design Final Documents

Expected Process

110.01 Receive Design Coordinated Documents Approval from Owner

RECREATING/ COBie	110.02.10	**Produce Design Final Documents**		
	-	Avg. Number of Plan Drawings in Design Final Drawings		
	0.00	Avg QTO Time for Equipment Components (hours / plan drawing)		
	0.00	Avg QTO Time for Spaces in building (hours / plan drawing)		
	0%	Percentage of Time Spent by Licensed Professional Architect		
	0%	Percentage of Time Spent by Architect Drafter		
	$0.00	Licensed Professional Architect Rate ($ / hou	$0.00	
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
REFORMATTING / COBie	110.02.20	**Produce Detailed Specification / Product Type Candidates**		
	0	Number of Equipment (product) Types (Types / project)		
	0.0	Avg. Time Spent Developing Detailed Equipment (products) Type Candidate (hours / product)		
	$0.00	Specifier	$0.00	
		SubTotal		**$0.00**

110.03 Receive Consultant's Design Final Documents

	110.04	Produce Check Set of Design Final Documents			
VALIDATING/ COBie	110.05	Validate Checkset before Submission through manual QA/QC Process			
	0	Avg. Time Spent Evaluating Design Final Drawings against Design Requirements - Space and Equipment			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
RECREATING/ COBie	110.06.10	Make Corrections			
	0.00	Avg. Time spent making corrections due to non-conformance with Space Program			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
COPYING/ ELEC.DOC.	110.06.20	Copy Design Final Documents			
	-	Avg. Number of Sheets in Design Final Drawings			
	0	Avg. Number of Letter Sized 'Pages in Design Final Narrative			
	0	Avg. Number of Letter Sized Pages in Design Final Specification			
	-	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	110.06.30	Send Design Final Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	110.06.40	Log Transmittal of Design Final Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		$0.00	

	110.04	Produce Check Set of Design Final Documents			
VALIDATING/ COBie	110.05	Validate Checkset before Submission through manual QA/QC Process			
	0.00	Avg. Time Spent Evaluating Design Final Drawings against Design Requirements - Space and Equipment			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
RECREATING/ COBie	110.06.10	Make Corrections			
	0.00	Avg. Time spent making corrections due to non-conformance with Space Program			
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
COPYING/ ELEC.DOC.	110.06.20	Copy Design Final Documents			
	-	Avg. Number of Sheets in Design Final Drawings			
	0	Avg. Number of Letter Sized 'Pages in Design Final Narrative			
	0	Avg. Number of Letter Sized Pages in Design Final Specification			
	0	Number of Design Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	110.06.30	Send Design Final Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Cost	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	110.06.40	Log Transmittal of Design Final Documents			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal		$0.00	

	110.07	Receive Design Final and Product Type Candidate Documents			
HANDLING/ ELEC.DOC.	110.08	**Log Receipt of Design Final Documents for Bidding Process**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			**$0.00**
	110.09	Produce Design Final Documents for Bidding Process			
				Current Process Total	**$0.00**

	110.07	Receive Design Final and Product Type Candidate Documents			
HANDLING/ ELEC.DOC.	110.08	**Log Receipt of Design Final Documents for Bidding Process**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			**$0.00**
	110.09	Produce Design Final Documents for Bidding Process			
				Expected Process Total	**$0.00**

Process Name	Request For Proposal
OmniClass Stage	31-20 20 24 Product Selection Phase 31-20 20 27 Material Selection Phase 31-20 20 31 Equipment Selection Phase
OmniClass Role	34-25 41 00 Specifier
Description	Once the design is complete, the Owner packages the Design Final Documents information together with the owner-supplied information (e.g., contractual terms) and creates a *Request for Proposals (RFP)* . This becomes the official bid set.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

HANDLING/ ELEC.DOC.	**120.01**	**Receive Information from A/E to Develop Bid Documents**			
	-	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
	120.02	Produce RFP Front Matter			
COPYING/ ELEC.DOC.	**120.03**	**Copy Request for Proposal (RFP) Package**			
	0	Avg. Number of Pages in Front Matter			
	-	Avg. Number of Sheets in Design Final Drawings			
	0	Avg. Number of Letter Sized 'Pages in Design Final Narrative			
	0	Avg. Number of Letter Sized Pages in Design Final Specification			
	0	Avg. Number of Request for Proposal Submittal Sets Reqd.			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0	Avg. In-house Reproduction Time Per Set (hours/set)			
	$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		**$0.00**	

Expected Process

HANDLING/ ELEC.DOC.	**120.01**	**Receive Information from A/E to Develop Bid Documents**			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
	120.02	Produce RFP Front Matter			
COPYING/ ELEC.DOC.	**120.03**	**Copy Request for Proposal (RFP) Package**			
	0	Avg. Number of Pages in Front Matter			
	-	Avg. Number of Sheets in Design Final Drawings			
	0	Avg. Number of Letter Sized 'Pages in Design Final Narrative			
	0	Avg. Number of Letter Sized Pages in Design Final Specification			
	0	Avg. Number of Request for Proposal Submittal Sets Reqd.			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0	Avg. In-house Reproduction Time Per Set (hours/set)			
	$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		**$0.00**	

HANDLING/ ELEC.DOC.	120.04	Send Request for Proposal (RFP) Package				
	0	Avg. Number of Transmittals (Transmittals)				
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)				
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00		
		Mailing Cost		$0.00		
		SubTotal			**$0.00**	
	120.05	Receive RFP Package				
			Current Process Total		**$0.00**	

HANDLING/ ELEC.DOC.	120.04	Send Request for Proposal (RFP) Package				
	0	Avg. Number of Transmittals (Transmittals)				
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				
	0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)				
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00		
		Mailing Cost		$0.00		
		SubTotal			**$0.00**	
	120.05	Receive RFP Package				
			Expected Process Total		**$0.00**	

Process Name	Inquiry Issue (Clarification)
OmniClass Stage	31-20 20 24 Product Selection Phase 31-20 20 27 Material Selection Phase 31-20 20 31 Equipment Selection Phase
OmniClass Role	34-25 41 00 Specifier
Description	Before finalizing a bid proposal, the Contractor typically request additional information or clarification of some bid documents.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

130.01 Acquire/Review Bidding Documents

130.02 Define Inquiry Issue (Clarification)

130.03 Produce Inquiry Issues

HANDLING/ ELEC.DOC. **130.04 Send Inquiry Issue (Clarification)**

0	Avg. Number of Transmittals (Transmittals)		
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)		
0	Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal)		
$0.00	Contractor Administrative Rate ($ / hour)	$0.00	
	Mailing Costs	$0.00	
	SubTotal		**$0.00**

HANDLING/ ELEC.DOC. **130.05 Log Transmittal of Inquiry Issue (Clarification)**

0	Avg. Number of Transmittals (Transmittals)		
0	Time to Log (hours / transmittal)		
$0.00	Contractor Administrative Rate ($ / hour)	$0.00	
	SubTotal		**$0.00**

Expected Process

130.01 Acquire/Review Bidding Documents

130.02 Define Inquiry Issue (Clarification)

130.03 Produce Inquiry Issues

HANDLING/ ELEC.DOC. **130.04 Send Inquiry Issue (Clarification)**

0	Avg. Number of Transmittals (Transmittals)		
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)		
0.00	Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal)		
$0.00	Contractor Administrative Rate ($ / hour)	$0.00	
	Mailing Costs	$0.00	
	SubTotal		**$0.00**

HANDLING/ ELEC.DOC. **130.05 Log Transmittal of Inquiry Issue (Clarification)**

0	Avg. Number of Transmittals (Transmittals)		
0	Time to Log (hours / transmittal)		
$0.00	Contractor Administrative Rate ($ / hour)	$0.00	
	SubTotal		**$0.00**

	130.06	Receive Inquiry Issue (Clarification) from Contractor			
HANDLING/ ELEC.DOC.	130.07	**Log Receipt of Inquiry Issue (Clarification)**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00	
		SubTotal			**$0.00**
HANDLING/ ELEC.DOC.	130.08	**Send Inquiry Issue (Clarification) to Architect**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.000	Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00	
		Mailing Costs		$0.00	
		SubTotal			**$0.00**
HANDLING/ ELEC.DOC.	130.09	**Log Transmittal of Inquiry Issue (Clarification)**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00	
		SubTotal			**$0.00**
	130.10	Receive Inquiry Issue (Clarification)			
HANDLING/ ELEC.DOC.	130.11	**Log Receipt of Inquiry Issue (Clarification)**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)		$0.00	
		SubTotal			**$0.00**
	130.12	Review Inquiry Issue (Clarification)			
HANDLING/ ELEC.DOC.	130.13	**Send Inquiry Issue (Clarification) Response**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.000	Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)		$0.00	
		Mailing Costs		$0.00	
		SubTotal			**$0.00**

	130.06	Receive Inquiry Issue (Clarification) from Contractor			
HANDLING/ ELEC.DOC.	130.07	**Log Receipt of Inquiry Issue (Clarification)**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00	
		SubTotal			**$0.00**
HANDLING/ ELEC.DOC.	130.08	**Send Inquiry Issue (Clarification) to Architect**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.000	Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00	
		Mailing Costs		$0.00	
		SubTotal			**$0.00**
HANDLING/ ELEC.DOC.	130.09	**Log Transmittal of Inquiry Issue (Clarification)**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)		$0.00	
		SubTotal			**$0.00**
	130.10	Receive Inquiry Issue (Clarification)			
HANDLING/ ELEC.DOC.	130.11	**Log Receipt of Inquiry Issue (Clarification)**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)		$0.00	
		SubTotal			**$0.00**
	130.12	Review Inquiry Issue (Clarification)			
HANDLING/ ELEC.DOC.	130.13	**Send Inquiry Issue (Clarification) Response**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.000	Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)		$0.00	
		Mailing Costs		$0.00	
		SubTotal			**$0.00**

HANDLING/ ELEC.DOC.	130.14	Log Transmittal of Inquiry Issue (Clarification) Response					HANDLING/ ELEC.DOC.	130.14	Log Transmittal of Inquiry Issue (Clarification) Response				
	0	Avg. Number of Transmittals (Transmittals)						0	Avg. Number of Transmittals (Transmittals)				
	0	Time to Log (hours / transmittal)						0	Time to Log (hours / transmittal)				
	$0.00	Architect Drafter Rate ($ / hour)	$0.00					$0.00	Architect Drafter Rate ($ / hour)	$0.00			
		SubTotal		$0.00					SubTotal		$0.00		
	130.15	Receive Response to Inquiry Issue (Clarification) from Architect						130.15	Receive Response to Inquiry Issue (Clarification) from Architect				
HANDLING/ ELEC.DOC.	130.16	Log Receipt of Response of Inquiry Issue (Clarification)					HANDLING/ ELEC.DOC.	130.16	Log Receipt of Response of Inquiry Issue (Clarification)				
	0	Avg. Number of Transmittals (Transmittals)						0	Avg. Number of Transmittals (Transmittals)				
	0	Time to Log (hours / transmittal)						0	Time to Log (hours / transmittal)				
	$0.00	Architect Drafter Rate ($ / hour)	$0.00					$0.00	Architect Drafter Rate ($ / hour)	$0.00			
		SubTotal		$0.00					SubTotal		$0.00		
	130.17	Review Responses to Inquiry Issue (Clarification)						130.17	Review Responses to Inquiry Issue (Clarification)				
HANDLING/ ELEC.DOC.	130.18	Send Inquiry Issue (Clarification) Response to Contractor					HANDLING/ ELEC.DOC.	130.18	Send Inquiry Issue (Clarification) Response to Contractor				
	0	Avg. Number of Transmittals (Transmittals)						0	Avg. Number of Transmittals (Transmittals)				
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)						$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				
	0.000	Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal)						0.000	Avg. Time to Prepare Transmittals for Inquiry Issues (hours / transmittal)				
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00					$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00			
		Mailing Costs	$0.00						Mailing Costs	$0.00			
		SubTotal		$0.00					SubTotal		$0.00		
HANDLING/ ELEC.DOC.	130.19	Log Transmittal of Inquiry Issue (Clarification) Response					HANDLING/ ELEC.DOC.	130.19	Log Transmittal of Inquiry Issue (Clarification) Response				
	0	Avg. Number of Transmittals (Transmittals)						0	Avg. Number of Transmittals (Transmittals)				
	0	Time to Log (hours / transmittal)						0	Time to Log (hours / transmittal)				
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00					$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00			
		SubTotal		$0.00					SubTotal		$0.00		
	130.20	Receive Inquiry Issue (Clarification) Response						130.20	Receive Inquiry Issue (Clarification) Response				
HANDLING/ ELEC.DOC.	130.21	Log Receipt of Inquiry Issue (Clarification) Response					HANDLING/ ELEC.DOC.	130.21	Log Receipt of Inquiry Issue (Clarification) Response				
	0	Avg. Number of Transmittals (Transmittals)						0	Avg. Number of Transmittals (Transmittals)				
	0	Time to Log (hours / transmittal)						0	Time to Log (hours / transmittal)				
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00					$0.00	Contractor Administrative Rate ($ / hour)	$0.00			
		SubTotal		$0.00					SubTotal		$0.00		
				Current Process Total	$0.00						Expected Process Total	$0.00	

Process Name	Pre-Construction Plan
OmniClass Stage	31-40 20 27 Submittal Processing Phase
OmniClass Role	34-35 14 00 Contractor
Description	The Contractor is required to develop a Pre-Construction Plan that describes how the Contractor will provision and manage the construction of the facility. This is sent as a submittal package. Refer to the submittal Package exchange for detailed requirements related to transmitting and handling Pre-Construction Plan Submittals.

Information Attributes

		Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process		Expected Process	
140.01	Review Specification Requirements	140.01	Review Specification Requirements
140.02	Develop Pre-Construction Plan	140.02	Develop Pre-Construction Plan
140.03	Submittal Process	140.03	Submittal Process
	Current Process Total $ -		**Expected Process Total** $ -

Process Name Inquiry issue (RFI)
OmniClass Stage 31-40 20 27 Submittal Processing Phase
OmniClass Role 34-35 14 00 Contractor

Description The Contractor submits a Request for Information (RFI) to ask for clarification during the construction process. These questions may be due to ambiguities or contradictions in the drawings or to site conditions.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -

Process

Current Process

150.01 Acquire/Review Bidding Documents

150.02 Define Inquiry Issue (RFI)

150.03 Produce Questions

HANDLING/ELEC.DOC. **150.04 Send Inquiry Issue (RFI)**

0	Avg. Number of RFIs	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0.00	Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal)	
$ -	Contractor Administrative Rate ($ / hour)	$0.00
	Mailing Costs	$0.00
	SubTotal	**$0.00**

HANDLING/ELEC.DOC. **150.05 Log Transmittal of Inquiry Issue (RFI)**

0	Avg. Number of RFIs	
0.00	Time to Log (hours / transmittal)	
$0.00	Contractor Administrative Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

Expected Process

150.01 Acquire/Review Bidding Documents

150.02 Define Inquiry Issue (RFI)

150.03 Produce Questions

HANDLING/ELEC.DOC. **150.04 Send Inquiry Issue (RFI)**

0	Avg. Number of RFIs	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0.00	Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal)	
$ -	Contractor Administrative Rate ($ / hour)	$0.00
	Mailing Costs	$0.00
	SubTotal	**$0.00**

HANDLING/ELEC.DOC. **150.05 Log Transmittal of Inquiry Issue (RFI)**

0	Avg. Number of RFIs	
0	Time to Log (hours / transmittal)	
$0.00	Contractor Administrative Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

	150.06	Receive Inquiry Issue (RFI) from Contractor				
HANDLING/ ELEC.DOC.	150.07	**Log Receipt of Inquiry Issue (RFI)**				
	0	Avg. Number of Transmittals (Transmittals)				
	0.00	Time to Log (hours / transmittal)				
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00			
		SubTotal		**$0.00**		
HANDLING/ ELEC.DOC.	150.08	**Send Inquiry Issue (RFI) to Architect**				
	0	Avg. Number of RFIs				
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				
	0.000	Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal)				
	$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00			
		Mailing Costs	$0.00			
		SubTotal		**$0.00**		
HANDLING/ ELEC.DOC.	150.09	**Log Transmittal of Inquiry Issue (RFI)**				
	0	Avg. Number of RFIs				
	0	Time to Log (hours / transmittal)				
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00			
		SubTotal		**$0.00**		
	150.10	Receive Inquiry Issue (RFI)				
HANDLING/ ELEC.DOC.	150.11	**Log Receipt of Inquiry Issue (RFI)**				
	0	Avg. Number of RFIs				
	0	Time to Log (hours / transmittal)				
	$0.00	Architect Drafter Rate ($ / hour)	$0.00			
		SubTotal		**$0.00**		
	150.12	Review Inquiry Issue (RFI)				

	150.06	Receive Inquiry Issue (RFI) from Contractor				
HANDLING/ ELEC.DOC.	150.07	**Log Receipt of Inquiry Issue (RFI)**				
	0	Avg. Number of Transmittals (Transmittals)				
	0	Time to Log (hours / transmittal)				
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00			
		SubTotal		**$0.00**		
HANDLING/ ELEC.DOC.	150.08	**Send Inquiry Issue (RFI) to Architect**				
	0	Avg. Number of RFIs				
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)				
	0.000	Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal)				
	$ -	Owners Rep. Administrative Rate ($ / hour)	$0.00			
		Mailing Costs	$0.00			
		SubTotal		**$0.00**		
HANDLING/ ELEC.DOC.	150.09	**Log Transmittal of Inquiry Issue (RFI)**				
	0	Avg. Number of RFIs				
	0	Time to Log (hours / transmittal)				
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00			
		SubTotal		**$0.00**		
	150.10	Receive Inquiry Issue (RFI)				
HANDLING/ ELEC.DOC.	150.11	**Log Receipt of Inquiry Issue (RFI)**				
	0	Avg. Number of RFIs				
	0	Time to Log (hours / transmittal)				
	$0.00	Architect Drafter Rate ($ / hour)	$0.00			
		SubTotal		**$0.00**		
	150.12	Review Inquiry Issue (RFI)				

HANDLING/ ELEC.DOC.	150.13 Send Inquiry Issue (RFI) Response				
	0	Avg. Number of RFIs			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal			$0.00
HANDLING/ ELEC.DOC.	150.14 Log Transmittal of Inquiry Issue (RFI) Response				
	0	Avg. Number of RFIs			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal			$0.00
	150.15 Receive Response to Inquiry Issue (RFI) from Architect				
HANDLING/ ELEC.DOC.	150.16 Log Receipt of Response of Inquiry Issue (RFI)				
	0	Avg. Number of RFIs			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			$0.00
	150.17 Review Responses to Inquiry Issue (RFI)				
HANDLING/ ELEC.DOC.	150.18 Send Inquiry Issue (RFI) Response to Contractor				
	0	Avg. Number of RFIs			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal			$0.00
HANDLING/ ELEC.DOC.	150.19 Log Transmittal of Inquiry Issue (RFI) Response				
	0	Avg. Number of RFIs			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			$0.00

HANDLING/ ELEC.DOC.	150.13 Send Inquiry Issue (RFI) Response				
	0	Avg. Number of RFIs			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.00	Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal			$0.00
HANDLING/ ELEC.DOC.	150.14 Log Transmittal of Inquiry Issue (RFI) Response				
	0	Avg. Number of RFIs			
	0	Time to Log (hours / transmittal)			
	$0.00	Architect Drafter Rate ($ / hour)	$0.00		
		SubTotal			$0.00
	150.15 Receive Response to Inquiry Issue (RFI) from Architect				
HANDLING/ ELEC.DOC.	150.16 Log Receipt of Response of Inquiry Issue (RFI)				
	0	Avg. Number of RFIs			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			$0.00
	150.17 Review Responses to Inquiry Issue (RFI)				
HANDLING/ ELEC.DOC.	150.18 Send Inquiry Issue (RFI) Response to Contractor				
	0	Avg. Number of RFIs			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.000	Avg. Time to Prepare Transmittals for Inquiry Issues (RFI) (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal			$0.00
HANDLING/ ELEC.DOC.	150.19 Log Transmittal of Inquiry Issue (RFI) Response				
	0	Avg. Number of RFIs			
	0	Time to Log (hours / transmittal)			
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00		
		SubTotal			$0.00

	150.20	Receive Inquiry Issue (RFI) from Owner				
HANDLING/ ELEC.DOC.	150.21	**Log Receipt of Inquiry Issue (RFI) Response**				
		0	Avg. Number of RFIs			
		0	Time to Log (hours / transmittal)			
		$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
			SubTotal		$0.00	
				Current Process Total	$0.00	

	150.20	Receive Inquiry Issue (RFI) from Owner				
HANDLING/ ELEC.DOC.	150.21	**Log Receipt of Inquiry Issue (RFI) Response**				
		0	Avg. Number of RFIs			
		0	Time to Log (hours / transmittal)			
		$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
			SubTotal		$0.00	
				Expected Process Total	$0.00	

Process Name	Product Type Selection
OmniClass Stage	31-40 20 27 Submittal Processing Phase
OmniClass Role	34-35 14 00 Contractor

Description The Contractor and Sub-Contractors gather information for products identified in the Design Final documents and prepare submittals. Refer to the Submittal Package exchange for detailed requirements related to transmitting and handling Product Type Selection submittals.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

160.01	Review Contract Documents
160.02	Validate Submittal Information
160.03	Submittal Process

Current Process Total $ -

Expected Process

160.01	Review Contract Documents
160.02	Validate Submittal Information
160.03	Submittal Process

Expected Process Total $ -

Process Name	System Layout
OmniClass Stage	31-40 20 27 Submittal Processing Phase
OmniClass Role	34-35 14 00 Contractor
Description	The Contractor and Sub-Contractors review information for products identified in the Design Final documents and prepare shop drawings. Refer to Submittal Package exchange for detailed requirements related to transmitting and handling System Layout submittals.

Information Attributes

		Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process		Expected Process	
170.01	Review Contract Drawings	170.01	Review Contract Drawings
170.02	Layout and Route Building System	170.02	Layout and Route Building System
170.03	Overlay System Layouts (Shop Drawings)	170.03	Overlay System Layouts (Shop Drawings)
170.04	Identify System Interferences	170.04	Identify System Interferences
170.05	Resolve System Interferences	170.05	Resolve System Interferences
170.06	Update System Layouts (Shop Drawings)	170.06	Update System Layouts (Shop Drawings)
170.07.10	Submittal Process	170.07.10	Submittal Process
	Current Process Total $ -		Expected Process Total $ -

Process Name Submittal Package
OmniClass Stage 31-40 20 27 Submittal Processing Phase
OmniClass Role 34-35 14 00 Contractor

Description The Contractor organizes the required submittal information and creates Submittal Packages to be reviewed by the Architect and/or Owner's Representative.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -

Process

Current Process

180.01 Identify Submittal Dates on Submittal Register

180.02.10 Receive Submittal Information from Sub-Contractors and Vendors

HANDLING/ ELEC.DOC. — **180.02.15 Log Receipt of Submittal Package from Sub-Contractors and Vendors**

0	Avg. Number of Transmittals (Transmittals)	
0.00	Time to Log (hours / transmittal)	
$0.00	Contractor Administrative Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

REFORMATTING/ COBie — **180.02.20 Produce Submittal Information**

0	Number of Equipment (product) Types (Types / project)	
0.00	Avg. Time Spent Organizing Equipment (product) Type information (hours / submittal item)	
$0.00	Assistant (Construction) Project Manager Rate ($ / hou	$0.00
	SubTotal	**$0.00**

VALIDATING/ COBie — **180.03 Validate Submittal Information against Contract Documents**

0	Number of Equipment (product) Types (Types / project)	
0	Avg. Time Spent Evaluating Equipment (product) Type Submittal Items against Contract Documents (hours / submittal item)	
0%	Percentage of Submittals Items rejected	
0%	Percentage of Time Spent by Construction Project Manager	
0%	Percentage of Time Spent by Assistant (Construction) Project Manager	
$0.00	Construction Project Manager Rate ($ / hour)	$0.00
$0.00	Assistant (Construction) Project Manager Rate ($ / hou	$0.00
	SubTotal	**$0.00**

Expected Process

180.01 Identify Submittal Dates on Submittal Register

180.02.10 Receive Submittal Information from Sub-Contractors and Vendors

HANDLING/ ELEC.DOC. — **180.02.15 Log Receipt of Submittal Package from Sub-Contractors and Vendors**

0	Avg. Number of Transmittals (Transmittals)	
0	Time to Log (hours / transmittal)	
$0.00	Contractor Administrative Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

REFORMATTING/ COBie — **180.02.20 Produce Submittal Information**

0	Number of Equipment (product) Types (Types / project)	
0.00	Avg. Time Spent Organizing Equipment (product) Type information (hours / submittal item)	
$0.00	Assistant (Construction) Project Manager Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

VALIDATING/ COBie — **180.03 Validate Submittal Information against Contract Documents**

0	Number of Equipment (product) Types (Types / project)	
0.00	Avg. Time Spent Evaluating Equipment (product) Type Submittal Items against Contract Documents (hours / submittal item)	
0%	Percentage of Submittals Items rejected	
0%	Percentage of Time Spent by Construction Project Manager	
0%	Percentage of Time Spent by Assistant (Construction) Project Manager	
$0.00	Construction Project Manager Rate ($ / hour)	$0.00
$0.00	Assistant (Construction) Project Manager Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

	180.04	Produce Submittal Package			
COPYING/ ELEC.DOC.	180.05	**Copy Submittal Package**			
	0	Avg. Number of Submittal Pages in a Submittal Item (pages/submittal item)			
	0	Avg. Number of Submittal Sheets in a Submittal Item (sheets/submittal item)			
	0	Avg. Number of Submittal Items in a Submittal Package for each Equipment (product) Type (submittal items/submittal package)			
	0	Number of Equipment (product) Types (Types / project)			
	0	Number of Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	180.06	**Stamp Submittal Package**			
	0	Avg. Number of Submittal Pages in a Submittal Item (pages/submittal item)			
	0	Avg. Number of Submittal Sheets in a Submittal Item (sheets/submittal item)			
	0	Avg. Number of Submittal Items in a Submittal Package for each Equipment (product) Type (submittal items/submittal package)			
	0	Number of Submittal Sets Reqd. (sets / submittal)			
	0.000	Avg. Time to Sign each Page (hours/page)			
	0.000	Avg. Time to Stamp each Sheet (hours / sheet)			
	$0.00	Construction Project Manager Rate ($ / hour)	$0.00		
	$0.00	Assistant (Construction) Project Manager Rate ($ / hou	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	180.07	**Send Submittal Package**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.000	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	180.08	**Log Transmittal of Submittal Package**			
	0	Avg. Number of Transmittals (Transmittals)			
	0.0	Time to Log (hours / transmittal)			
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	

	180.04	Produce Submittal Package			
COPYING/ ELEC.DOC.	180.05	**Copy Submittal Package**			
	0	Avg. Number of Submittal Pages in a Submittal Item (pages/submittal item)			
	0	Avg. Number of Submittal Sheets in a Submittal Item (sheets/submittal item)			
	0	Avg. Number of Submittal Items in a Submittal Package for each Equipment (product) Type (submittal items/submittal package)			
	0	Number of Equipment (product) Types (Types / project)			
	0	Number of Submittal Sets Reqd. (sets / submittal)			
	$0.00	Avg. Per Page Copy Cost ($ / page)			
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)			
	0.00	Avg. In-house Reproduction Time Per Set (hours/set)			
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
		Copying Cost	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	180.06	**Stamp Submittal Package**			
	0	Avg. Number of Submittal Pages in a Submittal Item (pages/submittal item)			
	0	Avg. Number of Submittal Sheets in a Submittal Item (sheets/submittal item)			
	0	Avg. Number of Submittal Items in a Submittal Package for each Equipment (product) Type (submittal items/submittal package)			
	0	Number of Submittal Sets Reqd. (sets / submittal)			
	0.00	Avg. Time to Sign each Page (hours/page)			
	0.00	Avg. Time to Stamp each Sheet (hours / sheet)			
	$0.00	Construction Project Manager Rate ($ / hour)	$0.00		
	$0.00	Assistant (Construction) Project Manager Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	180.07	**Send Submittal Package**			
	0	Avg. Number of Transmittals (Transmittals)			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.000	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
		Mailing Costs	$0.00		
		SubTotal		**$0.00**	
HANDLING/ ELEC.DOC.	180.08	**Log Transmittal of Submittal Package**			
	0	Avg. Number of Transmittals (Transmittals)			
	0	Time to Log (hours / transmittal)			
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
		SubTotal		**$0.00**	

	180.09	Receive Submittal Package		
HANDLING/ ELEC.DOC.	180.10	**Log Receipt of Submittal Package**		
	0	Avg. Number of Transmittals (Transmittals)		
	0	Time to Log (hours / transmittal)		
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
	180.11	Review Submittal Package		
HANDLING/ ELEC.DOC.	180.12	**Send Submittal Package to Architect**		
	0	Avg. Number of Transmittals (Transmittals)		
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)		
	0.000	Avg. Time to Prepare a Transmittal (hours/transmittal)		
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
		Mailing Costs	$0.00	
		SubTotal		**$0.00**
HANDLING/ ELEC.DOC.	180.13	**Log Transmittal of Submittal Package**		
	0	Avg. Number of Transmittals (Transmittals)		
	0	Time to Log (hours / transmittal)		
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
	180.14	Receive Submittal Package		
HANDLING/ ELEC.DOC.	180.15	**Log Receipt of Submittal Package**		
	0	Avg. Number of Transmittals (Transmittals)		
	0	Time to Log (hours / transmittal)		
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
	180.16	Submittal Issue		
			Current Process Total	**$0.00**

	180.09	Receive Submittal Package		
HANDLING/ ELEC.DOC.	180.10	**Log Receipt of Submittal Package**		
	0	Avg. Number of Transmittals (Transmittals)		
	0	Time to Log (hours / transmittal)		
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
	180.11	**Verify Submittal Package**		
HANDLING/ ELEC.DOC.	180.12	**Send Submittal Package to Architect**		
	0	Avg. Number of Transmittals (Transmittals)		
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)		
	0.000	Avg. Time to Prepare a Transmittal (hours/transmittal)		
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
		Mailing Costs	$0.00	
		SubTotal		**$0.00**
HANDLING/ ELEC.DOC.	180.13	**Log Transmittal of Submittal Package**		
	0	Avg. Number of Transmittals (Transmittals)		
	0	Time to Log (hours / transmittal)		
	$0.00	Owners Rep. Administrative Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
	180.14	Receive Submittal Package		
HANDLING/ ELEC.DOC.	180.15	**Log Receipt of Submittal Package**		
	0	Avg. Number of Transmittals (Transmittals)		
	0	Time to Log (hours / transmittal)		
	$0.00	Architect Drafter Rate ($ / hour)	$0.00	
		SubTotal		**$0.00**
	180.16	Submittal Issue		
			Expected Process Total	**$0.00**

Process Name Submittal Issue
OmniClass Stage 31-40 20 27 Submittal Processing Phase
OmniClass Role 34-35 14 00 Contractor

Description The Owner's Representative and Architect review the submittals provided by the contractor and provide comments.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -
COBie process cost:	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -

Current Process

190.01 Examine Submittal Package (Pre-Construction, Product Type Selection, System Layout)

HANDLING/ELEC.DOC. **190.02.10 Send Copies of Submittal Package (Product Type Selection, System Layout) to Sub-Consultants**

0	Avg. Number of Transmittals (Transmittals)	
$0.00	Avg. Mailing Cost per Transmittal	
-	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$ -	Architect Drafter Rate ($ / hour)	$0.00
	Mailing Costs	$0.00
	SubTotal	**$0.00**

HANDLING/ELEC.DOC. **190.02.11 Log Transmittal of Submittal Package (Product Type Selection, System Layout)**

0	Avg. Number of Transmittals (Transmittals)	
0	Time to Log (hours / transmittal)	
$0.00	Architect Drafter Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

190.02.12 Receive Copies of Sub Consultant's Submittal Mark-ups/Comments

HANDLING/ELEC.DOC. **190.02.13 Log Receipt of Sub Consultant's Submittal Mark-ups/Comments**

0	Avg. Number of Transmittals (Transmittals)	
0	Time to Log (hours / transmittal)	
$0.00	Architect Drafter Rate ($ / hour)	$0.00

Expected Process

190.01 Examine Submittal Package (Pre-Construction, Product Type Selection, System Layout)

HANDLING/ELEC.DOC. **190.02.10 Send Copies of Submittal Package (Product Type Selection, System Layout) to Sub-Consultants**

0	Avg. Number of Transmittals (Transmittals)	
$0.00	Avg. Mailing Cost per Transmittal	
-	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$ -	Architect Drafter Rate ($ / hour)	$0.00
	Mailing Costs	$0.00
	SubTotal	**$0.00**

HANDLING/ELEC.DOC. **190.02.11 Log Transmittal of Submittal Package (Product Type Selection, System Layout)**

0	Avg. Number of Transmittals (Transmittals)	
0	Time to Log (hours / transmittal)	
$0.00	Architect Drafter Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

190.02.12 Receive Copies of Sub Consultant's Submittal Mark-ups/Comments

HANDLING/ELEC.DOC. **190.02.13 Log Receipt of Sub Consultant's Submittal Mark-ups/Comments**

0	Avg. Number of Transmittals (Transmittals)	
0	Time to Log (hours / transmittal)	
$0.00	Architect Drafter Rate ($ / hour)	$0.00

	190.02.14	Review Sub Consultant's Submittal Mark-ups/Comments					
VALIDATING/ COBie	190.02.20	**Validate Submittal Package not sent to Sub Consultants**					
	0	Number of Equipment (product) Types (Types / project)					
	0	Avg. Time Spent Evaluating Product Type Submittal Items against Contract Documents (hours / product type submittal item)					
	0%	Percentage of Product Submittals reviewed by Licensed Architect					
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00				
		SubTotal		**$0.00**			
HANDLING/ ELEC.DOC.	190.02.21	**Mark-up Copies of Submittals with Comments**					
	0	Avg. Number of Submittal Pages in a Submittal Item (pages/submittal item)					
	0	Avg. Number of Submittal Sheets in a Submittal Item (sheets/submittal item)					
	0	Avg. Number of Submittal Items in a Submittal Package for each Equipment (product) Type (submittal items/submittal package)					
	0	Number of Equipment (product) Types (Types / project)					
	0.00	Avg. Time Spent Transferring Comments per Page (hours / page)					
	0.00	Avg. Time Spent Transferring Comments per Sheet (hours / sheet)					
	0	Number of Submittal Sets Reqd. (sets / submittal)					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00				
		SubTotal		**$0.00**			
HANDLING/ ELEC.DOC.	190.03.10	**Send Copies of Submittal Issues**					
	0	Avg. Number of Transmittals (Transmittals)					
	$0.00	Avg. Mailing Cost per Transmittal					
	-	Avg. Time to Prepare a Transmittal (hours/transmittal)					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00				
		Mailing Cost	$0.00				
		SubTotal		**$0.00**			
HANDLING/ ELEC.DOC.	190.03.20	**Log Transmittal of Submittal Issues**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00				
		SubTotal		**$0.00**			
	190.04	Receive Submittal Issue					
HANDLING/ ELEC.DOC.	190.05	**Log Receipt of Submittal Issue**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00				
		SubTotal		**$0.00**			
	190.06	Review Submittal Package					
			Subtotal (1st Review Total)	**$0.00**			

	190.02.14	Review Sub Consultant's Submittal Mark-ups/Comments					
VALIDATING/ COBie	190.02.20	**Validate Submittal Package not sent to Sub Consultants**					
	0	Number of Equipment (product) Types (Types / project)					
	0.0	Avg. Time Spent Evaluating Product Type Submittal Items against Contract Documents (hours / product type submittal item)					
	0%	Percentage of Product Submittals reviewed by Licensed Architect					
	$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00				
		SubTotal		**$0.00**			
HANDLING/ ELEC.DOC.	190.02.21	**Mark-up Copies of Submittals with Comments**					
	0	Avg. Number of Submittal Pages in a Submittal Item (pages/submittal item)					
	0	Avg. Number of Submittal Sheets in a Submittal Item (sheets/submittal item)					
	0	Avg. Number of Submittal Items in a Submittal Package for each Equipment (product) Type (submittal items/submittal package)					
	0	Number of Equipment (product) Types (Types / project)					
	0.00	Avg. Time Spent Transferring Comments per Page (hours / page)					
	0.00	Avg. Time Spent Transferring Comments per Sheet (hours / sheet)					
	0	Number of Submittal Sets Reqd. (sets / submittal)					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00				
		SubTotal		**$0.00**			
HANDLING/ ELEC.DOC.	190.03.10	**Send Copies of Submittal Issues**					
	0	Avg. Number of Transmittals (Transmittals)					
	$0.00	Avg. Mailing Cost per Transmittal					
	-	Avg. Time to Prepare a Transmittal (hours/transmittal)					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00				
		Mailing Cost	$0.00				
		SubTotal		**$0.00**			
HANDLING/ ELEC.DOC.	190.03.20	**Log Transmittal of Submittal Issues**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	$0.00	Architect Drafter Rate ($ / hour)	$0.00				
		SubTotal		**$0.00**			
	190.04	Receive Submittal Issue					
HANDLING/ ELEC.DOC.	190.05	**Log Receipt of Submittal Issue**					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00				
		SubTotal		**$0.00**			
	190.06	Review Submittal Package					
			Subtotal (1st Review Total)	**$0.00**			

RECREATING/ COBie	190.06.10	Recreate Submittal Package (Product Type Selection, System Layout)			
	0	Number of Equipment (product) Types (Types / project)			
	0	Avg. Time Spent Revising one Product Submittal Item (hours / product)			
	0%	Percentage of Time Spent by Construction Project Manager			
	0%	Percentage of Time Spent by Assistant (Construction) Project Manager			
	$0.00	Construction Project Manager Rate ($ / hour)	$0.00		
	$0.00	Assistant (Construction) Project Manager Rate ($ / hou	$0.00		
		SubTotal	$0.00		
	0%	Percentage of Product Submittals rejected on 2nd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
				$0.00	
	0%	Percentage of Product Submittals rejected on 3rd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
				$0.00	
	0%	Percentage of Product Submittals rejected on 4th review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
				$0.00	
			Current Process Total	$0.00	
		Elec. Doc Current process cost:			
		2nd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
		3rd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
		4th review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
			Architect's Sub Total	$0.00	
			Contractor's Sub Total	$0.00	
		COBie Current process cost:			
		2nd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
		3rd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
		4th review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
			Architect's Sub Total	$0.00	
			Contractor's Sub Total	$0.00	

RECREATING/ COBie	190.06.10	Recreate Submittal Package (Product Type Selection, System Layout)			
	0	Number of Equipment (product) Types (Types / project)			
	0.00	Avg. Time Spent Revising one Product Submittal Item (hours / product)			
	0%	Percentage of Time Spent by Construction Project Manager			
	0%	Percentage of Time Spent by Assistant (Construction) Project Manager			
	$0.00	Construction Project Manager Rate ($ / hour)	$0.00		
	$0.00	Assistant (Construction) Project Manager Rate ($ / hour	$0.00		
		SubTotal	$0.00		
	0%	Percentage of Product Submittals rejected on 2nd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
				$0.00	
	0%	Percentage of Product Submittals rejected on 3rd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
				$0.00	
	0%	Percentage of Product Submittals rejected on 4th review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
				$0.00	
			Expected Process Total	$0.00	
		Elec. Doc Expected process cost:			
		2nd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
		3rd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
		4th review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
			Architect's Sub Total	$0.00	
			Contractor's Sub Total	$0.00	
		COBie Expected process cost:			
		2nd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
		3rd review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
		4th review			
		Architect's Cost	$0.00		
		Contractor's Cost	$0.00		
			Architect's Sub Total	$0.00	
			Contractor's Sub Total	$0.00	

Process Name	Purchase Order
OmniClass Stage	31-40 20 27 Submittal Processing Phase
OmniClass Role	34-35 14 00 Contractor
Description	The Contractor contacts a Supplier to order equipment and materials. The Supplier then provides a price quote to the Contractor for the equipment and/or materials. The Contractor verifies the specifications of the equipment and/or materials in the quote against approved submittal documentation and then submits a Purchase Order.

Information Attributes

		Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process		**Expected Process**	
200.01	Contact Supplier	200.01	Contact Supplier
200.02	Request Quote and Technical Data	200.02	Request Quote and Technical Data
200.03	Receive Quote and Technical Data	200.03	Receive Quote and Technical Data
200.04	Submit Technical Data for Approval	200.04	Submit Technical Data for Approval
200.05	Receive Approval	200.05	Receive Approval
200.06	Issue Purchase Order	200.06	Issue Purchase Order
200.07	Send Purchase Order and Approved Product Type Selection to Supplier	200.07	Send Purchase Order and Approved Product Type Selection to Supplier
	Current Process Total $ -		**Expected Process Total** $ -

Process Name Product Installation
OmniClass Stage 31-40 40 11 17 Installation Phase
OmniClass Role 34-35 14 00 Contractor

Description The Contractor installs the building equipment, materials, and systems using the design final drawings, approved shop drawings, product data and manufacturer's instructions.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

210.01 Receive Equipment and Materials

210.02 Review Purchase Order

210.03.10 Log Receipt of Equipment and Materials

210.03.11 Review Manufacturer's Installation Instructions

210.03.12 Install Equipment, Materials and Building Systems - Recording Component Data

REFORMATTING/ COBie — **210.04 Reformat Product Installation Report**

0	Number of Tagged Components (components / project)	
0.00	Avg. Time Spent Re-formatting Product Installation Report in Office (hours/ component)	
$0.00	Assistant (Construction) Project Manager Rate ($ / hour	$0.00
	SubTotal	**$0.00**

HANDLING/ ELEC.DOC. — **210.05 Send Product Installation Report to Architect / Owners Rep**

0	Avg. Number of Transmittals (Transmittals)	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$0.00	Contractor Administrative Rate ($ / hour)	$0.00
	Mailing Cost	$0.00
	SubTotal	**$0.00**

Expected Process

210.01 Receive Equipment and Materials

210.02 Review Purchase Order

210.03.10 Log Receipt of Equipment and Materials

210.03.11 Review Manufacturer's Installation Instructions

210.03.12 Install Equipment, Materials and Building Systems - Recording Component Data

REFORMATTING/ COBie — **210.04 Reformat Product Installation Report**

0	Number of Tagged Components (components / project)	
0.00	Avg. Time Spent Re-formatting Product Installation Report in Office (hours/ component)	
$0.00	Assistant (Construction) Project Manager Rate ($ / hou	$0.00
	SubTotal	**$0.00**

HANDLING/ ELEC.DOC. — **210.05 Send Product Installation Report to Architect / Owners Rep**

0	Avg. Number of Transmittals (Transmittals)	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$0.00	Contractor Administrative Rate ($ / hour)	$0.00
	Mailing Cost	$0.00
	SubTotal	**$0.00**

HANDLING/ ELEC.DOC.	210.06	Log Transmittal of Product Installation Report					
	0	Avg. Number of Transmittals (Transmittals)					
	0.00	Time to Log (hours / transmittal)					
	$0.00	Contractor Administrative Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
	210.07	Receive Product Installation Report					
HANDLING/ ELEC.DOC.	210.08	Log Receipt of Product Installation Report					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	$0.00	Architect Drafter Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
			Current Process Total		$0.00		

HANDLING/ ELEC.DOC.	210.06	Log Transmittal of Product Installation Report					
	0	Avg. Number of Transmittals (Transmittals)					
	0.0	Time to Log (hours / transmittal)					
	$0.00	Contractor Administrative Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
	210.07	Receive Product Installation Report					
HANDLING/ ELEC.DOC.	210.08	Log Receipt of Product Installation Report					
	0	Avg. Number of Transmittals (Transmittals)					
	0	Time to Log (hours / transmittal)					
	$0.00	Architect Drafter Rate ($ / hour)		$0.00			
		SubTotal			$0.00		
			Expected Process Total		$0.00		

Process Name	Start-Up
OmniClass Stage	31-40 40 11 17 Installation Phase
OmniClass Role	34-35 14 00 Contractor
Description	After the Contractor completes the installation process, the equipment/systems must be tested by activating the equipment. This testing must be completed with the Owner's Representative and Manufacturer's representative present.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

220.01	Send Start-Up Test Procedures and Recording Forms to Owner's Rep.
220.02	Schedule Start-Up Test with Owner's Rep.
220.03	Review Manufacturer's Start-Up/Operation Instructions
220.04	Conduct Start-Up/Test of Installed Equipment
220.05	Record Test Results

Current Process Total $ -

Expected Process

220.01	Send Start-Up Test Procedures and Recording Forms to Owner's Rep.
220.02	Schedule Start-Up Test with Owner's Rep.
220.03	Review Manufacturer's Start-Up/Operation Instructions
220.04	Conduct Start-Up/Test of Installed Equipment
220.05	Record Test Results

Expected Process Total $ -

Process Name Product Inspection
OmniClass Stage 31-40 40 91 17 Evaluation Phase
OmniClass Role 34-35 14 00 Contractor

Description When the Contractor has completed installation of equipment or systems, a notification is sent to the Architect indicating the installed item is ready for inspection/observation. The Architect conducts regular inspections of the installed construction work. The findings of the inspections including any deficiencies are identified in the inspection report, the Contractor corrects them and requests a re-inspection.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
COBie process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

230.01 Request Product Inspection

230.02 Review Contract Drawings and Product Inspection Report

230.03 Conduct Product Inspection

REFORMATTING/ COBie — **230.04 Reformat Product Inspection Report**

0	Avg. Field Time Spent Documenting Report per Site Visit (hours / visit)	
0	Avg. Number of Site Visits per month (visit / month)	
0	Avg. Number of Months of Construction (months)	
8	Total Time Spent in Office (hours / day)	
0%	Avg. Percentage of Office Time Spent Quantifying products-in-place	
$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

HANDLING/ ELEC.DOC. — **230.05 Send Product Inspection Report to Contractor**

0	Avg. Number of Transmittals (Transmittals)	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0.000	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$0.00	Architect Drafter Rate ($ / hour)	$0.00
	Mailing Cost	$0.00
	SubTotal	**$0.00**

Expected Process

230.01 Request Product Inspection

230.02 Review Contract Drawings and Product Inspection Report

230.03 Conduct Product Inspection

REFORMATTING/ COBie — **230.04 Reformat Product Inspection Report**

0.00	Avg. Field Time Spent Documenting Report per Site Visit (hours / visit)	
0	Avg. Number of Site Visits per month (visit / month)	
0	Avg Number of Months of Construction (months)	
0	Total Time Spent in Office (hours / day)	
0%	Avg. Percentage of Office Time Spent Quantifying products-in-place	
$0.00	Licensed Professional Architect Rate ($ / hour)	$0.00
	SubTotal	**$0.00**

HANDLING/ ELEC.DOC. — **230.05 Send Product Inspection Report to Contractor**

0	Avg. Number of Transmittals (Transmittals)	
$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)	
0.00	Avg. Time to Prepare a Transmittal (hours/transmittal)	
$0.00	Architect Drafter Rate ($ / hour)	$0.00
	Mailing Cost	$0.00
	SubTotal	**$0.00**

HANDLING/ ELEC.DOC.	230.06	**Log Transmittal of Product Inspection Report**					
		0	Avg. Number of Transmittals (Transmittals)				
		0.00	Time to Log (hours / transmittal)				
		$0.00	Architect Drafter Rate ($ / hour)	$0.00			
			SubTotal		**$0.00**		
	230.07	Receive Product Inspection Report					
HANDLING/ ELEC.DOC.	230.08	**Log Receipt of Product Inspection Report**					
		0	Avg. Number of Transmittals (Transmittals)				
		0	Time to Log (hours / transmittal)				
		$0.00	Contractor Administrative Rate ($ / hour)	$0.00			
			SubTotal		**$0.00**		
	230.09	Review Product Inspection Report					
	230.10	Correct Deficiencies					
	230.11	Request Re-inspection					
				Current Process Total	**$0.00**		

HANDLING/ ELEC.DOC.	230.06	**Log Transmittal of Product Inspection Report**					
		0	Avg. Number of Transmittals (Transmittals)				
		0	Time to Log (hours / transmittal)				
		$0.00	Architect Drafter Rate ($ / hour)	$0.00			
			SubTotal		**$0.00**		
	230.07	Receive Product Inspection Report					
HANDLING/ ELEC.DOC.	230.08	**Log Receipt of Product Inspection Report**					
		0	Avg. Number of Transmittals (Transmittals)				
		0	Time to Log (hours / transmittal)				
		$0.00	Contractor Administrative Rate ($ / hour)	$0.00			
			SubTotal		**$0.00**		
	230.09	Review Product Inspection Report					
	230.10	Correct Deficiencies					
	230.11	Request Re-inspection					
				Expected Process Total	**$0.00**		

Process Name	Punchlist Issue
OmniClass Stage	31-40 40 91 17 Evaluation Phase
OmniClass Role	34-35 14 00 Contractor
Description	The Architect creates a final punchlist based upon a survey of the completed construction work. The Contractor corrects the deficiencies identified in the punchlist. The Architect verifies that the Contractor has corrected the deficiencies in the punchlist by performing a final walkthrough.
Information Attributes	

		Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process		**Expected Process**	
240.01	Request Punchlist Issue Inspection	240.01	Request Punchlist Issue Inspection
240.02	Review Contract Drawings	240.02	Review Contract Drawings
240.03	Conduct Punchlist Issue Inspection	240.03	Conduct Punchlist Issue Inspection
240.04	Reformat Punchlist Issue Report	240.04	Reformat Punchlist Issue Report
240.05	Send Punchlist Issue Report to Contractor	240.05	Send Punchlist Issue Report to Contractor
240.06	Log Transmittal of Punchlist Issue Report	240.06	Log Transmittal of Punchlist Issue Report
240.07	Receive Punchlist Issue Report	240.07	Receive Punchlist Issue Report
240.08	Log Receipt of Punchlist Issue Report	240.08	Log Receipt of Punchlist Issue Report
240.09	Review Punchlist Issue Report	240.09	Review Punchlist Issue Report
240.10	Correct Deficiencies	240.10	Correct Deficiencies
240.11	Request Re-inspection	240.11	Request Re-inspection
	Current Process Total $ -		**Expected Process Total** $ -

Process Name Turnover Package
OmniClass Stage 31-40 40 91 17 Evaluation Phase
OmniClass Role 34-35 14 00 Contractor

Description The Contractor gathers all the as-built information related to the project and forwards the information to the owner.

Information Attributes

	Owner	Architect	Contractor
Current process cost:	$ -	$ -	$ -	$ -
Expected process cost:	$ -	$ -	$ -	$ -
Process Cost Difference:	$ -	$ -	$ -	$ -

Process

Current Process

SEARCHING/ ELEC.DOC.	250.01	Compile Turnover Package		
	0	Avg. Time Spent Searching and Assembling Operations & Maintenance Manuals (hours / document)		
	0	Avg. Time Spent Searching and Assembling Commissioning Report (hours / document)		
	0	Avg. Time Spent Searching and Assembling Record Specifications (hours / document)		
	0	Avg. Number of Sheets in Record (As-Built) Drawings		
	0.0000	Avg. Time Spent Searching and Assembling Record (As-Built) Drawings (hours / sheet)		
	0	Avg. Number of Sheets in Final Approved Shop Drawings		
	0.00	Avg. Time Spent Searching and Assembling Final Approved Shop Drawings (hours / sheet)		
	0%	Percentage of Time Spent by Construction Project Manager		
	0%	Percentage of Time Spent by Assistant (Construction) Project Manager		
	$0.00	Construction Project Manager Rate ($ / hour)	$0.00	
	$0.00	Assistant (Construction) Project Manager Rate ($ /	$0.00	
		SubTotal		**$0.00**
COPYING/ ELEC.DOC.	250.02	Copy Turnover Package		
	0	Avg. Number of Pages in Operations & Maintenance Manuals (pages / product)		
	0	Number of Equipment (product) Types (Types / project)		
	0	Avg. Number of Pages in Commissioning Report (pages / component)		
	0	Avg. Number of Components & Systems to be Commissioned		
	0	Avg. Number of Pages in Record Specifications		
	0	Avg. Number of Sheets in Record (As-Built) Drawings		
	0	Avg. Number of Sheets in Final Approved Shop Drawings		
	0	Number of Submittal Sets Reqd. (sets / submittal)		
	$0.00	Avg. Per Page Copy Cost ($ / page)		
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)		
	0	Avg. In-house Reproduction Time Per Set (hours/set)		
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00	
		Reproduction Costs	$0.00	
		SubTotal		**$0.00**

Expected Process

SEARCHING/ ELEC.DOC.	250.01	Compile Turnover Package		
	0.0	Avg. Time Spent Searching and Assembling Operations & Maintenance Manuals (hours / document)		
	0	Avg. Time Spent Searching and Assembling Commissioning Report (hours / document)		
	0.00	Avg. Time Spent Searching and Assembling Record Specifications (hours / document)		
	0	Avg. Number of Sheets in Record (As-Built) Drawings		
	0.0000	Avg. Time Spent Searching and Assembling Record (As-Built) Drawings (hours / sheet)		
	0	Avg. Number of Sheets in Final Approved Shop Drawings		
	0.0000	Avg. Time Spent Searching and Assembling Final Approved Shop Drawings (hours / sheet)		
	0%	Percentage of Time Spent by Construction Project Manager		
	0%	Percentage of Time Spent by Assistant (Construction) Project Manager		
	$0.00	Construction Project Manager Rate ($ / hour)	$0.00	
	$0.00	Assistant (Construction) Project Manager Rate ($ /	$0.00	
		SubTotal		**$0.00**
COPYING/ ELEC.DOC.	250.02	Copy Turnover Package		
	0	Avg. Number of Pages in Operations & Maintenance Manuals (pages / product)		
	0	Number of Equipment (product) Types (Types / project)		
	0	Avg. Number of Pages in Commissioning Report (pages / component)		
	0	Avg. Number of Components & Systems to be Commissioned		
	0	Avg. Number of Pages in Record Specifications		
	0	Avg. Number of Sheets in Record (As-Built) Drawings		
	0	Avg. Number of Sheets in Final Approved Shop Drawings		
	0	Number of Submittal Sets Reqd. (sets / submittal)		
	$0.00	Avg. Per Page Copy Cost ($ / page)		
	$0.00	Avg. Per Sheet Copy Cost ($ / sheet)		
	0	Avg. In-house Reproduction Time Per Set (hours/set)		
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00	
		Reproduction Costs	$0.00	
		SubTotal		**$0.00**

HANDLING/ ELEC.DOC.	250.03	Send Copies of Turnover Package			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.0	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$ -	Contractor Administrative Rate ($ / hour)	$0.00		
		Mailing Cost ($)	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	250.04	Log Transmittal of the Turnover Package			
	0	Time to Log (hours / transmittal)			
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	250.05	Receive Copies of the Turnover Package			
HANDLING/ ELEC.DOC.	250.06	Log Receipt of the Turnover Package			
	0	Time to Log (hours / transmittal)			
	$0.00	Owner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	250.07	Review Turnover Package			
	0	Avg. Number of Pages in Operations & Maintenance Manuals			
	0.0000	Avg. Time Spent Reviewing Operations & Maintenance Manuals (hours/page)			
	0	Avg. Number of Pages in Commissioning Report			
	0	Avg. Time Spent Reviewing Commissioning Report (hours/page)			
	0	Avg. Number of Pages in Record Specifications			
	0.0000	Avg. Time Spent Reviewing Record Specifications (hours / page)			
	0	Avg. Number of Sheets in Record (As-Built) Drawings			
	0.0000	Avg. Time Spent Reviewing Record (As-Built) Drawings (hours /sheet)			
	0	Avg. Number of Sheets in Final Approved Shop Drawings			
	0.0000	Avg. Time Spent Reviewing Final Approved Shop Drawings (hours/sheet)			
	$0.00	Owner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	250.08	File Turnover Package			
	0.00	Avg. Time Spent Filing Operations & Maintenance Manuals (hours / document)			
	0	Avg. Time Spent Filing Commissioning Report (hours/document)			
	0.00	Avg. Time Spent Filing Record Specifications (hours/document)			
	0	Avg. Number of Sheets in Record (As-Built) Drawings			
	0.0000	Avg. Time Spent Filing Record (As-Built) Drawings (hours/sheet)			
	0	Avg. Number of Sheets in Final Approved Shop Drawings			
	0.0000	Avg. Time Spent Filing Final Approved Shop Drawings(hours/sheet)			
	$0.00	Owner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
			Current Process Total	$0.00	

HANDLING/ ELEC.DOC.	250.03	Send Copies of Turnover Package			
	$0.00	Avg. Mailing Cost per Transmittal ($ / Transmittal)			
	0.0	Avg. Time to Prepare a Transmittal (hours/transmittal)			
	$ -	Contractor Administrative Rate ($ / hour)	$0.00		
		Mailing Cost ($)	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	250.04	Log Transmittal of the Turnover Package			
	0	Time to Log (hours / transmittal)			
	$0.00	Contractor Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
	250.05	Receive Copies of the Turnover Package			
HANDLING/ ELEC.DOC.	250.06	Log Receipt of the Turnover Package			
	0	Time to Log (hours / transmittal)			
	$0.00	Owner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	250.07	Review Turnover Package			
	0	Avg. Number of Pages in Operations & Maintenance Manuals			
	0.0000	Avg. Time Spent Reviewing Operations & Maintenance Manuals (hours/page)			
	0	Avg. Number of Pages in Commissioning Report			
	0	Avg. Time Spent Reviewing Commissioning Report (hours/page)			
	0	Avg. Number of Pages in Record Specifications			
	0	Avg. Time Spent Reviewing Record Specifications (hours / page)			
	0	Avg. Number of Sheets in Record (As-Built) Drawings			
	0.0000	Avg. Time Spent Reviewing Record (As-Built) Drawings (hours /sheet)			
	0	Avg. Number of Sheets in Final Approved Shop Drawings			
	0	Avg. Time Spent Reviewing Final Approved Shop Drawings (hours/sheet)			
	$0.00	Owner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
HANDLING/ ELEC.DOC.	250.08	File Turnover Package			
	0.00	Avg. Time Spent Filing Operations & Maintenance Manuals (hours / document)			
	0.00	Avg. Time Spent Filing Commissioning Report (hours/document)			
	0.00	Avg. Time Spent Filing Record Specifications (hours/document)			
	0	Avg. Number of Sheets in Record (As-Built) Drawings			
	0.0000	Avg. Time Spent Filing Record (As-Built) Drawings (hours/sheet)			
	0	Avg. Number of Sheets in Final Approved Shop Drawings			
	0.0000	Avg. Time Spent Filing Final Approved Shop Drawings(hours/sheet)			
	$0.00	Owner Administrative Rate ($ / hour)	$0.00		
		SubTotal		$0.00	
			Expected Process Total	$0.00	

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
October 2013	Final	

4. TITLE AND SUBTITLE

Assessment of Life Cycle Information Exchanges (LCie): Understanding the Value-Added Benefit of a COBie Process

5a. CONTRACT NUMBER
CRADA-07-CERL-02

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER
622784 T41

6. AUTHOR(S)

Kristine Fallon, Omobolawa Fadojutimi, Gregory Williams, Naila Crawford, Danielle Gran

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

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10. SPONSOR/MONITOR'S ACRONYM(S)
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ERDC/CERL CR-13-6

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The Construction Operations Building information exchange (COBie) standard defines a minimum set of information needed to capture electronic construction handover information. COBie, however, does not define the specific processes used to create such information. Some designers and contractors may choose to capture the data by mirroring current document-based processes, transcribing information from required paper documents into a COBie-formatted file following beneficial occupancy. Other designers and contractors may choose to capture this information as data, as the work progresses, using COBie-centered project extranets. This report examines the costs and benefits of each approach, and compares them by analyzing differences in each business process that uses COBie information. The results indicate that a significant benefit may be achieved through the elimination of the non-value-added activities related to the handling, routing, transforming, checking, copying, and transmitting documents containing COBie data.

15. SUBJECT TERMS

Construction Operations Building information exchange (COBie), Building Information Modeling (BIM), value-added analysis, business processes, project management

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (include area code)
Unclassified	Unclassified	Unclassified		382	