A Comparative Analysis of Construction Operation Information Exchange Via Paper-based Systems and COBie Format: A Case Study of The First COBie Pilot Project at University of Washington

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Table of Contents

List of Figures iii

List of Tables iv

Glossary v

Acknowledgements vii

My enormous appreciation goes to my parents and brother for their unsparing support and encouragement. vii

Chapter 1- Introduction 1

Chapter 2- Literature Review 3

2.1- Building Information Modeling 3

2.1.1- Definition of BIM 3

2.1.2- BIM and Construction Handover 4

2.2- Description of COBie 8

2.2.1- Early Design Stage 8

2.2.2- Construction Documents Design Stage 9

2.2.3- Contractor Quality Control Stage 9

2.2.4- Product Installation Stage 10

2.3- COBie and Interoperability 11

2.4- Conclusion 12

Chapter 3- Methodology 14

3.1- Project Introduction 15

3.2- Data Collection Method 16

3.2.1- Interviews 16

3.2.2- Studying COBie Spreadsheet 17

3.2.3- COBie BIM Model & Electronic O&M Manuals 17

3.2.4- Actual Data Entry 18
3.3- Type of Data Collected 18
3.3.1- Technical Work Processes 18
3.3.2- Assets tracked 19
3.3.3- Attributes of assets tracked 20
3.4- Method of Data Analysis 21
3.5- Anticipated Results 22
3.6- Description of AiM (UW's CMMS System) 22
Chapter 4- Description of Current Data Transfer Process 23
4.1- Retrieving Information from Paper Copies of Handover Data and Site Visit 23
4.2- Manual Data Entry into Facilities Services CMMS System 29
4.3- What is missing from AiM 35
4.4- Conclusion 35
Chapter 5- Description of COBie Data Transfer Process 38
5.2- First Step of COBie Format Process 38
Chapter 6- Analysis 47
6.1- Analysis of Hours Spent on Each Process 47
6.2- Analysis of The Work Flow of Each Process in Facility's Life Cycle 48
6.3- Is BIM Necessary For COBie Format Process? 50
Chapter 7- Conclusion & Future Research 51
Bibliography 52
Appendix A- COBie Spreadsheet 55

List of Figures

Figure 1- Master Asset Profile (AiM Screenshot) 29
Figure 2- Master Asset Profile filled out (AiM Screenshot)... 30
Figure 3- Attributes View (AiM Screenshot) 30
Figure 4- User Defined Fields view (AiM Screenshot) 31
Figure 5- Reference Data view (AiM Screenshot) 31
Figure 6- Graph of Time Spent On Data Retrieval And Data Entry In Current Process.............. 36
Figure 7- Comparison of Time Spent on Current Data Entry and Efficient Data Entry in Current Process 36
Figure 8- A VAV Box Selected in the Revit Model and Shown in Properties Window.............. 40
Figure 9- The VAV Box's COBie Data Shown in Type Properties.. 41
Figure 10- Multiple Types within the VAV Box Family (Example of one Family with Multiple Types) 41
Figure 11- Level 4 Mechanical Drawing Linked to the Architectural Revit Model 42
Figure 12- Time Spent on COBie Format Process 46
Figure 13- Comparative Diagram of the Time spent on Current & COBie Format Process........ 48
Figure 14 - The Time Span of Each Construction Handover Process 49

List of Tables

Table 1- COBie Data, Phasing, and Responsibility Matrix 11
Table 2- Asset Groups Tracked 19
Table 3- Method of Data Retrieval for Each Field in Current Process 25
Table 4- Time Estimate for Retrieval of Data in Current Process 27
Table 5- Adjusted Time Estimate for Retrieval of Data in Current Process 28
Table 6- Efficient Data Entry Time for 62% of Assets in Current Process 33
Table 7 - Efficient Data Entry Time for All Assets in Current Process 34
Table 8- Universal and Instance Parameters 39
Table 9- Assets That Shop Managers believe are not needed to be in AiM 45
Table 10- Comparative Table of Time Spent on Current and COBie Format Process 47

Glossary

AEC – Architecture, Engineering, Construction

BAS – Building Automation System

BMS – Building Management System – similar to BAS, this refers to controls systems

BIM – Building Information Modeling – when capitalized, it indicates the general use of a geometry and information-based database to generate and manage building data across the lifecycle of a building

bim – building information model – refers to an individual building model file created in a program like Revit.

CAD – Computer Aided Design

CAFM – Computer Aided Facility Management – similar to a CMMS Assets – individual pieces of equipment or facilities that are tracked in the UW's CMMS Attributes – the data fields tracked for each asset inside the UW's CMMS. For instance, manufacturer, model number, serial number, and installation date.

CMMS – Computerized Maintenance Management System – a software program or system used in preventative maintenance, work order management, and other functions of facility management. The UW uses Aim by Assetworks. Other enterprise applications include Maximo by IBM, Tririga, and FM Systems

EAM – Enterprise Asset Management

IFC – Industry Foundation Classes

IWMS – Integrated Workplace Management System

NIBS – National Institute of Building Sciences

NIST – National Institute of Standards and Technology

O&Ms – Operations and Maintenance manuals - The instruction manuals for equipment that are compiled by the contractor and manufacture for the support of facility maintenance personnel

Revit – a BIM software application by Autodesk used by designers and contractors to create 3D models of buildings with information embedded in the geometry through an internal database

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Chapter 1- Introduction

For managing day-to-day operations of a facility as well as providing its upper management with reliable data for organizational management and planning, the need for standardized quality information that can be deposited and retrieved easily in and from a computerized system is continually increasing. Currently, there are a wide range of technology platforms, data repositories, or databases such as CAFM, CAD, IWMS, EAM, CMMS that are used for these purposes in various facilities. In most current practices, the data is extracted from paper construction documents and is inputted manually in one of the computerized systems mentioned above.

Almost all of the data needed for initial management of facilities is created during design and construction phase. Currently, if the design and construction practitioner uses building information modeling (BIM), they essentially input part of this data into their model. However, building information models (bim) have the capability to store all the data needed for facility management. Therefore, the building industry sees the opportunity to automate the transfer of the data from the building information models to the computerized systems used for facility management.

The information that facility owners and developers would need to make a decision to use an automated computerized data transfer process may include but not limited to the following:

- The extent of data needed for facility management
- The quality and accuracy of data transferred
- The time required for data transfer
- The comparative cost of data transferred automatically vs. manually
- The extent of the proficiency of the facility's personnel in using and maintaining their CMMS
- The opportunities that the use of bim can provide for advancing in visually communicating information about buildings.

This thesis provides a comparative analysis of manual transfer of information from paper construction documents to CMMS versus automatic transfer of data from a bim to CMMS. There are references to the proficiency of facilities personnel and the advanced uses of bim in FM, but these two areas are not particularly explored here. The hope is that this thesis will provide insight to both processes and help the facility owners to have a framework for evaluating their choices of data transfer.

Chapter 2- Literature Review

2.1- Building Information Modeling

2.1.1- Definition of BIM

The US National Institute of Building Sciences (NIBS) gives the following definition for BIM:

> "Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life cycle; defined as existing from earliest conception to demolition.
>
> A basic premise of BIM is collaboration by different stakeholders at different phase of the lifecycle of a facility to insert, extract, update or modify information in the BIM to support and reflect the roles of that stake holder" (Gallaher et al. 2004).

The benefits of using BIM for design and construction of facilities have been recognized by the entire design and construction community, and currently, adequate information is available to the owners to facilitate their decision making about the use of BIM and the extent of such use.

National Institute of Standards and Technology lists the benefits of BIM as following:

- Facilitating better informed design decision-making
- Simulating building performance and construction sequencing
- Streamlining information flow
- Reducing construction field problems and material waste
- Enabling off-site fabrication
- Making easy to capture the information needed for maintenance, expansion, and renovation of the facilities

To realize all these benefits in a project that utilizes BIM, interoperability becomes very important. As BIM is supposed to serve as a single, non-redundant information repository, it is very important that applications used to generate and store information during different phases of the project can be utilized by all stakeholders and the systems they use (Gallaher et al. 2004).

2.1.2- BIM and Construction Handover

The use of BIM for facility operations and maintenance is relatively new; therefore there are limited number of systems that enable such use. However research indicates that the majority of facilities operations personnel would be willing to use such tools in case of availability. In fact, in a survey of 125 facilities' operations and maintenance departments, Forns-Samso find out more than two thirds of facilities, especially the ones that have used BIM in design and construction phase, would use BIM frequently to retrieve information required for operation and maintenance. In this survey, BIM was presumed as a highly sophisticated tool that can link owner's CMMS system to the building information model and provide the spatial properties of an asset as well as its data, O&M manual, and all other information that is required for its maintenance in a single platform (Forns-Samso, 2010). Currently, there are applications that have the capability of storing both three dimensional representation of a building's systems and its assets' data, but they are very complicated to be used by field personnel who generally are not sophisticated users of computers. Currently, most facilities only use simple databases such as Computerized Maintenance Management Systems known as CMMS-s for operation and management.

CMMS-s are the commonly used information technology tools for facility management. These systems are databases for storing O&M data and planning O&M activities such as preventive maintenance, placing and tracking work orders, and managing renovation projects (Veeravigrom, 2008). As facilities are vital; meaning they are in constant change such as renovation, upgrade, and preventive maintenance, updating information stored in the CMMS is highly essential to provide the necessary information to the parties involved in a project at each stage of the facility's life cycle in a timely manner and less expense (Peacock,2003). An outdated CMMS system makes it unreliable and pushes trades people to rely on their or their colleagues' memory for collecting information on a specific asset. This is an inefficient data retrieval work flow and stands for one of the main causes of inefficiency in operation and maintenance fieldwork (Lee et al. 2009).

The possibility of automatic transfer of the information created during design and construction phases to the CMMS system, makes their use more appealing (Peacock, 2003). In the next section (2.1.2.1), a brief history of the building industry efforts for automatic and electronic data transfer from desing and construction to operation and management is presented.

2.1.2.1- History of BIM in Construction Handover

1990-s

A standard was defined by the National Institute of Building Sciences (NIBS), Facility Maintenance and Operations Committee (FMOC) for capturing construction handover data electronically. In this standard, the data structure follows the format defined in the Unified Facility Guide Specifications, Operations and Maintenance Support Information (OMSI) [UFGS 2006].

Per OMSI requirements, indexed contract documents are delivered in both paper and electronic file (pdf) format. Although pdf files that are compiled in one location (for example a compact disk (CD)) help to reduce the time spent on retrieving information, they present four major problems:

- The initial OMSI creation cost is too high. It can typically be $40,000 per capital project.
- The information on the CD does not get shared among multiple parties involved in the facility management due to the lack of standardized, centralized data repository.
- The owner pays three times for the construction handover information; first, during design and construction when this information is generated, second, during close out when paper copies get scanned and compiled in a CD, and third, to operations contractor for surveying existing equipment and compiling information into the owner’s CMMS system.
- Difficulty in purchasing replacement equipment that is no longer manufactured due to the lack of information about the original design requirements of such equipment (East et al. 2007).

2000

National Institute of Building Sciences (NIBS), Facility Maintenance and Operations Committee (FMOC) “created an eXtensible Mark-up Language (XML) schema that would organize the [pdf] files merged into an OMSI data file.” Through this schema the manufacturer’s product data can be imported to the owner’s CMMS system directly (East et al. 2007).

2002: IFC Model Based Operations and Maintenance International Project

In 2002, Industrial Foundation Classes (IFC) data format was tested to discover if it could improve information flow throughout design and construction as well as handover to operations and maintenance. This project was named IFC Model Based Operations and Maintenance (ifc-mBomb) and was sponsored by The U.K. Department of Trade and Industry (DTI). The goal of this pilot project, a real world one, was to demonstrate the IFC's capabilities and encourage commercial software implementations. The project was led by Taylor Woodrow Construction and the technology consultants were AEC3. The project targeted to eliminate the delay and cost involved in populating a facility management (FM) system which was estimated to be 6-12 months and £200,000 respectively for a typical hospital (NIST).

The Industry Foundation Classes (IFC) data model describes building and construction industry data and is developed by Building SMART Alliance (International Alliance for Interoperability, IAI) to facilitate interoperability between applications commonly used in AEC industry. IFC file format is object-based with a data model managed by a model server. A model server is software that enables complete models to be imported and exported, and helps real-time data sharing among several software applications. Therefore, IFC is designed to be a neutral and open specification that is not controlled by any specific vendor. It is registered by ISO as ISO/PAS 16739 and is in the process of becoming an official International Standard ISO/IS 16739 (Building SMART Alliance).

For this test project a two story auditorium within a tertiary (community) college building was chosen and only the data related to the building services (mechanical, electrical, plumbing) was transferred. The project team created a building information model of the building services using a number of software applications and based on the 2D drawings created by the original design team. Next, the team generated a package including schedules of the spaces and mechanical systems that included instances, types and operational instructions for handover. Then they loaded the assets' information into a Commercial Asset Management System. The package and the loaded information were organized around the room requirements data that was taken from the room sheet information created by the client and the architect. The generation of the package and the data load were completed in a few minutes, fully automatically without any re-keying (NIST).

2005- Formation of National Building Information Model Standard effort

National Building Information Model Standard effort was formed to develop and encourage the adoption of information exchange standards based upon the IFC models (East et al. 2007).

2006- Initiation of COBie

In December 2006, The Construction Operations Building Information Exchange (COBie) project was initiated to identify a completely electronic information exchange process between design and construction deliverables of a facility and its operation and maintenance system. As a result of this effort, several data elements that are critical for maintenance of a facility such as location, rooms' area, warranty periods, parts suppliers, equipment data … were identified (East et al. 2007). This data can be captured electronically and be imported to CMMS systems that support a standard data format which is IFC-compliant (NIST).

2007-Current

In 2007, The COBie Pilot implementation standard was published as Appendix B of the National Building Information Model Standard (East et al. 2007). Since then, several federal agencies such as the General Services Administration, The US Army Corps of Engineers, Department of State's Overseas Building Operations, National Aeronautics and Space Administration, and the Departments of Veterans Affairs contractually require the delivery of COBie data. In the first COBie implementation report published in 2008, Fort Lewis Department of Public Works reported that COBie could save them one full-time data entry clerk and reduce by half the need for a full-time CAD operator (NBIMS US COBie v2 ballot submission).

As the positive outcomes of this process get widely reported, many large private owners have started looking for the implementation of COBie in their projects as well. In a COBie case study presentation, a hospital facility manager stated that they could reduce the handover process from 3 man-years to 3 minutes by using COBie (NBIMS US COBie v2 ballot submission).

In addition to the owners, commercial software providers have increased their efforts in generating software applications that will support COBie. This was evidenced by the several vendors' presentation in BIM and Facility Management in Fall 2012 BIM Forum. In the COBie Guide published in October of 2012, it is reported that over twenty commercial software products that cover the entire facility life-cycle from planning, design, construction, commissioning to operations, maintenance, and space management support COBie (East et al. 2012).

Currently, the data required for COBie implementation gets compiled in the building information model (bim) or spreadsheets in the close-out of the construction by the general contractor. However, this is not the best practice, as the data is not captured by the party that has created it; in other words, the data has been created by either the designers or the manufacturers, but is compiled and entered into the bim by the general contractor which presents inefficiency in the system. Capturing COBie data as it gets created which will essentially require designers and manufacturers to format it electronically will increase accuracy and eliminate general contractor's fee for providing such services. In order to achieve these objectives, it is necessary that the building industry drafts contracts that will support COBie implementation across all parties involved in the project (East et al. 2007).

2.2- Description of COBie

"The Construction-Operations Building information exchange (COBie) format is the international standard for the exchange of information about managed facility assets. COBie does not add new requirements to contracts; it simply changes the format of existing deliverables from paper documents and proprietary formats, to an open, international standard format" (East et al. 2012). In the following paragraphs, the types of data that can be captured in each stage of a facility's life cycle based on the COBie standards is described.

2.2.1- Early Design Stage

Generally, in the early design stage of a facility, the owner's spatial requirements are translated into actual physical spaces in a virtual world. These physical spaces are either inside a building or outside. If they are inside the building, they can be identified by their room number located in a specific floor of a specific building. If the space is an outdoor one, it can be identified by its function such as parking lot (East, 2012).

As the space design progresses, the building systems required to meet the functions determined for those spaces get designed as well. These systems include electrical, heating, ventilating and air conditioning (HVAC), potable water, wastewater, fire protection, intrusion detection, and etc. Each of these systems is consisted of equipment, parts, and materials that need to be tracked in the facilities O&M system. The data related to these systems and their components will be incorporated into COBie data subsequently (East, 2012).

2.2.2- Construction Documents Design Stage

At this stage the material, products, and equipment of the building are specified and their information needs to be translated into COBie data set. All the information related to the building components that need to be maintained and managed through O&M are translated into COBie data set. This information generally includes the component type, its material, and location. If the component is part of a building system, optionally, its relation to that system and other components of the same system can be identified in COBie data set. This can be particularly helpful when closing or shutting down a piece of equipment for repair may affect other equipment (East, 2012).

As after this stage, the construction begins and the approved submittals get generated, it is essential to specify the requirements for delivery of the submittals at this stage, so that these documents can be linked to the COBie data (East, 2012).

2.2.3- Contractor Quality Control Stage

At this stage the general contractor provides the submittals and the designers approve them. The approved submittals can be turned into electronic format and directly, be linked to specific types of materials, products, equipment, and systems within the building (East, 2012).

Construction submittals generally are consisted of 3 sections; product manufacturer’s data sheets, shop drawings, and physical samples. The data sheets are generally available in pdf format directly from the manufacturer’s website. The shop drawings are created in a CAD/ BIM format that can easily be printed into the pdf format. The shop drawings should be transmitted in both CAD/BIM and pdf formats. The images of the physical samples (either scanned or photographed) should accompany the COBie data. These electronic files along with COBie file are transmitted on a single COBie data disk to the owner (East, 2012).

While the general contractors have the choice to compile the facility handover data at the end of the construction by scanning and linking COBie data, the handover will be more efficient both time and cost wise, if they choose to utilize an electronic submittal register. By using the submittal register software during the construction process, all submittals will be provided at the end of the project with zero effort of recollecting and compiling them. Currently several general contractors have the expertise to provide electronic submittals; however, the owners are not sophisticated enough to accept and process them (East, 2012).

2.2.4- Product Installation Stage

At this stage, the general contractor procures and installs the materials, products, and equipment that were approved on submittals. The manufacturers' information and the model of these components are required for COBie data and can be either provided in the prior stage or this one. The components serial number or tags and warranty periods are essential to be captured upon installation and be added to the COBie data at this stage (East, 2012).

2.2.5- System Commissioning Stage

In the commissioning stage, as the equipment are installed and tested, they become operational and documents that describe their operation such as instructions, tests, and certifications need to be added to COBie data set in native or pdf format. In addition to these documents, COBie requires three levels of information; job, resources, and spares (East, 2012).

COBie job data includes various plans and schedules that are generally developed during the commissioning phase and are needed to operate a facility. In COBie there is space for the following types of plans: Preventive Maintenance (PM), Safety Plans, Troubleshooting Plans, Start-Up Procedures, Shut-Down Procedures, and Emergency plans. COBie resource data provides the information related to materials, tools, and training needed to carry a job. Similarly, spare data includes information about spare parts (East, 2012).

All these three sets of data are generally included in the manufacturer's data sheets and catalogs. It is expected when COBie format is widely accepted in the construction industry, manufacturers will provide packages of COBie data and pdf catalog cuts to the general contractors. This will reduce the time that contractors spend in compiling and linking this information currently (East, 2012).

COBie Data	Spatial Requiremenrs	Facility Floor Room	Asset Type Asset Material Asset Location	Manufacturer Asset Model Product Data Sheet	Serial Number Warranty Period	O&M Manuals (pdf) Tests (pdf) Certifications (pdf)
Responsible Party	Architect		Architect Design Consultants	Subcontractors Manufacturers Suppliers	Subcontractors Manufacturers Suppliers	Subcontractors Manufacturers Suppliers
Phase	**Early Design**		**Construction Documents Design**	**Contractor Quality Control**	**Product Installation**	**System Commissioning**
	Design			**Construction**		

Table 1- COBie Data, Phasing, and Responsibility Matrix

2.3- COBie and Interoperability

As discussed in previous sections, efficient implementation of COBie in a project requires participation of several parties including the owner, the designers, the general contractor, the subcontractors, and the manufacturers. Each of these parties uses different software applications to generate the data that is eventually going to be handed over to the owner. To enable these parties to transfer data among each other electronically, interoperability between the various software applications used becomes essential. Exchanging data from up-stream to down-stream can be quite cumbersome if interoperability is nonexistence or poor. This is more critical when a two-way data exchange is expected in a project process (Marsters, 2011).

In fact, issues with interoperability during the lifetime of a project can be very costly. In the NIST study NIST GCR 04-867 published in 2004, it is reported that issues with interoperability cost 15.8 billion dollars annually to the US AEC industry. This estimate included expenses incurred to prevent, minimize, and mitigate interoperability problems as well as costs of delay in project completion and facility operation (NIST, 2007).

COBie standard has recognized the need for interoperability and has specified IFC Facility Management Handover Model View Definition as data exchange format (East, Nisbet 2010). As discussed in section 2.1.2.1 of this thesis, IFC enables BIM data exchange between different software applications and eliminates the need for each software application to support numerous native formats (BuildingSMART). Data meeting IFC can be provided in three interoperable formats: STEP Physical File, ifcXML, and SpreadsheetML. There are also tools that help to translate one interoperable format to another. These tools are presented in buildingSMARTalliance website (East et al. 2010).

The different formats for COBie are aimed to satisfy the needs of different users (designers, builders, and commissioning agents). COBie may be generated in spreadsheet directly by hand; however, most people will prefer to hide the COBie data model and use commercial software to create and exchange COBie data. COBie handover data can be first generated in BIM software and exported to an IFC file by the designers, and subsequently be provided as a spreadsheet and get imported into the construction and commissioning software. When the data is handed over to the FM, it can be directly transferred to the FM's operation and maintenance supporting software applications (East et al. 2010).

2.4- Conclusion

Construction data handover has been a cumbersome process involving numerous repetitive activities and re-keying. COBie standard aims to eliminate these inefficiencies and set a process during which the data generated in a particular stage of a project's lifecycle is in a format that can be transferred automatically to the subsequent parties responsible for continuation of the project or its maintenance. COBie has been designed in an open format meaning that it can be implemented without requiring the parties involved in a project to use particular software applications for data generation.

The benefits that owners have realized from implementing COBie on their projects have been significant, but predictable. As discussed in this chapter, most owners who have required implementation of COBie on their projects have reported dramatic positive results indicating significant time and cost savings. From an owner's standpoint the main improvement has been reduction of the cumbersome years-long task of extracting data from paper copies of submittals and entering them into their computerized system to the simple minutes-long task of exporting and importing a spreadsheet.

However, to realize the simplification of data transfer to the owner's computerized maintenance management system, other parties involved in the project such as designers, general contractors, and manufacturers have to go through complex paths of coordination and data exchange. In an ideal COBie project, all parties involved would be informed of the requirements from the very beginning of the project and each party that generates data will have it available in COBie format for an automatic exchange. However, in most reported projects, the general contractor has been the primary party for compilation and generation of COBie data. This can be partially because of

COBie being in its infancy and that the projects' delivery system may not support early involvement of all parties.

This thesis research has been conducted to understand the impact of implementation of COBie format on the time and work flow of construction hand over from a holistic view. Understanding this new process and comparing it to the pre-COBie format process by considering the work of all parties involved in the project can uncover the real benefits of COBie from the entire AEC industry standpoint.

Chapter 3- Methodology

This research has been done following the case study methodology. There are several reasons that makes case study one of the most fitting methodologies for studying topics related to COBie. COBie format has been tried by very few projects and owners; therefore the pool of samples is very small to conduct a research that includes large sample sizes, which many quantitative methods require. Additionally, as every owner has its unique construction information handover process and format, establishing a uniform baseline for comparison would be nearly impossible. Similarly, because the size, complexity, and systems of each facility are different, an accurate comparison can hardly happen with a limited pool of samples.

The case study method will help to understand how handover data is generated in COBie format, and how COBie format process is different from that of traditional process used to load data to the owners' CMMS system. Notably, as COBie standard is not necessarily be followed in its entirety in all projects, it can be implemented using various processes and at different stages of the life of a project. Therefore, as the purpose of this research is to provide quantitative as well as qualitative comparison between the two processes, case study research can provide context to understand the causes of the differences between the quantitative attributes of the two.

Considering the most predominant limitations of case study research which is providing evidence for validating generalization of case study results, this thesis research recognizes that its results cannot be used for generalization. However, it can be used as one sample the future research studies that will use quantitative methodologies when sufficient pool of samples is available. The case study method will help document the handover process in detail in the project studied in this thesis research. This detailed description will help future researchers to make an informed decision about considering this project as a sample by evaluating whether this project meets the "fixed variable" requirement they have set for their quantitative method.

This case study is focused on the turn-over process of Foster School of Business Phase II (Dempsy Hall) project. COBie deliverables were an addition to what traditionally is required for construction information exchange in the University of Washington's contracts with general contractors. Though, it is notable that it wasn't additional information compared to what traditionally gets exchanged, but it was exchanging information in a new format. In other words the construction hand-over information was exchanged both on paper and electronically in COBie format.

In the remainder of this chapter, a brief introduction of the project, the data collected, and methods of collecting and analyzing the data are presented.

3.1- Project Introduction

Construction Owners Association of America (COAA) has initiated a case study project with the aim of implementing COBie on construction projects of large institutions and measuring the achieved results. Being a large institution, University of Washington's Capital Projects Office (CPO) and Facility Services (FS) jointly, for the first time, decided to try the implementation of COBie on Foster School of Business Phase II (Dempsy Hall) project. As this decision was made at the time that Dempsy Hall was under construction, it was impossible to fully comply with the requirements set forward by COAA for such case studies which need to have COBie from design phase to operation. Therefore, the case study framework recommended by COAA for COBie implementation is conducted in smaller scale in Dempsy Hall project (Marsters, 2011).

COBie is best practiced when the project team is committed to its standards through all phases of the project from design to operation. Therefore, contractual language that will require such commitment becomes essential for full implementation of COBie. The most critical part of information exchange during the life of the project happens in transition from construction to facility management; therefore, the participation of manufacturers, subcontractors, and general contractor is of high essence. As at the time that Dempsy Hall was selected as the pilot project, it was already under construction and major contracts were in place, it was not feasible to change the contracts and to add new requirements; therefore, the general contractor agreed to provide the major mechanical, electrical, plumbing and fire protection equipment information in COBie format as a change order ($42,930). This process does not comply with that of COBie protocol; however, studying its results can provide a base for making decisions on its implementation on future projects (Marsters, 2011).

In the Spring of 2011, a research team consisted of Prof. Dossick (Associate Prof. at UW), Anne Anderson (Phd Student), and Andrew Marsters (CM Master's Student) was formed to conduct a research on this case study and act as "participant observers." The initial research that is reflected in detail in Andrew Marsters's thesis was aimed to explore business processes of Capital Projects Office and Facility Services, the information flow between these two entities, the hurdles in the current system for construction information hand-over, and possible opportunities and disadvantages of new information exchange systems (Marsters, 2011).

Sellen Construction, the general contractor of this project, provided COBie data in addition to the current standard deliverables that get handed over at the end of the construction. The COBie information was compiled in a COBie Revit model that included architectural and building systems drawings as well as geometries with embedded information representing the building assets.

After initial study of the project, a team consisted of Carrie Dossick, Anne Anderson, and me, Gayane Aghazarian, continued to study the COBie data exchange process to provide a comprehensive comparison between it and UW's current construction handover process. This research was conducted by interviewing Sellen Construction's staff who were involved in compilation and transfer of COBie Data, Facility Services and GIS departments' staff.

3.2- Data Collection Method

3.2.1- Interviews

To collect information about the exchange process three main groups were interviewed: staff of Facility Services and Capital Projects Office (CPO) Information systems department, and the general contractor's BIM staff who acted as the COBie data collector and compiler in this project. The interviewees at UW were Facility Services preventive maintenance manager, zone coordinator, refrigeration maintenance supervisor, and CPO's Building GIS/CAD Application Manager.

These interviews were non-structured and were aimed to understand the work process for compilation of the data and its transfer from one system to the other or from one medium to the other. Additionally, the interviews provided insight into the amount of time that each party contributed to the exchange process and the factors that affected the extension of time required for data exchange.

3.2.2- Studying COBie Spreadsheet

The spreadsheets that were provided by the general contractor as COBie deliverable were studied to extract the information of those building assets that were included in COBie format process. This information included the type of assets, the variety in the models of the same type, the quantity of each type of asset, the attributes tracked, etc.

Additionally, two copies of COBie spreadsheet was shared with two of Facility Services shop managers. One copy was the actual Spreadsheet including all 1111 item lines and the other copy was a summarized spreadsheet classified based on the assets category, asset group, and Omniclass title. These managers were asked to provide an estimate of time that they believe would require them to extract same information available in COBie spreadsheet from the paper copy O&M manuals and if necessary site visits.

To provide uniform condition for time estimation it was assumed that the manuals would be readily available and the pieces of equipment would be ideally accessible. The two managers also provided insight that what could cause to a less ideal situation which extend the time for acquiring information about a piece of equipment.

3.2.3- COBie BIM Model & Electronic O&M Manuals

The general contractor provided the CD which included COBie spreadsheet, O&M manuals (in pdf format and named after their respective omniclass number), and all BIM models used for generation of COBie data. Having O&M manuals and BIM models (main Revit file, Revit families, and MEP Revit backgrounds) provided insight into the volume of work that the general contractor had done for compiling data in COBie format.

As it is presented in section 4.2.1 of this thesis, in current construction handover process, the inclusion of certain information in O&M manuals is tentative. Therefore, O&M manuals were studied to find out if they would be sufficient source along with site visits and as-builts for retrieval of assets' data in absence of COBie spreadsheet and availability of paper copies of O&M manuals.

3.2.4- Actual Data Entry

The original design of this study was to compare the existing exchange processes with the new COBie format processes. However, although the information exchange in Dempsy Hall project happened in both formats that are supposed to be compared in this thesis research, it still didn't provide a solid ground for comparison, particularly because of the research timing. The reason is that the information that is needed to manage the UW facilities usually doesn't get transferred to UW's Facilities Services CMMS system until there is a work order or a preventive maintenance activity for a particular piece of equipment. It is only then that this information manually is entered in the computerized system. Because the data collection happened shortly after the construction turn-over in March 2011, real data about manual transfer of assets' data to the CMMS was not available. Therefore, the research was done with real simulation of a few hypothetical data entry cases. For this, the researcher conducted actual data entry based on the paper copy of the COBie spreadsheet that was provided by the general contractor.

The researcher was trained by the Facilities Services preventive maintenance manager on using AiM and entering data at UW's Plant Services Building. After training, the researcher entered five assets' information into AiM using the COBie spreadsheet that was provided by the general contractor. These assets included an A/C-server room-air cooled, a convector, a fire alarm system, a valve, and a VAV box. The total time that took to conduct the data entry for these items was tracked.

3.3- Type of Data Collected

3.3.1- Technical Work Processes

The technical work processes that are followed to accomplish the information exchange both in COBie format and in UW's current process were studied. Similar to the traditional paper handover process in which every owner may have its own culture and workflow for acquiring, verifying, and entering data into its computerized maintenance management system, COBie format can be provided following various work processes ranging from manually creating a simple excel spreadsheet to embedding the information into a building information model and then exporting a spreadsheet. Although these two work processes are not from the same nature to be compared, but their study was necessary to understand the time, cost, accuracy, and quality differences between the products each create.

3.3.2- Assets tracked

Eight main categories of assets were tracked in the COBie format process. These categories included mechanical equipment, pipe accessories, plumbing fixtures, electrical equipment, lighting fixtures, fire alarm devices, furniture, and doors. Each of these categories was further divided into asset groups. Each asset group except variable frequency drives, roof vents, convectors, toilet partitions and all plumbing fixtures, was assigned a unique asset group number that matches to that of UW's CMMS system.

The asset groups are as following:

Category	Asset Group	Category	Asset Group
Mechanical Equipment	A/C, Server Room, Air Cooled	Pipe Accessories	Ball Valve
	Fire Dampers		Butterfly Valve
	Fire Extinguisher		Globe Valve
	VAV Box	Doors	Interior Doors
	Exhaust Fan		Fire Doors
	Convector		Elevator Doors
	Air Handling Unit		Exterior Doors
	Gravity Intake	Lighting Fixtures	Emergency Lights
	Roof Vent	Furniture	Toilet Partitions
	Unit Heater, Steam		
Electrical Equipment	Transformer	Plumbing Fixtures	Drinking Fountains/Coolers
	Panel Board		Drains (Wastes)
	Switch, Interrupt, High Voltage, Fused Air		Service Sinks
	Variable Frequency Drive		Sinks/Lavatories
Fire Alarm Devices	Smoke Detectors		Water Closets
	Fire Alarm System		Urinals
	Fire Extinguisher		Siphonic Drains

Table 2- Asset Groups Tracked

3.3.3- Attributes of assets tracked

To provide an understanding of the volume of work needed for the information exchange, it was necessary to record the attributes that were tracked for each asset. In the COBie spreadsheet that was provided by the general contractor, the following attributes were tracked for each asset:

Region, Building, Room, manufacturer, model, Installation date, Omniclass number, Omnilass title, ID, unique ID, Family, Family and type, Supplier name; address; and phone number, and comments.

Notably, three attributes serial number (for fire dampers, unit heaters, refrigerant compressors axial Fans, centrifugal fans, and variable frequency controllers),the room served by the equipment (for valves and convectors), and belts (for exhaust fans and air handling units) were tracked for particular assets.

3.3.4- Time & cost associated with each process

There were two main steps identified in each of the information exchange processes: retrieving and verifying data, and entering data into the computerized maintenance management system. The time spent on each of these steps was collected for both current and COBie format. The time spent on the first step of the current process was provided by the Facilities Services shop managers and supervisors. They estimated this time for each asset type. Later, the researcher multiplied these numbers by the quantity of the respective assets and summed up all the numbers to have the total time spent on the current process's first step. The time for second step of the current process was estimated per asset by conducting actual data entry by the researcher. In contrast, the time spent on COBie format process was provided by the general contractor as total numbers for activities performed in the process. These activities included meetings, site visits (data verification), creating Revit families, setting Revit model, and entering parameter values.

For information retrieval time for the current process, the interviewees were asked to provide their estimate considering an ideal situation. When O&M manuals are available for an asset the ideal situation is when it is stored in a known place and is readily available. An ideal situation when O&M manual is not available and a site visit is required is defined as a situation in which all the following conditions are met: 1. the work order has been delivered to the right shop; 2. the information on the work order is accurate (such as the room number for which a problem has been reported); 3.the location of equipment inside the room is known; 4.the equipment is accessible, 5.the staff handling the work order are expert and experienced; 6.the problem reporter is the occupant of the room (this insures facilitated communication).

It is notable that the cost associated with each of these processes is mainly driven from labor cost, which is directly related to the time factor. Expenses other than labor cost can be mainly related to the printing and maintenance space of the paper submittals in the current process, and software costs in COBie format. However these costs haven't been included in this research, as it is nearly impossible to measure the cost of space for maintenance of one project's documents and a project's share from the software cost of a company.

3.3.5- Data Accuracy

In every information exchange process, accuracy of the data received is of critical importance, as it is directly related to reliability and as a result usefulness of that data. This research will not address the number and extent of the inaccuracies that have happened in the exchange processes of the project under study. However, a number of factors that could lead to such inaccuracies were discovered during the interviews.

3.4- Method of Data Analysis

The two processes are analyzed and compared on their time and work flow. The time spent on current process has been compared to the time spent on COBie format process in two scenarios. In the first scenario, the time spent on collecting the data of all assets, and in the second one, that of only those assets that Facility Services would absolutely need their information for operation are compared. In another comparison, both scenarios' time are adjusted for the general contractor's learning curve (as it was their first time conducting COBie) and efficient data entry in current process. The adjustments were made to understand, if the results of the comparison between two processes would be different when they were conducted efficiently. The method and logic of adjustments are discussed in their respective sections.

The work flow of each process has been analyzed and compared in three aspects: use of technology, the total time span of each process and the frequency of activities happening in each, and the number of people involved. The impact of all these aspects on the time spent for assets' data collection and loading to the CMMS system are discussed.

3.5- Anticipated Results

The results of this research should establish if the transfer of data in COBie format has improved the process of data exchange from construction to facility management. This improvement is defined as reduction in the time and consequently the cost of data transfer, increase in quality and accuracy of the data.

Recommendations for best practices of data transfer will be made to enhance this process for future projects on University of Washington's campuses. This thesis can be a helpful resource for other institutions that intend to implement COBie format for construction handover.

3.6- Description of AiM (UW's CMMS System)

University of Washington's Facilities Services uses AiM as their CMMS system. AiM is a software application developed by AssetWorks for asset management including operations and maintenance. At University of Washington, AiM is particularly used to coordinate field engineers and the customer work order request system (FS Works). Issues like life safety, state mandated maintenance, and customer requests are the major focus of the system (Marsters, 2011).

Currently, the asset information is manually entered into AiM; however, AiM has the capability to load COBie data sheets automatically. According to AssetWorks website, AiM is fully COBie compliant since 2010 (AssetWorks 2011). In addition to data sheets, AiM has the capability to load pdf files containing O&M manuals and warranties; however, University of Washington's Facilities Services does not use AiM in this capacity.

Chapter 4- Description of Current Data Transfer Process

Facilities Services takes two main steps to have assets information available in AiM; first, retrieving asset's information from O&M Manuals, and if not available, by visiting the project site, and second, manually entering the retrieved data into the AiM. Each of these steps is described in the subsequent sections. Additionally, an estimate of the time that would require Facilities Services to complete these steps is presented and the method of estimation is explained. To have a uniform comparison, the same attributes have been tracked for the assets in both current and COBie format process.

4.1- Retrieving Information from Paper Copies of Handover Data and Site Visit

After construction is complete and occupancy occurs, the paper copy of as-builts, shop-drawings, and O&M manuals are handed to Facilities Services. This handover takes over a year after the occupancy of the building to complete. This lag between the time the building starts its operation and the time the maintenance team receives the building's assets' information is one of the main hurdles of proper maintenance of a facility. After Facilities Services receives these documents, they are distributed to their respective shops responsible for their maintenance, for example, refrigerant systems' O&M manuals and as-builts go to the refrigeration shop. The information related to an asset stays on paper copies until there is a work order or preventive maintenance activity that needs to be handled by one of the Facilities Services shops. In other words, there is no effort in transferring information from paper or pdf copies of submittals and O&M manuals into AiM, before the need for retrieving information about a piece of equipment rises. Notably, if a work order is related to an asset that has a valid warranty, it will be directed to the warranty provider, not the FS shops.

Work orders are generated when a problem is reported from the occupants of a building or there is the need for preventive maintenance. For preventive maintenance work orders, O&M manuals and as-builts will provide sufficient information to carry the job. However, for the work orders that are report of a problem, if the cause of the problem is known, O&M manuals and as-builts would be sufficient, however, if the source of the problem is unknown, the technicians need to visit the job site and investigate the situation. After they discover the cause of the problem, they return to the shop and retrieve the information they need from the O&M manuals.

In this thesis research, only the first two situations have been considered in estimating data retrieval time, because the third situation (when the cause of the problem is unknown) can happen even when the COBie data is available.

After the work order is generated, it is directed to the responsible shop. The shop's lead assigned to handle the work order looks for information regarding the asset that can be the cause of the problem in the stored O&M manuals and as-builts. If the information is not available, a site visit becomes essential. After the information is retrieved (whether by using the sources available in the shop or a site visit) and the issue is retrofitted, the technician who has done the repair or replacement writes down notes and turns them into the lead. As the information regarding the repaired asset is not available in AiM, the lead fills out a new equipment form, and enters the information into AiM. The preventive maintenance manager, verifies the information and assigns a unique asset number to that piece, and makes the information available through the AiM.

For pieces of equipment that has been repaired, replaced, or gone through preventive maintenance previously and their information is available in AiM, the same process is followed to update their data after any change. It is at this point that commitment to updating information becomes very important. The value of a computerized system is maintained only when the most current information is available there. Several complaints were reported in the previous stage of the COBie pilot project regarding incorrect information in AiM. Having a system with out-dated information reduces the user's confidence level and reliability on that system and can make them reluctant to use it.

The above described process for transferring data into the UW's CMMS system requires over a year period to have all the major equipment data in AiM. Therefore, it was impossible for the researcher to capture the real-time information regarding the data transfer from paper copies to AiM due to the research timing. As a result, the interviewees were asked to provide estimate of the time that would require them to retrieve information about each asset from available sources (O&M manuals, as-builts, site visit,…) and make it available for entry into AiM.

The first step for estimating the required time for retrieval of information in the current process was to determine, if all the attributes that were included in the COBie spreadsheet were actually retrievable in the current process. The attributes that the interviewees indicated that can be extracted from O&M manuals, as-builts, and site visit are presented in the Table 3. According to this table, the only information that can be lost is the case that a room is served by equipment which is not installed in the same room. The attributes such as Asset Group, and OmniClass Number and Title that are not recorded in the handover documents, but can be looked up based on the information included in the O&M manuals are also considered retrievable.

Method of Retrival	**Attributes**																			
	Asset Description	Asset Type	Asset Group	AIM Status	AiM Region	AiM Facility	Room: FACROOM	Manufacturer	Model	Serial Number	Install Date	Serves	Belts	Type	Size	OmniClass Number	OmniClass Title	Supplier	Supplier Address	Supplier Phone #
Site Visit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		(only if the asset is serving the room in which it is installed)								
O&M Manual	✓	✓	✓	✓	If Recorded	If Recorded	If Recorded	✓	✓	✓	If Recorded		If Recorded	If Recorded	If Recorded	If Recorded	If Recorded	If Recorded	If Recorded	If Recorded
As-Builts					✓	✓	✓													

Table 3- Method of Data Retrieval for Each Field in Current Process

The refrigeration maintenance supervisor reported that it could take 15 minutes in an ideal situation (defined in section 3.3.4) to an hour in a non-ideal situation for his technicians to capture a piece of equipment's information from the O&M manuals and on the job site. Notably, he made this estimate for only the equipment under his supervision and it was assumed that this would be a one-time effort for visiting the site and capturing the data related to all equipment. However, in real life, the data is retrieved when it is needed.

In another report, The UW's Seattle campus zone coordinator provided a detailed estimate of time for retrieving information for different scenarios for all assets. The first scenario is the situation when there is no hardcopy information (O&M manuals) available and a site visit and searching on the web for downloading O&M manuals are required to retrieve information. The second scenario is when the O&M manuals are readily available, and a site visit for verification is required. Aside from assumptions that have been defined for ideal situations in section 3.3.4, this estimate was made considering a uniform ease of accessibility for all assets. The estimated time will increase for assets that are located in spaces such as rooftops, crawlspaces, etc. that are difficult to reach. In the Table 4 this estimate and an analysis of it are presented.

The estimate revealed that Facility Services is not interested in keeping the record of all assets. "Some of the items listed are things we would probably not bother going out to gather information on (such as fire extinguishers, toilet partitions, urinals etc.).We have enough of that stuff around here that it's prohibitive to try and stock all of the parts and pieces; it's easier to just repair it when it fails." These assets are presented in the Table 4 with zero time for both 1^{st} and 2^{nd} scenarios and noted as NDN in the Comments column. 421 assets out of 1111 assets (38%) fall under this category. In Table 5, Table 4 data for this type of assets is adjusted from zero to half an hour and a quarter of an hour for 1^{st} and 2^{nd} scenarios respectively.

As shown in Table 4, it will take some time between 62 to 121 hours to retrieve and compile information for 690 (62%) of this project's assets in an ideal situation. This is the amount of time that Facilities Services will spend on this process in a real case. Based on the Table 5, it will require Facilities Services some time between 77 to 152 hours to retrieve and compile all assets data. These numbers are comparable to COBie format process, as COBie format process included all assets data without exclusion of those that normally Facilities Services won't attempt to collect their data.

Both Table 4 and Table 5 represent numbers of an ideal situation in which there are no lost O&M manuals or inaccessible/hard-to-access assets.

Category	Asset Description	Quantity	First Scenario (hrs)	Second Scenario (hrs)	Number of Type Variations	Number of Size Variations	Number of Total Variations	Total Time (hrs) (1st Scenario)	Total Time (hrs) (2nd Scenario)	Comments
Mechanical Equipment	A/C (Fire Damper)	7	1.50	0.25	3	0	3	5	0.75	-
	A/C (Refrigerant Compressor)	7	1.50	0.50	3	0	3	5	2	-
	Fire Dampers	52	0	0	1	32	33	0	0	NDN
	Fire Extinguisher	3	0	0	1	0	1	0	0	NDN
	VAV Box	75	1.00	1.00	1	16	17	17	17	NDN
	Exhaust Fan (Axial)	2	1.50	0.50	2	0	2	3	1	-
	Exhaust Fan (Centrifugal)	4	1.50	0.50	4	0	4	6	2	-
	Convector	105	0	0	1	6	7	0	0	NDN
	Air Handling Unit	2	1.50	0.50	2	0	2	3	1	-
	Unit Heater, Steam	2	1.00	0.50	1	0	1	1	1	-
	Gravity Intake	1	0	0	1	0	1	0	0	NDN
	Roof Vent	4	0	0	1	3	4	0	0	NDN
		264					**32**	**39**	**23.75**	
Electrical Equipment	Transformer	4	2.00	1.00	3	0	3	6	3	-
	Panel Board	25	1.50	0.75	6	1	7	11	5	RC
	Switch	7	0	0	1	0	1	0	0	NDN
	Variable Frequency Drive	7	1.00	0.50	4	0	4	4	2	-
		43					**14**	**20.5**	**10.25**	
Fire Alarm Devices	Fire Alarm System	42	1.50	0.75	1	0	1	1.50	0.75	-
	Fire Extinguisher	17	0	0	1	0	1	0	0	NDN
	Smoke Detectors	115	0	0	2	0	2	0	0	NDN
		174					**1**	**1.5**	**0.75**	
Pipe Accessories	Valves	61	1.00	0.25	3	8	11	11	2.75	NSV
		61					**11**	**11**	**2.75**	
Doors	Interior Doors	268	1.00	0.50	33	5	38	38	19	-
	Fire Doors	8	1.00	0.50	2	2	4	4	2	-
	Exterior Doors	3	1.00	0.50	1	0	1	1	1	-
	Elevator Doors	4	0	0	1	0	1	0	0	NDN
		283					**43**	**43**	**21.5**	
Lighting Fixtures	Emergency Lights	169	0.50	0.25	9		9	4.50	2.25	NSV
		169					**9**	**4.5**	**2.25**	
Furniture	Toilet Partitions	26	0	0	1	1	2	0	0	NDN
		26					**0**	**0**	**0**	
Plumbing Fixtures	Drinking Fountains/Coolers	4	1.00	0.50	1	0	1	1	0.50	-
	Service Sinks	4	0	0	1	0	1	0	0	NDN
	Sinks/Lavatories	18	0	0	1	0	1	0	0	NDN
	Drains (Wastes)	15	0	0	3	0	3	0	0	NDN
	Water Closets	26	0	0	1	1	2	0	0	NDN
	Urinals	10	0	0	1	0	1	0	0	NDN
	Siphonic Drains	14	0	0	1	0	1	0	0	NDN
		91					**1**	**1**	**0.5**	
	Total	**1111**						**120.5**	**61.75**	

Table 4- Time Estimate for Retrieval of Data in Current Process
(NDN=No Data Needed / NSV = No Site Visit Required, if O&M Manuals Available / RC = To Record and Copy Panel Schedule)

Category	Asset Description	Quantity	First Scenario (hrs)	Second Scenario (hrs)	Number of Type Variations	Number of Size Variations	Number of Total Variations	Total Time (hrs) (1st Scenario)	Total Time (hrs) (2nd Scenario)	Comments
Mechanical Equipment	A/C (Fire Damper)	7	1.50	0.25	3	0	3	5	0.75	-
	A/C (Refrigerant Compressor)	7	1.50	0.50	3	0	3	5	2	-
	Fire Dampers	52	0.50	0.25	1	32	33	16.50	8.25	NSV
	Fire Extinguisher	3	0.50	0.25	1	0	1	0.50	0.25	NSV
	VAV Box	75	1.00	1.00	1	16	17	17	17	NSV
	Exhaust Fan (Axial)	2	1.50	0.50	2	0	2	3	1	-
	Exhaust Fan (Centrifugal)	4	1.50	0.50	4	0	4	6	2	-
	Convector	105	0.50	0.25	1	6	7	4	1.75	NSV
	Air Handling Unit	2	1.50	0.50	2	0	2	3	1	-
	Unit Heater, Steam	2	1.00	0.50	1	0	1	1	1	-
	Gravity Intake	1	0.50	0.25	1	0	1	0.50	0.25	NSV
	Roof Vent	4	0.50	0.25	1	3	4	2.00	1.00	NSV
		264					**78**	**62**	**35.25**	
Electrical Equipment	Transformer	4	2.00	1.00	3	0	3	6	3	-
	Panel Board	25	1.50	0.75	6	1	7	11	5	RC
	Switch	7	0.50	0.25	1	0	1	0.50	0.25	NSV
	Variable Frequency Drive	7	1.00	0.50	4	0	4	4	2	-
		43					**15**	**21**	**10.5**	
Fire Alarm Devices	Fire Alarm System	42	1.50	0.75	1	0	1	1.50	0.75	-
	Fire Extinguisher	17	0.50	0.25	1	0	1	0.50	0.25	NSV
	Smoke Detectors	115	0.50	0.25	2	0	2	1.00	0.50	NSV
		174					**4**	**3**	**1.5**	
Pipe Accessories	Valves	61	1.00	0.25	3	8	11	11	2.75	NSV
		61					**11**	**11**	**2.75**	
Doors	Interior Doors	268	1.00	0.50	33	5	38	38	19.00	-
	Fire Doors	8	1.00	0.50	2	2	4	4	2.00	-
	Exterior Doors	3	1.00	0.50	1	0	1	1	0.50	-
	Elevator Doors	4	0.50	0.25	1	0	1	0.50	0.25	NSV
		283					**44**	**43.5**	**21.75**	
Lighting Fixtures	Emergency Lights	169	0.50	0.25	9		9	4.50	2.25	NSV
		169					**9**	**4.5**	**2.25**	
Furniture	Toilet Partitions	26	0.50	0.25	1	1	2	1.00	0.50	NSV
		26					**2**	**1**	**0.50**	
Plumbing Fixtures	Drinking Fountains/Coolers	4	1.00	0.50	1	0	1	1	0.50	-
	Service Sinks	4	0.50	0.25	1	0	1	0.50	0.25	NSV
	Sinks/Lavatories	18	0.50	0.25	1	0	1	0.50	0.25	NSV
	Drains (Wastes)	15	0.50	0.25	3	0	3	1.50	0.75	NSV
	Water Closets	26	0.50	0.25	1	1	2	1.00	0.50	NSV
	Urinals	10	0.50	0.25	1	0	1	0.50	0.25	NSV
	Siphonic Drains	14	0.50	0.25	1	0	1	0.50	0.25	NSV
		91					**10**	**5.5**	**2.75**	
	Total	**1111**						**151.5**	**77.25**	

Table 5- Adjusted Time Estimate for Retrieval of Data in Current Process
(NSV = No Site Visit Required, if O&M Manuals Available / RC = To Record and Copy Panel Schedule

4.2- Manual Data Entry into Facilities Services CMMS System

As discussed in the previous section, AiMs data is primarily entered by the Facilities Services shop leads, and it is reviewed and approved by the preventive maintenance manager. The leads' source of information for data entry is O&M manuals, as builts, and the handwritten notes received from technicians who have handled a work order (either a preventive maintenance or repair/replacement).

AiM has the capability to store the facilities assets' description, images, location, preventive maintenance schedule, manufacturer name, model, serial number, type, and group. Notably, UW Facilities Services does not utilize image and preventive maintenance fields. Images are considered burdensome due to their large size and the additional time that they will require to get uploaded. Preventive maintenance schedule is stored in a separate database. To avoid duplication of information and the burden of keeping these two databases coordinated, preventive maintenance schedule field has been left blank in Aim. In the following paragraphs, a detailed description of data entry into AiM is presented.

In the first step, the asset's description, location, type, and asset group information are entered under Master Asset Profile page.

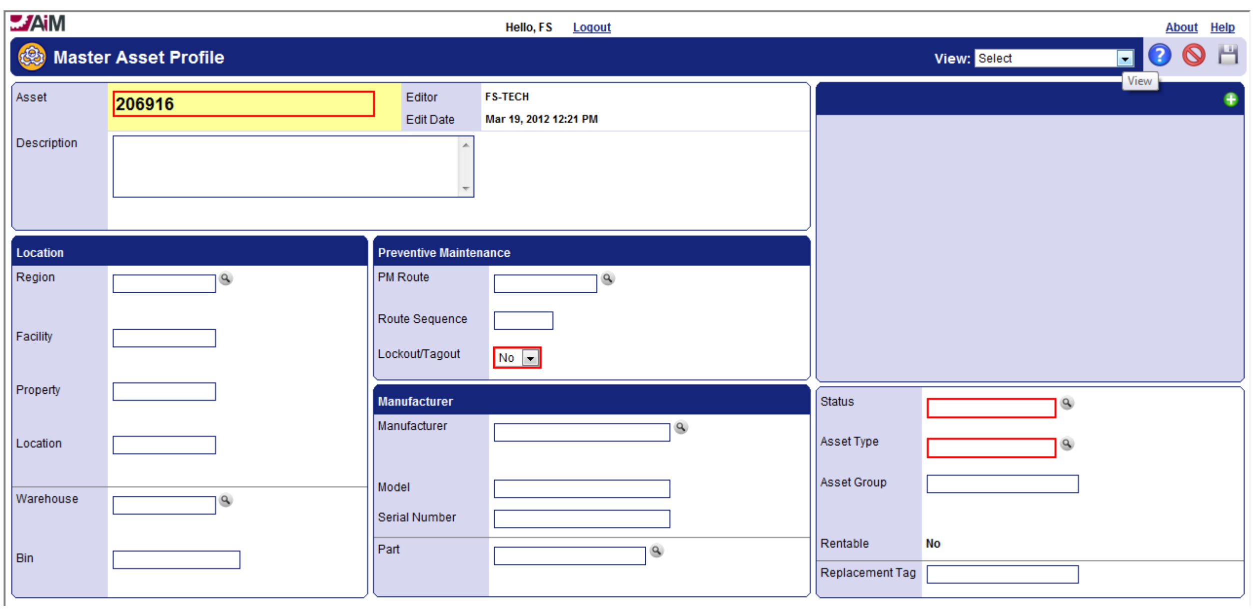

Figure 1- Master Asset Profile (AiM Screenshot)

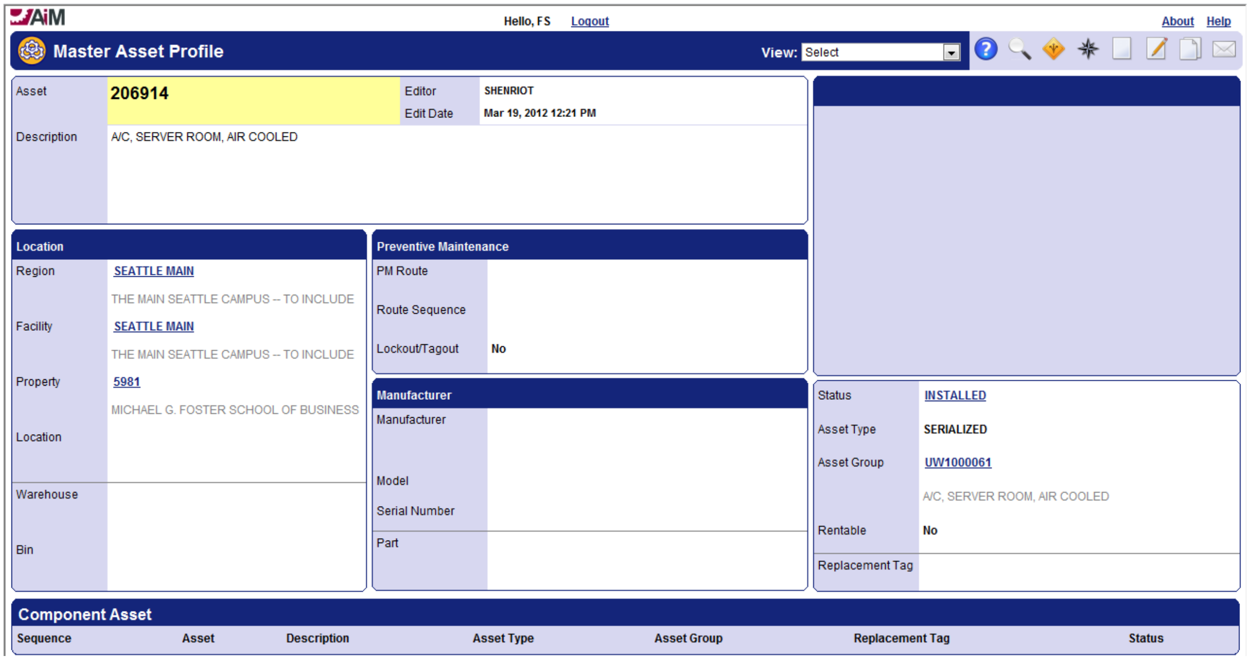

Figure 2- Master Asset Profile filled out (AiM Screenshot)

The manufacturer information, asset's model, serial number, installation date, area of service, and location within the building (the room in which it is installed) is filled under Attributes page.

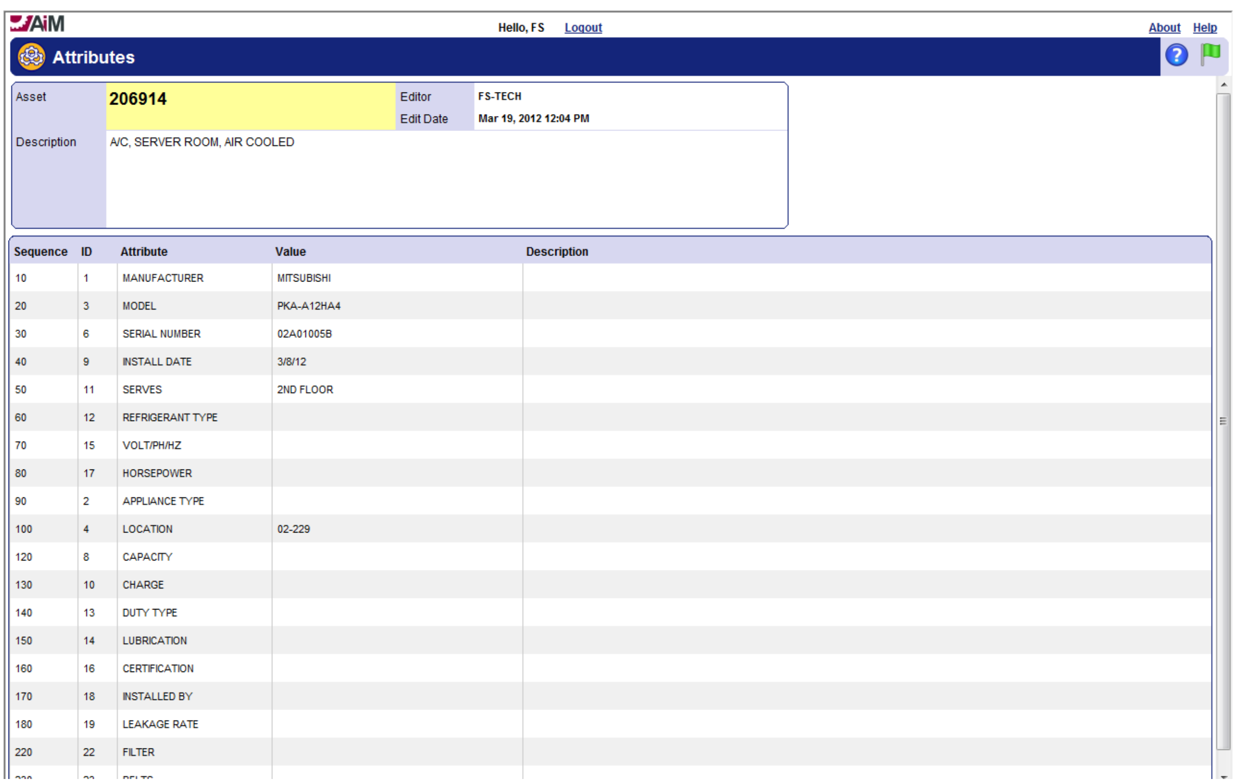

Figure 3- Attributes View (AiM Screenshot)

In addition to the information that was included in COBie datasheet, Facilities Services fills out other fields in the AiM's User Defined Fields page and Refernce Data page which are of high importance. Under User Defined Fields, it is determined whether the asset needs confidence test, or if it is a critical building asset. The omniclass # is also entered here. Under Reference Data, the shop responsible for maintenance of each asset is identified.

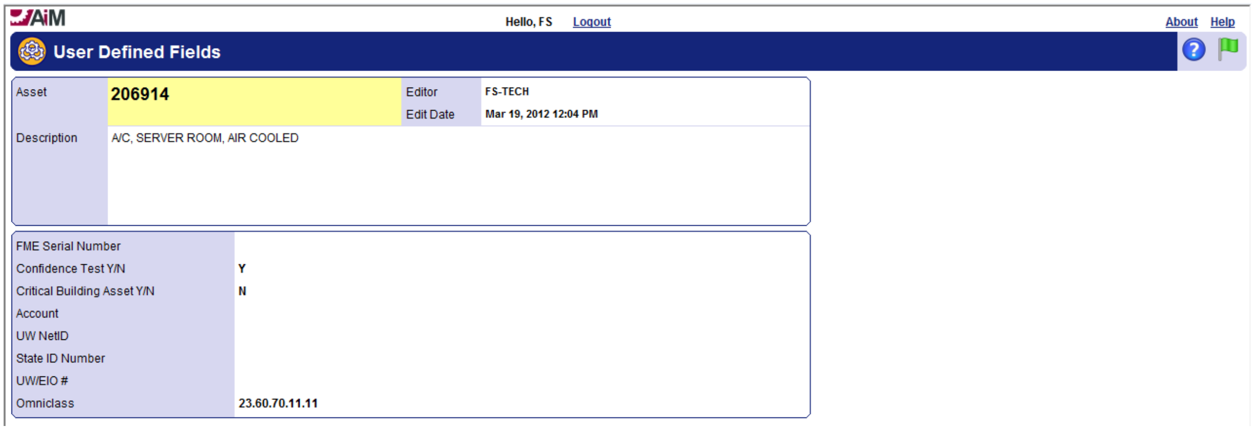

Figure 4- User Defined Fields view (AiM Screenshot)

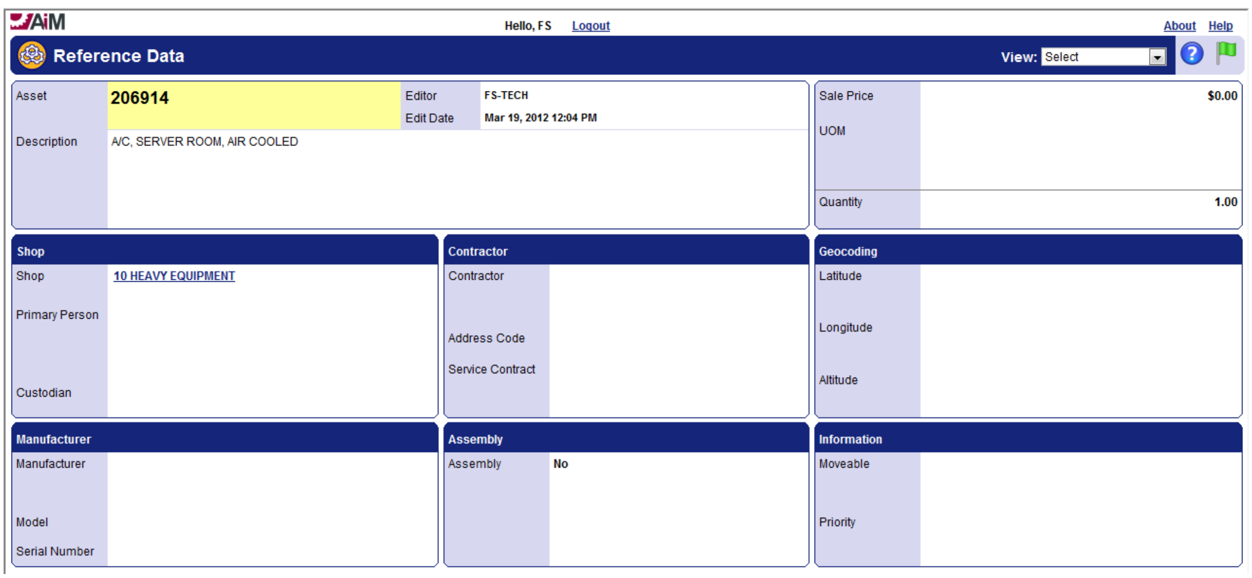

Figure 5- Reference Data view (AiM Screenshot)

After this information is entered, it is submitted to the preventive maintenance manager who reviews the information, assigns a unique number to the asset, and approves it.

The hypothetical data entry that the researcher performed for five assets (A/C-server room-air cooled, convector, fire alarm system, valve, and VAV box) took an hour which averages to 12 minutes per asset. It is expected that a real data entry case would take longer, as it would require several logging into the system effort. Therefore for the time estimate of this step, it is assumed that data entry for each asset will take 14 minutes. This number for all 1111 assets of this project totals to 259 hours. However, in the real world, Facilities Services won't enter all the assets information into the AiM. As mentioned in the section 4.2.1 of this thesis, only the information of 62% of this project's assets would be entered into AiM. The time required for data entry for these 690 assets totals to 161 hours.

The data entry process explained above was not an efficient one, as the data shared among same type assets were entered multiple times. It would be more efficient, if Facilities Services enters the data in a spreadsheet and then transfers it to AiM. In such case, they have the opportunity to enter the data shared among same type assets once and copy/paste it for the rest of the assets in the same group. Such process is referred as "efficient data entry" in the rest of this thesis.

To calculate the time that would be spent on efficient data entry, the number of variations in size or type of an asset group is identified (using COBie spreadsheet). It is considered that it would take 15 minutes to enter each variation's information and a minute for copy/pasting and modifying room information per additional asset that falls under same variation, then the total number was rounded up. For example, there are 75 VAV boxes with 17 variations in this project. The total time for entering the VAV boxes would equal to Round up{(17x.25) + [(75-17)/60]}= 6 hrs.

As presented in Table 6 and Table 7, it would take 46 and 77 hours to do efficient data entry for 62% of assets and all assets respectively.

Category	Asset Description	Quantity	Number of Total Variations	Data Entry (hrs)
Mechanical Equipment	A/C (Fire Damper)	7	3	1
	A/C (Refrigerant Compressor)	7	3	1
	VAV Box	75	17	6
	Exhaust Fan (Axial)	2	2	1
	Exhaust Fan (Centrifugal)	4	4	1
	Air Handling Unit	2	2	1
	Unit Heater, Steam	2	1	1
		99	**32**	**12**
Electrical	Transformer	4	3	1
	Panel Board	25	7	3
	Variable Frequency Drive	7	4	2
		36	**14**	**6**
Fire Alarm	Fire Alarm System	42	1	1
		42	**1**	**1**
Pipe Accessories	Ball Valve	61	11	4
		61	**11**	**4**
Doors	Interior Doors	268	38	14
	Fire Doors	8	4	2
	Exterior Doors	3	1	1
		279	**43**	**17**
Lighting Fixtures	Emergency Lights	169	9	5
		169	**9**	**5**
Plumbing Fixtures	Drinking Fountains/Coolers	4	1	1
		4	**1**	**1**
	Total	**690**	**111**	**46**

Table 6- Efficient Data Entry Time for 62% of Assets in Current Process

Category	Asset Description	Quantity	Number of Total Variations	Total Time (1st Scenario)
Mechanical Equipment	A/C (Fire Damper)	7	3	1
	A/C (Refrigerant Compressor)	7	3	1
	Fire Dampers	52	33	10
	Fire Extinguisher	3	1	1
	VAV Box	75	17	6
	Exhaust Fan (Axial)	2	2	1
	Exhaust Fan (Centrifugal)	4	4	1
	Convector	105	7	4
	Air Handling Unit	2	2	1
	Unit Heater, Steam	2	1	1
	Gravity Intake	1	1	1
	Roof Vent	4	4	2
		264	**78**	**30**
Electrical Equipment	Transformer	4	3	1
	Panel Board	25	7	3
	Switch	7	1	1
	Variable Frequency Drive	7	4	2
		43	**15**	**7**
Fire Alarm Devices	Fire Alarm System	42	1	1
	Fire Extinguisher	17	1	1
	Smoke Detectors	115	2	3
		174	**4**	**5**
Pipe Accessories	Ball Valve	61	11	4
		61	**11**	**4**
Doors	Interior Doors	268	38	14
	Fire Doors	8	4	2
	Exterior Doors	3	1	1
	Elevator Doors	4	1	1
		283	**44**	**18**
Lighting Fixtures	Emergency Lights	169	9	5
		169	**9**	**5**
Furniture	Toilet Partitions	26	2	1
		26	**2**	**1**
Plumbing Fixtures	Drinking Fountains/Coolers	4	1	1
	Service Sinks	4	1	1
	Sinks/Lavatories	18	1	1
	Drains (Wastes)	15	3	1
	Water Closets	26	2	1
	Urinals	10	1	1
	Siphonic Drains	14	1	1
		91	**10**	**7**
	Total	**1111**	**173**	**77**

Table 7 - Efficient Data Entry Time for All Assets in Current Process

In the initial stage of the COBie pilot project in University of Washington, it was discovered that sometimes the information found in AiM was not accurate and corresponding to what was installed in the field. The preventive maintenance manager reported that unreliable data in the AiM is partially because of turning in the data verified on the field on unorganized notes and hand writings that are difficult to read.

4.3- What is missing from AiM

The interviews with Facilities Services staff revealed that they are interested to have two fields in addition to what they have in AiM; initial cost of the asset and manufacturer recommended preventive maintenance schedule. The Facilities Services believes that knowing the initial cost of an asset will help to make decisions regarding financial feasibility of repairing vs replacing it in case of failure. However, if an asset fails after a significant time from its installation date, the initial cost won't represent a valid scale for decision making, as the price of the asset is subject to inflation. In that case, the market price of both repair and replacement should be investigated.

The manufacturer recommended preventive maintenance schedule would help to meet warranty requirements. However, most of these recommendations are not applied by the shop leads. Usually, the shop leads decide how often and what type of preventive maintenance should an asset receive. It is because the shop leads believe that the manufacturer recommended preventive maintenance schedule is a very conservative estimate of such need that would release the manufacturer from liability for rare case failures. The shop leads usually schedule this maintenance based on what they think is really needed for an asset, and additionally, they consider the available budget and human resources for conducting such maintenance.

4.4- Conclusion

For Dempsey Hall project, in a real case scenario with ideal situation, Facilities Services spends some time between 223 to 282 hours to retrieve, verify, and enter the information of those assets that it needs into its CMMS system. In case of efficient data entry, these numbers would be reduced to 108 and 167 hrs respectively, a savings of 115 hours.

In a comparative case to COBie in which all asset data is entered into AiM, it will take some time between 336 to 411 hours to compile all assets data in AiM. These hours could be reduced to154 to 229 respectively by doing efficient data entry which represents savings of 182 hours.

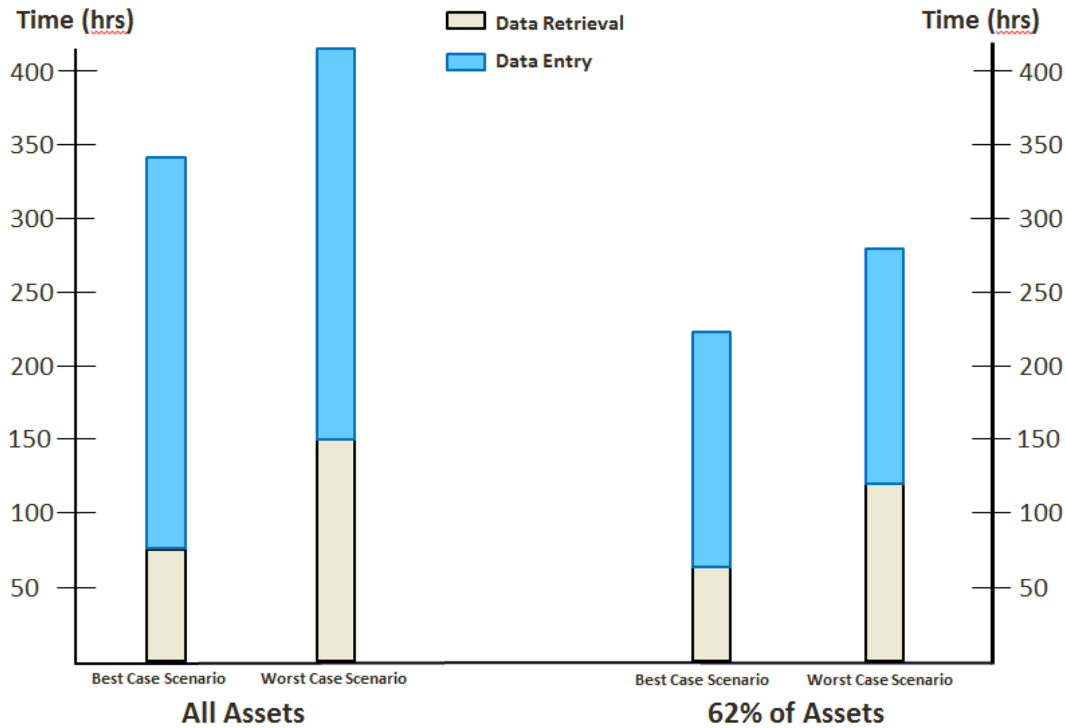

Figure 6- Graph of Time Spent On Data Retrieval And Data Entry In Current Process

Figure 7- Comparison of Time Spent on Current Data Entry and Efficient Data Entry in Current Process

Although these numbers show that the entire process takes six to eleven weeks of one full-time worker to complete, in reality, it takes years to have all the data compiled in AiM. The initial lag between the start of the building operation and the completion of handover, and the incremental work process contributes to this extension of time.

Chapter 5- Description of COBie Data Transfer Process

Similar to the current construction data transfer process, COBie format process that was taken for Dempsey Hall project consisted of two main steps. The first step was retrieving, verifying, and formatting data, and the second step was loading the data into AiM. Notably, if COBie deliverable was required from the very beginning of the project, the first step would be essentially different from the one in our case study in which the general contractor was the primary party responsible for compilation and generation of COBie deliverable. In an ideal COBie format process there would be no data retrieval, as the party who creates the data will put that in COBie format. For example the Architect would have the space requirements in COBie format, and the design consultants would add equipment to the locations provided by the architects and specify the types of equipment in COBie format.

In the first section of this chapter, the first step of COBie format process is described in detail and a time estimate for this step is presented. The second step of COBie format process - loading COBie spreadsheet into AiM – is a few minutes long action consisted of performing an import function in AiM.

5.2- First Step of COBie Format Process

The goal of this step was to generate the COBie spreadsheet. Four main tasks were performed to reach this goal; first, identifying the information that was needed to be included in COBie spreadsheet; second, compiling this information; third, entering that information into the building information model (bim), and finally, exporting the COBie spreadsheet from the bim.

The general contractor received initial list of assets and their attributed data needed to be tracked from Facilities Services. Each asset type's geometry and properties were represented in the Revit model in the form of family. There were 64 families modeled in Revit for Dempsey Hall. Each family had universal and instance parameters attributed to it. The universal parameters (such as omniclass number, asset type, asset group,…) were shared among all or some of the assets of the same asset group. In contrast, instance parameters were unique for each asset (such as serial number, room, …).

Universal parameters were created in two ways. One was embedding parameters' values in the family file for those parameters that were shared among all assets of the same asset group such as omniclass number. For editing these parameters, it was required to open each family file and modify it. Second was creating types within one family for those parameters that were shared among some of the assets of the same asset group. Entering or changing the values of these parameters can be done within the project in the Edit Type window. Table 8 identifies which attributes were universal or instance.

Universal Parameters		**Instance Parameters**
Embedded in Family File	**Type Parameters**	
Asset Type	Asset Description	Room: FACRoom
AiM Status	Asset Group	Serial Number
AiM Region	Model	Room Served
AiM Facility	Size	Belts
Category	Supplier name	Install Date
OmniClass #	Supplier phone #	
OmniClass Title	Supplier address	
	Manufacturer	

Table 8- Universal and Instance Parameters

Most parameters of the assets were pre-defined in Revit, however a number of them did not exist in the software by default and the general contractor created them. These parameters were created in the form of "Shared Parameter" and were saved in one txt file. This txt file was loaded both to the family files and the project file. The fields that were created in this manner in this project were: asset group, asset description, supplier name, address, and phone number.

Once the txt file is uploaded to a family or project file, there is no need to reference to it, and the shared parameters are defined permanently in those files. However, it is recommended that the txt file accompanies the family files when the bims are transferred to the owner for two particular reasons. First the owner can utilize these family files in several projects by handing them over to the designers (the txt file needs to be uploaded to each project file so that the shared parameters within family files can be identifiable), and second, new families can be created having the same shared parameters.

If an owner makes the effort to create a library of all these families that represent the properties of their normally used assets, they can provide these to the designers to use in their models. Consequently, it will save general contractors significant time that is spent on regeneration of these families for every project. From an industry wide standpoint, probably the best practice is having manufacturers to provide their equipment models in generally used BIM applications for COBie.

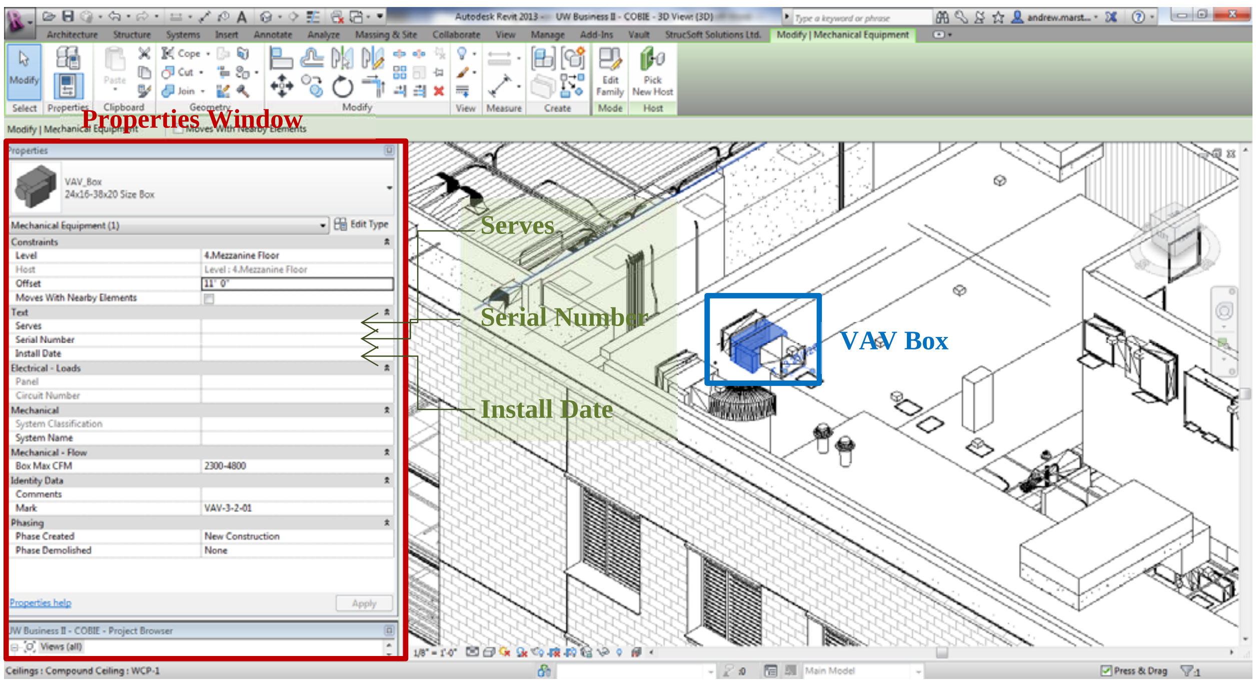

Figure 8- A VAV Box Selected in the Revit Model and Shown in Properties Window

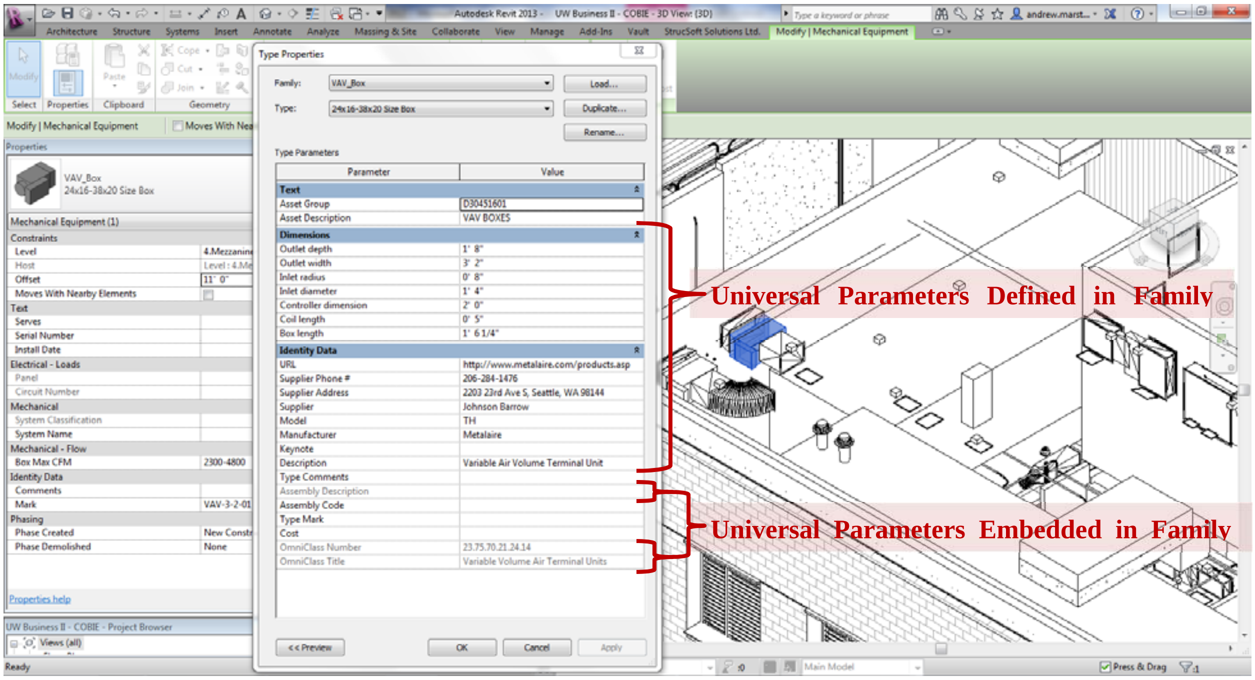

Figure 9- The VAV Box's COBie Data Shown in Type Properties

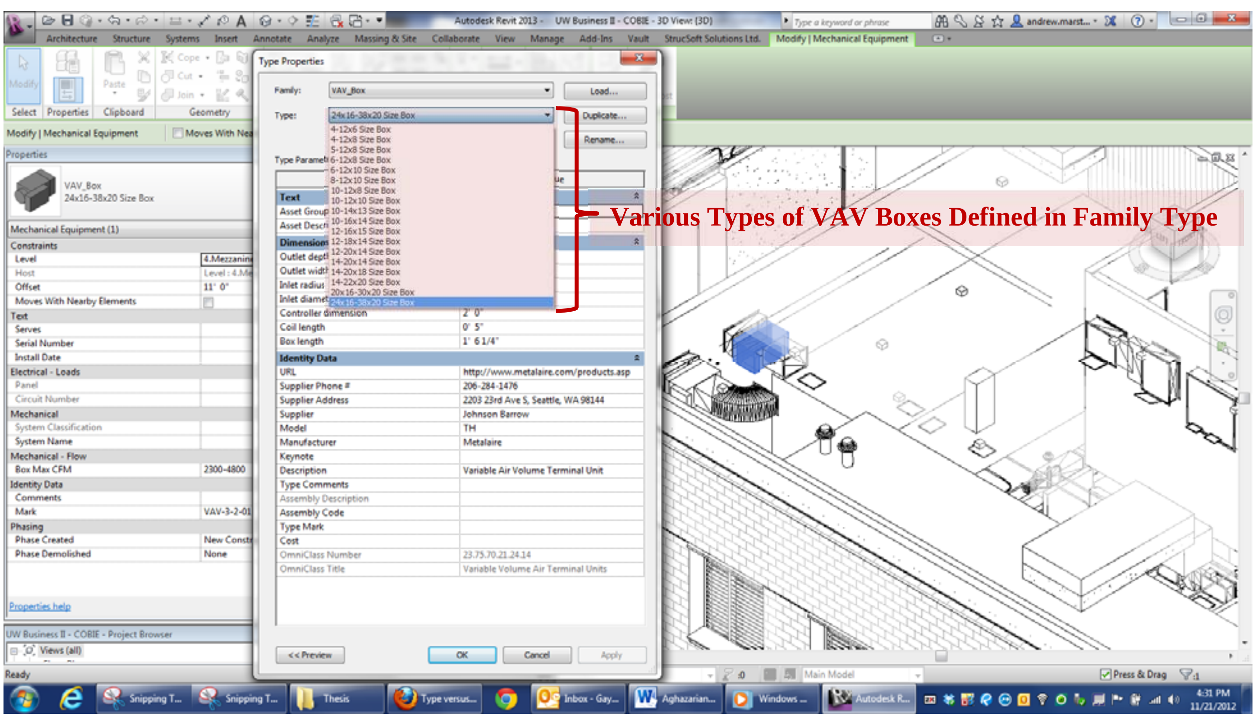

Figure 10- Multiple Types within the VAV Box Family (Example of one Family with Multiple Types)

After identifying necessary parameters and creating the families and parameters, the families were placed in the Revit model. However, before taking this step, the general contractor linked all MEP models provided by the MEP subcontractor along with structural and concrete models to the architectural Revit model. The subcontractors had created their models in CAD Ducts and AutoCAD softwares. The models created in CAD Ducts were exported to an IFC file and then imported into the Revit model, the AutoCAD models though were imported directly. This stage in the process is one of the examples of the necessity of interoperability between the software applications used by different parties involved in the project. After all files were compiled to a main Revit file, the rooms that were predefined in the architectural model were renamed to UW's room naming requirements defined by the GIS department.

When the main Revit model was all set up, the asset families were uploaded to that file and placed in their respective locations in the model and the right family type was assigned to them. The locations of the assets were identified based on the MEP backgrounds that were linked to the main Model.

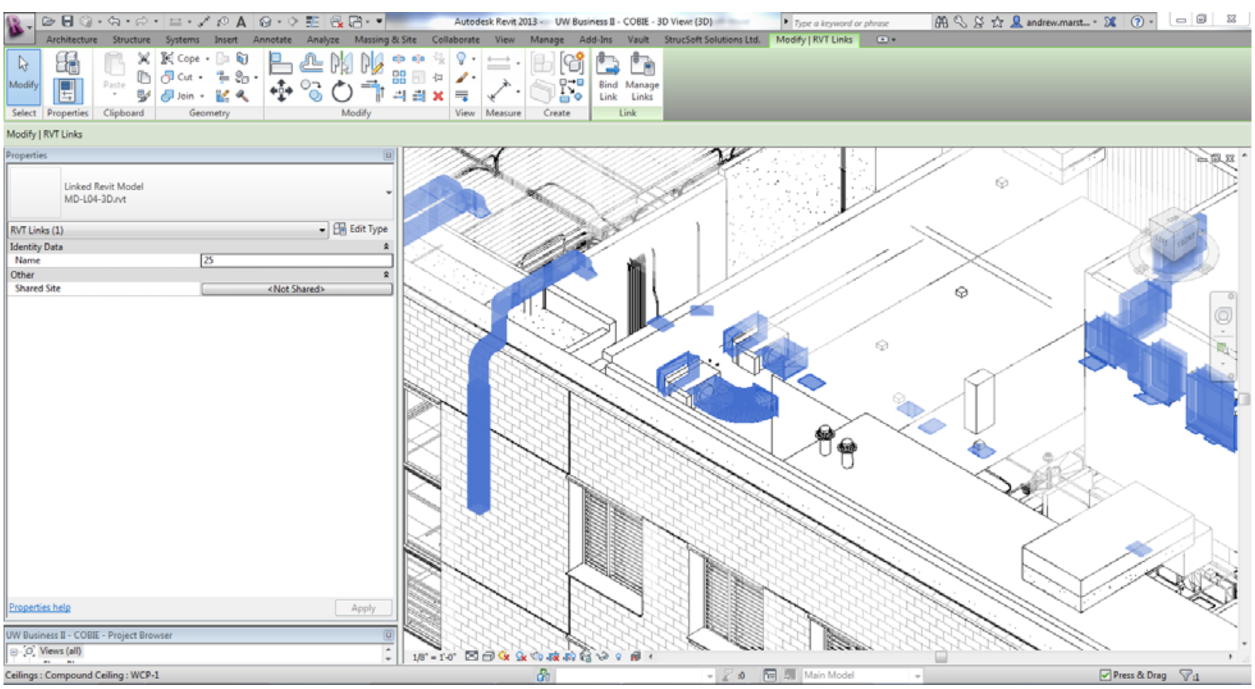

Figure 11- Level 4 Mechanical Drawing Linked to the Architectural Revit Model

The instance parameters with the exception of FACRoom were entered individually for each asset after their representing Revit family was placed in the model. FACRoom values were automatically identified by the model based on the room where the asset was located, and no data entry was required for this parameter. After values were entered for all parameters of all assets, an excel spreadsheet (a .csv file) was exported from the Revit model that could be instantly imported into AiM (See Appendix A).

The values for parameters were mainly extracted from the original submittals prepared by the subcontractors and suppliers. These values were verified through site visits, O&M manuals submitted by the subcontractors, and commissioning report. The only parameters whose values came from the Revit model itself were those related to the location of the assets. This location was defined by room number, floor number, building name, and campus region.

Although all the asset data could simply be entered in an excel spreadsheet instead of creating a bim, having them in the Revit model presented two main benefits. First, if a room name changed during the process, it could automatically be updated in the asset's schedule. Second, the Revit model could be linked to the UW's GIS system which can help to easily locate the assets in the building. This system is currently in research and development process.

The general contractor reported a total of 387 hours for creating the COBie Data. From these 387 hours 53 hours were spent on meetings, 20 hours on site-visits (data validation), 64 hours on collecting and extracting data from O&M manuals, 140 hours on creating Revit families and setting the Revit model, and finally 110 hours on entering parameters' values. Additionally the general contractor reported that 60% of these hours were spent on learning curve, as it was the first time that they were doing this process. This learning curve can be applied to the hours that were spent on creating families and main model, and entering parameter values. This being said, the general contractor expects to spend only 237

(=[53+20+64+250]*40%) hours on creating COBie spreadsheet when their staff are experienced enough.

This total number could reduce, if the general contractor had included only those assets that Facilities Services shop managers believe are not needed to be in the AiM (Table 9). If this group of assets were eliminated from COBie work, there would be 62 (=19+43) less data extraction from O&M manuals (36% of total Data extraction incidents), 19 less families created (30% of total families), and 62 (=19+43) less data entry incidents (36% of total Data entry incidents).This reduction in work volume translates to 23, 42, and 39 hours reduction from the hours spent on extracting data from O&M Manuals, creating families, and data entry respectively. These hours totals to 104 hours reduction from the total time spent in COBie format process. If the percentage of number of these assets from total number of assets were applied to the total hours spent on COBie format process, a reduction of 127 hours would be realized. Therefore, in an adjusted COBie Case for the assets that Facilities Service would actually collect their data for entering into AiM, the COBie format process will take some time between 260 to 283 hours.

The general contractor's recommendation for best practices was to simply create a spreadsheet. They believed that populating a spreadsheet would have been a quicker and more efficient process than working through Revit. However, using Revit for this process can have only long-term benefits, only if UW uses Revit and maintains the model over the life-time of this building. The main benefit that comes out of Revit is that it adds locational and spatial parameter to the data. However this spatial model is only useful, if the owner updates in case changes occurs in the building (such as asset replacement, asset relocation, room number change, and room reconfigurations, etc.).

If generating a spreadsheet was the path taken, the general contractor envisioned that it could be done by contractually requiring all subcontractors, suppliers, and manufacturers to provide a spreadsheet of all COBie data needed for maintenance of the assets that were provided and installed by them.For this particular reason, the general contractor reported that if COBie data request was made in the beginning of the project and it was specified in the specifications, they would be able to provide it at no additional cost to the owner.

Category	Asset Description	Quantity	Number of Type Variations	Number of Size Variations
Mechanical Equipment	Fire Dampers	52	1	32
	Fire Extinguisher	3	1	0
	Convector	105	1	6
	Gravity Intake	1	1	0
	Roof Vent	4	1	3
		165	5	41
Electrical Equipment	Switch	7	1	0
		7	**1**	**0**
Devices	Fire Extinguisher	17	1	0
	Smoke Detectors	115	2	0
		132	**3**	**0**
Doors	Elevator Doors	4	1	0
		4	**1**	**0**
Furniture	Toilet Partitions	26	1	1
		26	**1**	**1**
Plumbing Fixtures	Service Sinks	4	1	0
	Sinks/Lavatories	18	1	0
	Drains (Wastes)	15	3	0
	Water Closets	26	1	1
	Urinals	10	1	0
	Siphonic Drains	14	1	0
		87	**8**	**1**
	Total	**421**	**19**	**43**

Table 9- Assets That Shop Managers believe are not needed to be in AiM

Along with the COBie asset data, the general contractor included pdf O&M manuals in the COBie CD. This was in addition to the electronic O&M manuals that UW would get under their initial contract with the general contractor. Each asset type's O&M manual was included in an individual file that was named based on the facility number and the omniclass title and number of that asset. In typical construction handover, if the O&M manuals are transferred electronically, they are all included in one single pdf file. This represents three issues; first, the pdf file is a large file that may take time to open or share on a system, second, the user should go through all pages to find the piece they find or conduct a search within the document (if they are familiar with this function of pdf reader applications), and third, if an asset is replaced over the life-time of a building, that part of the pdf that includes the instructions related to that asset gets outdated and invalid while the rest of the file is current & valid. Although this issue is manageable by using pdf editor applications, it is quite burdensome. Having O&M manual of each asset type in an individual pdf file will resolve all three of these issues.

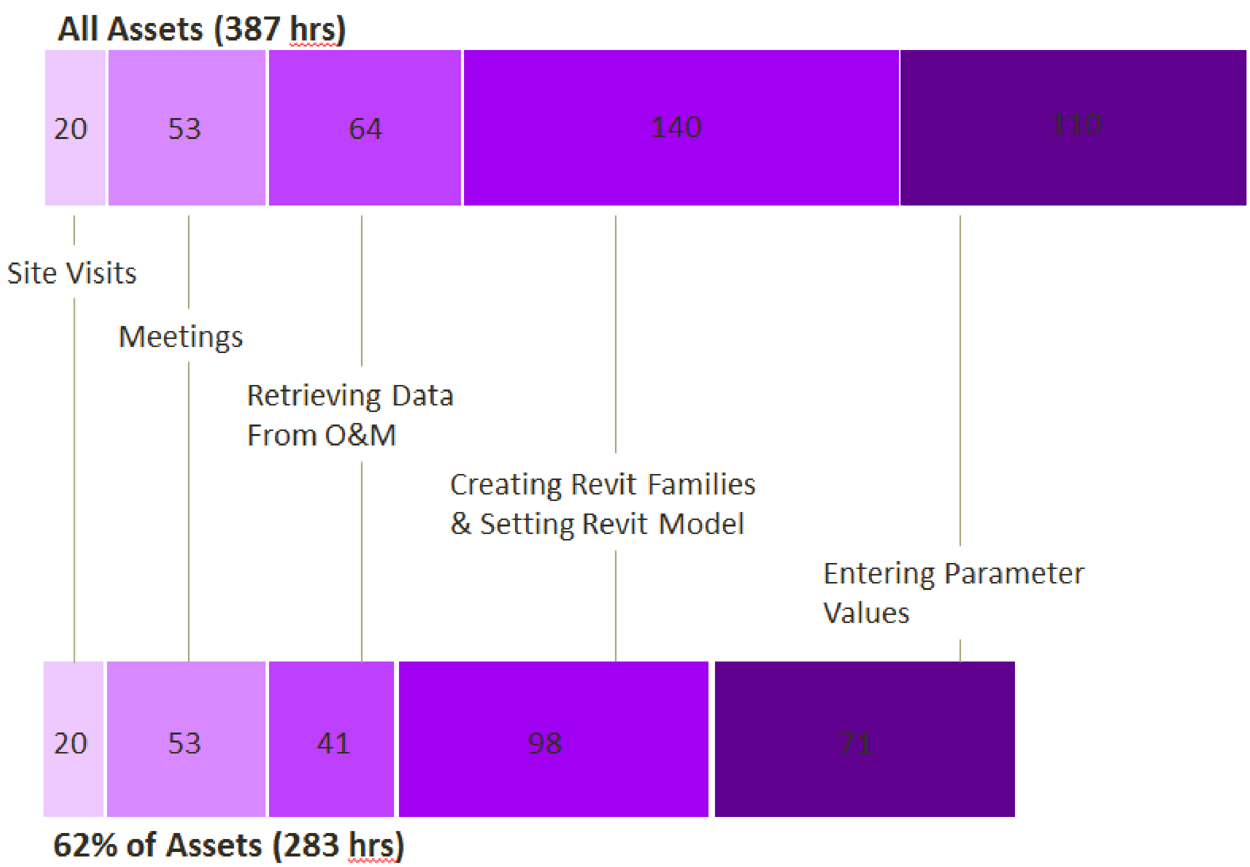

Figure 12- Time Spent on COBie Format Process

Chapter 6- Analysis

Both current and COBie format process are consisted of two main steps; first, data retrieval and verification, and second importing data into AiM. In this chapter a comprehensive comparison and analysis of the current and COBie format processes are presented.

6.1- Analysis of Hours Spent on Each Process

Dempsey Hall case study project showed no significant difference between hours spent on the current data handover process and COBie format process. As the data collected for COBie format process included all assets in Dempsey Hall and the data collected for current process included 62% of the total assets, the hours spent on each process were adjusted to provide a uniform situation for both processes in order to make a valid comparison. As we can see in the Table 10- Comparative Table of Time Spent on Current and COBie Format ProcessTable 10, the COBie format process can take at best 24 hours less and at worst 60 hours more than the current process. However, if the general contractor had prior experience of COBie and no time was spent on learning curve, the COBie format process will take some time between 99 to 178 less hours compared to the current process. On the other hand, if data entry was done efficiently in the current process, it would take at best 83 hours less and at worst 63 hours more compared to the hours that an experienced general contractor with no learning curve would spend on COBie format process.

	Time Spent on All Assets (Hours)	Time Spent on Assets Approved by Shop Managers (Hours)	Time Spent on All Assets- Adjusted for Learning Curve and Efficient Data Entry (Hours)	Time Spent on Assets Approved by Shop Managers- Adjusted for Learning Curve and Efficient Data Entry (Hours)
Current Process	336-411	223 - 282	154 - 229	108 - 167
COBie Format Process	387	260 – 283	237	104 – 113
Difference	(+51) – (-24)	(+60) – (-22)	(+83) – (+8)	(+5) – (-63)

Table 10- Comparative Table of Time Spent on Current and COBie Format Process

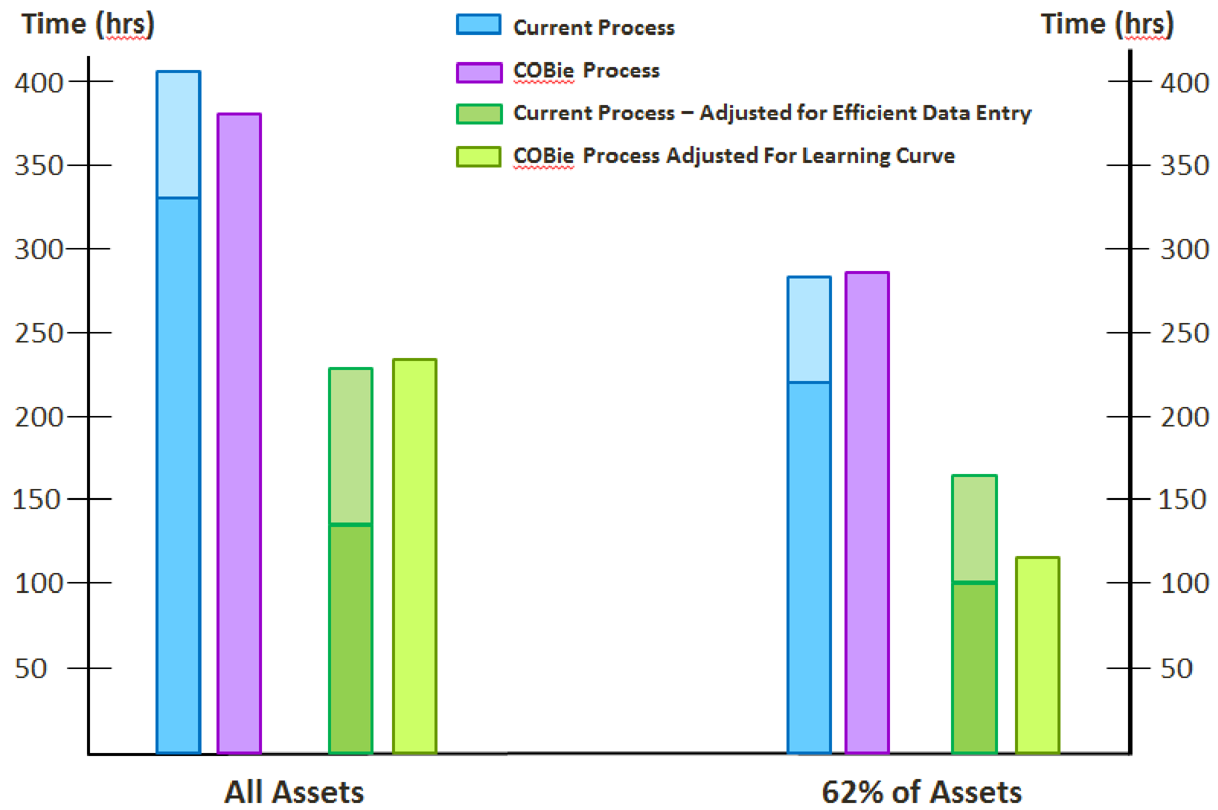

Figure 13- Comparative Diagram of the Time spent on Current & COBie Format Process

6.2- Analysis of The Work Flow of Each Process in Facility's Life Cycle

Although no significant time difference was observed between the current process and COBie format process, the two divert from each other in the timing of their happening in the lifecycle of the project. As shown in Figure 14, the current process occurs after the construction takes place and it expands in several increments of time over one to two years. In contrast, COBie format process started in the middle of construction, and happened as a continuous focused effort, and ended shortly after the handover took place. This shows that the COBie format process handed the final product much earlier than the current process.

As mentioned before, UW's COBie Pilot project significantly differed in its timing compared to an ideal COBie project in which COBie deliverable is specified from the beginning of the project. As the COBie deliverable was prescribed during the construction of UW's COBie pilot project, it provided no opportunity for the involvement of the designers in the process which could help eliminate some of the rework. One example of rework was redrawing building system components in the model by the general contractor. If the MEP designers and detailers were required to work in Revit and had used the families in their design process, there would be no rework for data entry and locating components in the model by the general contractor. Another example would be having the architect to use the right families for doors and partitions, and naming the rooms per UW's GIS Department requirements. Additionally, late prescription of COBie deliverable left no chance for the general contractor to include COBie requirements to its contracts with subcontractors; therefore, the entire effort of compiling COBie data was done by the general contractor.

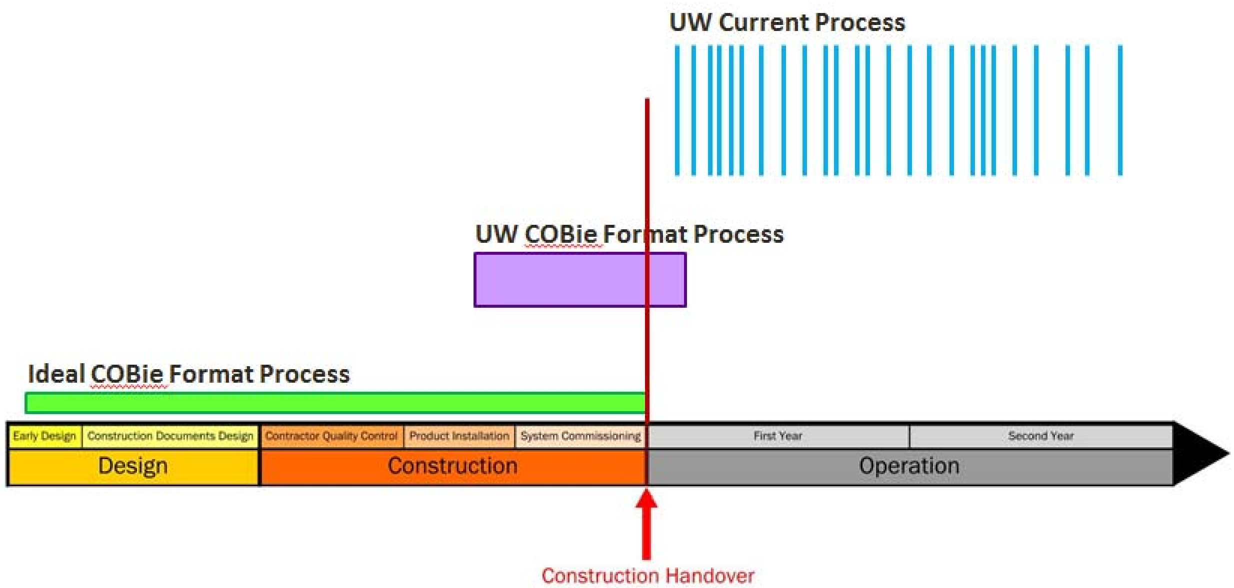

Figure 14 - The Time Span of Each Construction Handover Process

The incremental work flow of the current process imposes inefficiencies as well as expansion over a long period of time. The lack of concentrated effort for transferring handover data leads to inconsistent data collection and no opportunity for documenting the lessons learned for improvements. These shortcomings may be magnified by the involvement of multiple people across different shops of the Facility Services in the current process.

However, having multiple people involved in the current process presents the opportunity for having them to gain tacit knowledge on the building and assets. Additionally, as several people are involved in maintaining a facility, it is necessary to have the input of the majority of them for making decisions about the information needed for building maintenance. For example, the discrepancy between the numbers of assets presented in COBie data set, and what Facilities

Services managers reported they would need was caused by having only the input of one person from Facility Services.

6.3- Is BIM Necessary For COBie Format Process?

As discussed in chapter 5, in COBie format process, all assets' information can be compiled in electronic spreadsheets. In fact, the general contractor reported that it would have been more efficient, if they had generated a simple spreadsheet rather than developing a building information model. This process could have been even more efficient, if the suppliers and manufacturers of the assets had transferred the COBie spreadsheet along with the assets.

However, a building information model can be useful in more than generating a COBie spreadsheet. In this pilot project, the building information model is intended to be tied to the University of Washington's GIS system and to provide spatial information and graphical representation of Dempsey Hall. This bim can be used to orient the technicians into the new building specially the hidden assets.

For making decision regarding the use of a bim in COBie format process, one should consider the timing of COBie deliverable, the possibility of easy integration and linkage of the models from different participants and without significant time consumption, and the owner's capability in utilizing bim in various disciplines. If an owner decides to use bim for purposes other than compiling asset's information, it is critical to find out whether it has the capability to update and keep the bim current.

Chapter 7- Conclusion & Future Research

In this research, the current process of construction data handover for Dempsey Hall at University of Washington and COBie format process (which was prescribed in the middle of construction) for the same project were compared. This comparison demonstrated no significant difference between the number of hours spent on each of them, although COBie format process brings in the final product (a complete assets' information in the UW's CMMS system) much earlier than the current process.

The results of this research show the timing of COBie deliverable prescription is critical to its efficient implementation. If COBie deliverable is specified in the construction stage of the project and after the design is complete, the change from current process to COBie would not save hours and consequently cost to the owner. This change would be only a shift of the responsibility from the owner to the general contractor for compiling and entering data into the CMMS system. Therefore, it is highly recommended that COBie deliverable is specified in the owner's contract with the designers and contractors from the very beginning of the project. If specified early, designers and contractors should be able to deliver COBie data at no or little additional cost to the owner.

An ideal COBie format process would start from the early design stage by the Architect, then be handed over to the design consultants, and later subcontractors. However, it is nearly impossible to have a linear work flow in today's integrated project delivery systems in which design and construction overlap. It would be invaluable to research how this process can work between designers and contractors in different project delivery systems. An essential question for future research would be identifying project delivery systems that best support an efficient COBie format process.

This research showed that decisions about implementation of COBie (how? And when?), need to be made by having a holistic view across the owner's all departments that may potentially benefit from it. Taking an integrated perspective to this matter and considering the input from all affected departments may bring the most benefit to the owner. Although it is very unlikely that an owner can prescribe the tools and methods of preparing COBie deliverable, it can definitely have an influence on them by accurately defining the deliverables in the contract, for example whether they would need a bim along with CObie data.

Bibliography

Akcamete, A., Akinci, B., Garret J. H. "Potential Utilization of Building Information Models for Planning Maintenance Activities." *International Conference On Computing In Civil And Building Engineering*. 2010.

AssetWorks. "AiM Enterprise Asset Management." *AssetWorks.* 2011. http://www.assetworks.com/pdf/products/AiM_BIM.pdf (accessed May 16, 2011).

Building SMART Alliance. "Model - Industry Foundation Classes (IFC). The buildingSMART data model." *Building SMART Alliance*. n.d. http://buildingsmart.com/standards/ifc (accessed October 12, 2012).

Clayton, Mark J., Ozener, Ozan Onder, and Carlos A. Nome. "BIM to CAFM: an investigation of adapting a building information model to a legacy computer aided facility management." *Digital library of construction informatics.* 2010. http://itc.scix.net/data/works/att/w78-2009-1-20.pdf (accessed January 24, 2012).

D., Francisco. *Percieved Value of Building Information Modeling in Facilities Operations and Maintenance.* University of New Mexico, 2010.

East, Bill, Mariangelica Carrasquillo-Mangua. "The COBie Guide: a commentary to the NBIMS-US COBie standard." *Building SMART Alliance.* 2012. http://buildingsmartalliance.org/index.php/projects/cobieguide/ (accessed September 12, 2012).

East, William E. "Construction Operations Building Information Exchange (COBie): Requirements Definition and Pilot Implementation Standard"." *Defense Technical Information Center*. 2007. http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA491932 (accessed January 12, 2012).

—. *Whole Building Design Guide. National Institute of Building Sciences.Construction Operations Building Information Exchange (COBie).* 2012. http://www.wbdg.org/resources/COBie.php (accessed September 17, 2012).

East, William E., and William Brodt. "BIM for Construction Handover." *Journal of Building Information Modeling*, 2007: 28-35.

East, William E., Danielle Love, and Nicholas Nisbet. "A Life-Cycle Model For Contracted Information Exchange." *Proceedings of the CIB W78 2010: 27th International Conference.* Cairo, 2010.

East, William E., Nicholas Nisbet. "Construction Operations Building Information Exchange (COBie): Means and Methods." *Building SMART Alliance.* 2012. http://www.buildingsmartalliance.org/index.php/projects/COBie (accessed September 17, 2012).

East, William E., Nicholas Nisbet, and J. Wix. "Lightweight capture of as-built construction information." *Proceedings of the 26th International Conference on IT in Construction.* NewYork: CRC Press, 2010. 53-62.

Eastman, Charles M. *BIM handbook: a guide to building information modeling for owners, managers, designers, engineers, and contractors.* Hoboken, N.J.: Wiley, 2008.

Forns-Samso, Francisco D. *Percieved Value of Building Information Modeling in Facilities Operations and Maintenance.* University of NewMexico, 2010.

Gallaher, M.P., O'Connor,A.C., Dettbarn, J.L., & Gilday, L.T. "Cost Analysis f Inadequate Interoperability in the U.S. Capital Facilities Industry." *National Institute of Standards and Technology.* 2004. http://fire.nist.gov/bfrlpubs/build04/art022.html (accessed September 24, 2012).

Juan, Helen E. *The collection of COBie data for existing buildings: a comparative cost analysis of four survey methods.* University of Washington, 2008.

Lee, Sanghoon, and Akin Omer. "Shadowing tradespeople: Inefficiency in maintenance fieldwork." *Automation in Construction* 18, no. 5 (2009): 536-546.

Marsters, Andrew. *Obstacles of Implementing 6D Information Exchange: a Case Study of COBie at the University of Washington.* University of Washington, 2011.

National Institute of Building Sciences. "National BIM Standard Version 1, Part 1,- Out for Industry Review." *National Institute of Building Sciences.* March 2007. http://www.nibs.org/nbims.html (accessed May 17, 2012).

—. "NBIMS US COBie v2 ballot submission." *Whole Building Design Guide.* n.d. http://www.wbdg.org/resources/COBie.php#cs (accessed October 17, 2012).

National Institute of Standards and Technology. "General Buildings Information Handover Guide." *National Institute of Standards and Technology.* August 2007. http://www.fire.nist.gov/bfrlpubs/build07/PDF/b07015.pdf (accessed October 13, 2012).

Rojas, Eddy M., Carrie Sturts Dossick, John Schaufelberger, Beth A. Brucker, Helen Juan, and Christopher Rutz. "Evaluating Alternative Methods for Capturing As-Built Data for Existing Facilities." *ASCE* , 2009: 237-246.

Rutz, Christopher M. *Productivity of alternative methodologies for capturing as-built building information models (BIM) for existing facilities.* University of Washington, 2009.

Smith, Dana K., and Michael Tardif. *Building Information Modeling: A Strategic Implementation Guide for Architects, Engineers, Constructors, and Real Estate Asset Managers.* Hoboken, New Jersey: John Wiley & Sons, 2009.

Song, Yunsik, Mark J. Clayton, and Robert E. Johnson. "Anticipating reuse: documenting buildings for operations using web technology." *Automation in Construction* 11, no. 2 (2002): 185-197.

Suermann, Patrick C. *Evaluating The Impact Of Building Information Modeling (BIM) On Construction.* University of Florida, 2009.

Veeravigrom, M. *Building Information Systems for Operations and Maintenance.* University of Washington, 2008.

Appendix A- COBie Spreadsheet

The following table is the actual COBie spreadsheet that was delivered by the general contractor.

Gray cells have contained confidential information.

*=N/A

Asset Description	Asset Type	Asset Group	AIM Status	AiM Region	AiM Facility	Room: FACROOM	Manufacturer	Model	Serial Number	Install Date	Field ID (Mark)	Serves	Belts	Shives	Type	Size	OmniClass Number	OmniClass Title	Id	Unique Id	Family	Family and Type	Category	Supplier	Supplier Address	Supplier Phone #	Comments
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					AC Unit		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					AC Unit		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					AC Unit		Mechanical Equipment				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				

DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					drinking_fountain_round_4114		Plumbing Fixtures				
TRANSFORMER, DRY TYPE 500 KVA AND OVER	Serialized		Installed						*			*	*	*	*	*					Dry Type Transformer - 480-208Y120 - NEMA Type 2		Electrical Equipment				
TRANSFORMER, DRY TYPE 500 KVA AND OVER	Serialized		Installed						*			*	*	*	*	*					Dry Type Transformer - 480-208Y120 - NEMA Type 2		Electrical Equipment				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				

FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					fire extinguisher		Mechanical Equipment				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
ELEVATOR, HYDRAULIC, PASSENGER / FREIGHT	Serialized		Installed						*			*	*	*	*	*					Lift Door		Doors				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 3 Frame		Doors				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink - Mop		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Handicapped		Furniture				

TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Handicapped		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Transformer Switchboard		Electrical Equipment				
DOOR, FIRE	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame Fire Stair		Doors				
DOOR, FIRE	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame Fire		Doors				
DOOR, FIRE	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame Fire		Doors				
DOOR, FIRE	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame Fire		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame no clerestory		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame no clerestory		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				

LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F6		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F6		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F6		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F6		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				

VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					AC Unit		Mechanical Equipment				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				

DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	hP					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Curtain Panel F		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Curtain Panel F		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Curtain Panel F		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Curtain Panel F		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Curtain Panel F		Doors				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					drinking_fountain_round_4114		Plumbing Fixtures				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				

SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
FAN, EXHAUST	Serialized		Installed									*		*	*	*					Exhaust Fan		Mechanical Equipment				
FAN, EXHAUST	Serialized		Installed									*		*	*	*					Exhaust Fan		Mechanical Equipment				
FAN, EXHAUST	Serialized		Installed									*		*	*	*					Exhaust Fan		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				

FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
ELEVATOR, HYDRAULIC, PASSENGER / FREIGHT	Serialized		Installed						*			*	*	*	*	*					Lift Door		Doors				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
DOOR, EXTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing) exterior		Doors				
DOOR, EXTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing) exterior		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing)		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing)		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing)		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing)		Doors				
DOOR, EXTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame Exterior		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink - Mop		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				

SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Handicapped		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Handicapped		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
DOOR, FIRE	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame Fire Stair		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame.301B		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				

DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				

LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					AC Unit		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					AC Unit		Mechanical Equipment				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				

VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
PLUMBING FIXTURES	Serialized		Installed						*			*	*	*	*	*					drinking_fountain_round_4114		Plumbing Fixtures				
TRANSFORMER, DRY TYPE 500 KVA AND OVER	Serialized		Installed						*			*	*	*	*	*					Dry Type Transformer - 480-208Y120 - NEMA Type 3R		Electrical Equipment				
TRANSFORMER, DRY TYPE 500 KVA AND OVER	Serialized		Installed						*			*	*	*	*	*					Dry Type Transformer - 480-208Y120 - NEMA Type 3R		Electrical Equipment				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				

CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
ELEVATOR, HYDRAULIC, PASSENGER / FREIGHT	Serialized		Installed						*			*	*	*	*	*					Lift Door		Doors				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				

PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing)		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing)		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				

DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink - Mop		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Handicapped		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Handicapped		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				

TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
DOOR, FIRE	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame Fire Stair		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 2 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 2 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				

LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F9A		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F9A		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F9A		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F9A		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F16		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F22		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				

VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					AC Unit		Mechanical Equipment				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				

DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
VALVE, BALL, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Ball Valve - 2-6 Inch		Pipe Accessories				
VALVE, BUTTERFLY, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Butterfly Valve - 2-12 Inch		Pipe Accessories				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					drinking_fountain_round_4114		Plumbing Fixtures				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				

CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
CONVECTORS	Serialized	?????	Installed						*				*	*	*	*					Fin Tube		Mechanical Equipment				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					Fire Extinguisher Cabinet		Fire Alarm Devices				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Rectangular		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Rectangular		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				

ELEVATOR, HYDRAULIC, PASSENGER / FREIGHT	Serialized		Installed						*			*	*	*	*	*					Lift Door		Doors				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing)		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame (Right Swing)		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 1 Alum Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					New Type 2 Alum Frame		Doors				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				

PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink - Mop		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Sink-Round-Variable		Plumbing Fixtures				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Smoke Detector		Fire Alarm Devices				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Handicapped		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Handicapped		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
TOILET PARTITIONS	Serialized	????	Installed						*			*	*	*	*	*					Toilet Partition - Standard		Furniture				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				

PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Toilet-Commercial-Wall-3D		Plumbing Fixtures				
DOOR, FIRE	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame Fire Stair		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame.301B		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 2 Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 3 Frame		Doors				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Urinal-Wall-3D		Plumbing Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F5		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F9A		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F9A		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F9A		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F9A		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F11		Lighting Fixtures				

LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F11		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F11		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F33		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - F36		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X2		Lighting Fixtures				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VALVE, GLOBE, ABOVE 4"	Serialized		Installed						*				*	*	*	*					Valve - 0.375-2 Inch - Threaded		Pipe Accessories				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				

VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Acces Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Acces Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Access Door		Doors				
AIR HANDLING UNIT	Serialized		Installed									*		*	*	*					Air Handler Unit		Mechanical Equipment				
AIR HANDLING UNIT	Serialized		Installed									*		*	*	*					Air Handler Unit		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					Air-Cooled Compressor-Condensor		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					Air-Cooled Compressor-Condensor		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					Air-Cooled Compressor-Condensor		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					Air-Cooled Compressor-Condensor		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					Air-Cooled Compressor-Condensor		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					Air-Cooled Compressor-Condensor		Mechanical Equipment				
A/C, SERVER ROOM, AIR COOLED	Serialized		Installed									*	*	*	*	*					Air-Cooled Compressor-Condensor		Mechanical Equipment				
SWITCH, INTERRUPT, HIGH VOLTAGE, FUSED AIR	Serialized		Installed						*			*	*	*	*	*					Combination Starter - Disconnect Switches		Electrical Equipment				
SWITCH, INTERRUPT, HIGH VOLTAGE, FUSED AIR	Serialized		Installed						*			*	*	*	*	*					Combination Starter - Disconnect Switches		Electrical Equipment				
SWITCH, INTERRUPT, HIGH VOLTAGE, FUSED AIR	Serialized		Installed						*			*	*	*	*	*					Combination Starter - Disconnect Switches		Electrical Equipment				
SWITCH, INTERRUPT, HIGH VOLTAGE, FUSED AIR	Serialized		Installed						*			*	*	*	*	*					Combination Starter - Disconnect Switches		Electrical Equipment				
SWITCH, INTERRUPT, HIGH VOLTAGE, FUSED AIR	Serialized		Installed						*			*	*	*	*	*					Combination Starter - Disconnect Switches		Electrical Equipment				
SWITCH, INTERRUPT, HIGH VOLTAGE, FUSED AIR	Serialized		Installed						*			*	*	*	*	*					Combination Starter - Disconnect Switches		Electrical Equipment				
SWITCH, INTERRUPT, HIGH VOLTAGE, FUSED AIR	Serialized		Installed						*			*	*	*	*	*					Combination Starter - Disconnect Switches		Electrical Equipment				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				

SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
SMOKE DETECTORS	Serialized		Installed						*			*	*	*	*	*					Duct Sensor		Fire Alarm Devices				
FAN, EXHAUST	Serialized		Installed									*		*	*	*					Exhaust Fan		Mechanical Equipment				
FAN, EXHAUST	Serialized		Installed									*		*	*	*					Exhaust Fan		Mechanical Equipment				
FAN, EXHAUST	Serialized		Installed									*		*	*	*					Exhaust Fan		Mechanical Equipment				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE ALARM SYSTEM	Serialized		Installed						*			*	*	*	*	*					Fire Alarm System		Fire Alarm Devices				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE DAMPERS	Serialized		Installed						*			*	*	*	*	*					Fire Damper		Mechanical Equipment				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					fire extinguisher		Mechanical Equipment				
FIRE EXTINGUISHER	Serialized		Installed						*			*	*	*	*	*					fire extinguisher		Mechanical Equipment				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Drain - Round		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Sink - Round		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Floor Sink - Round		Plumbing Fixtures				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-208V MCB-Surface		Electrical Equipment				
PANELBOARD, 225 A AND ABOVE	Serialized		Installed						*			*	*	*	*	*					Lighting and Appliance Panelboard-480V MCB-Surface		Electrical Equipment				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
PLUMBING FIXTURES	Serialized	????	Installed						*			*	*	*	*	*					Roof Drain		Plumbing Fixtures				
DOOR, FIRE	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame Fire		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
DOOR, INTERIOR	Serialized		Installed						*			*	*	*	*	*					Type 1 HM Frame		Doors				
UNIT HEATER, STEAM	Serialized		Installed									*	*	*	*	*					Unit Heater		Mechanical Equipment				

UNIT HEATER, STEAM	Serialized		Installed									*	*	*	*	*					Unit Heater		Mechanical Equipment				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
LIGHT, EMERGENCY	Serialized		Installed						*			*	*	*	*	*					UW BS II - X1 Ceiling		Lighting Fixtures				
VARIABLE FREQUENCY DRIVE	Serialized	?????	Installed					???	*			*	*	*	*	*					Variable Frequency AC Drive		Electrical Equipment				
VARIABLE FREQUENCY DRIVE	Serialized	?????	Installed									*	*	*	*	*					Variable Frequency AC Drive		Electrical Equipment				
VARIABLE FREQUENCY DRIVE	Serialized	?????	Installed									*	*	*	*	*					Variable Frequency AC Drive		Electrical Equipment				
VARIABLE FREQUENCY DRIVE	Serialized	?????	Installed									*	*	*	*	*					Variable Frequency AC Drive		Electrical Equipment				
VARIABLE FREQUENCY DRIVE	Serialized	?????	Installed									*	*	*	*	*					Variable Frequency AC Drive		Electrical Equipment				
VARIABLE FREQUENCY DRIVE	Serialized	?????	Installed									*	*	*	*	*					Variable Frequency AC Drive		Electrical Equipment				
VARIABLE FREQUENCY DRIVE	Serialized	?????	Installed									*	*	*	*	*					Variable Frequency AC Drive		Electrical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
VAV BOXES	Serialized		Installed						*			*	*	*	*	*					VAV_Box		Mechanical Equipment				
GRAVITY INTAKE	Serialized	????	Installed						*			*	*	*	*	*					Louvered Gravity Relief		Mechanical Equipment				
ROOF VENT	Serialized	????	Installed						*			*	*	*	*	*					Louvered Gravity Relief		Mechanical Equipment				
ROOF VENT	Serialized	????	Installed						*			*	*	*	*	*					Louvered Gravity Relief		Mechanical Equipment				
ROOF VENT	Serialized	????	Installed						*			*	*	*	*	*					Louvered Gravity Relief		Mechanical Equipment				
ROOF VENT	Serialized	????	Installed						*			*	*	*	*	*					Louvered Gravity Relief		Mechanical Equipment				