

**MATERIAL HANDLING SYSTEM IN HOSPITAL:
SIMULATION CASE STUDY OF PNEUMATIC TUBE SYSTEM**

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**MATERIAL HANDLING SYSTEM IN HOSPITAL: SIMULATION CASE STUDY
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ABSTRACT

Hospitals are a major part in the Healthcare system. When patients come to be treated at hospital, they make many material deliveries in hospital; for example, specimens, patient records, blood, medicines, fabric, food, and waste etc. In future, the number of patients will increase and the amount of material will also increase. Therefore, hospitals need a good management material handling system (MHS). In this research, we study the selection factors of the material handling system in hospitals from their requirements and problems. MHS property is compared to find the appropriate system, but the system is complex and expensive. We evaluated the system before installation by using ARENA version 11 in terms of time and utilization.

This research used information from a medium private hospital that is located in the middle of Bangkok and has the problem about the high number of delivery specimens, blood, medicines and documents between many buildings. The result show the hospital in the case study has the appropriate Pneumatic tube system (PTS) and the result of evaluating PTS the system by using simulation 30 replications shows the delivery time is 37.34 ± 0.46 second and less than 3 minutes 95% service level. Diverter 3 is not necessary and Transfer unit 1 and 2 should take more care and maintenance.

**KEY WORDS: MATERIAL HANDLING SYSTEM IN HOSPITAL/ ARENA
SIMULATION MODEL/ PNEUMATIC TUBE SYSTEM**

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MATERIAL HANDLING SYSTEM IN HOSPITAL: SIMULATION CASE STUDY
PNEUMATIC TUBE SYSTEM.

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บทคัดย่อ

โรงพยาบาลเป็นหน่วยงานหลักในการรักษาพยาบาลคนไข้ คนไข้หนึ่งคนก่อให้เกิดการขนส่งวัสดุต่าง ๆ มากมาย เช่น ตัวอย่างส่งตรวจ แพ้มประวัตการรักษ เลือด ยา ผ่า อาหาร ขยะ เป็นต้น ในอนาคตปริมาณคนไข้มีแนวโน้มเพิ่มมากขึ้น ปริมาณการขนส่งวัสดุในโรงพยาบาลก็จะเพิ่มขึ้นตาม เพราะฉะนั้นโรงพยาบาลต้องการระบบขนส่งวัสดุที่ดี งานวิจัยนี้ทำศึกษาเพื่อระบุปัจจัยในการเลือกใช้ระบบขนส่งวัสดุในโรงพยาบาล โดยวิเคราะห์จากความต้องการและปัญหาที่เกิดขึ้น แล้วทำการเปรียบเทียบเพื่อหาระบบขนส่งที่มีความเหมาะสม แต่เนื่องจากระบบขนส่งมีการทำงานที่ซับซ้อนและราคาสูง จึงต้อง ทำการประเมินประสิทธิภาพระบบก่อนติดตั้ง โดยใช้การจำลองสถานการณ์ ด้วยโปรแกรม ARENA version 11 เพื่อประเมินด้านเวลา และการทำงานของระบบ

งานวิจัยนี้ใช้ข้อมูลจากโรงพยาบาลกรณีศึกษาซึ่งเป็นโรงพยาบาลเอกชนขนาดกลาง ตั้งอยู่ใจกลางกรุงเทพ ที่มีปัญหาด้านการขนส่ง เลือด ยา ตัวอย่างส่งตรวจ และเอกสาร ระหว่างอาคารต่างๆซึ่งมีปริมาณการขนส่งต่อวันสูง ผลการวิจัยแสดงปัจจัยที่ใช้เป็นต้นแบบในการเลือก ระบบขนส่งในโรงพยาบาล และพบว่าโรงพยาบาลกรณีศึกษาเหมาะสมที่จะใช้ระบบท่อลมขนส่ง วัสดุ และผลการประเมินประสิทธิภาพโดยการจำลองการทำงานของระบบท่อลมขนส่ง จำนวน 30 รอบ พบว่าระบบใช้เวลาเฉลี่ยในการขนส่งอยู่ที่ 37.34 ± 0.46 วินาที และการยังแสดงให้เห็นว่า เครื่อง สับเปลี่ยนเส้นทาง หมายเลข 3 ถูกออกแบบมาเกินความจำเป็น และเครื่องสับเปลี่ยนเส้นทาง 1 และ 2 เป็นอุปกรณ์ที่ต้องดูแลมากเป็นพิเศษ เพราะต้องรองรับปริมาณงานมาก

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CHAPTER I

INTRODUCTION

This chapter will discuss about the background and problem statement of material handling system in hospital and the reason to apply simulation modeling in automated material handling system as well as the clarification about the objective, scope, and expected result of this research.

1.1 Background and problem statement

Hospital is a vital place where is responsible for treat, prevent, and rehabilitate patients both physical and mental. The amount of time that patient went to the hospital in each year (Figure 1.1) was increasing drastically (61%) about 58 million times from year 2000 to 2009. The basic service of hospital differs from other business because it affects patient life. So, hospitals should have corrective and well-timed treatment. That mean all of hospital curing processes have to operate smoothly.

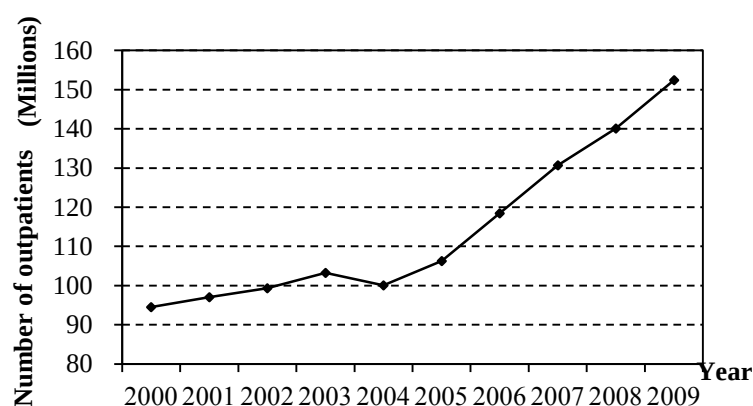


Figure 1.1 Number of outpatients in Thailand
(<http://service.nso.go.th/nso/nsopublish/BaseStat/basestat.html>)

Hospitals have two major business processes that are clinical processes and non-clinical processes. Clinical processes include diagnostic, health checking, blood test, specimen test, X-ray, injection, operation, dressing and dispensation patient process that depend on knowledge of doctors and nurses. Non-clinical processes include medical record handling, specimen handling, blood handling, fabric management, food handling, and cleaning process that depend on quality of hospital management. The hospital management is easier to control and improve quality than doctors and nurses.

Hospital management must ensure that all of materials and information will handle smoothly and correctly to reduce risk, time and improve patient safety. Since patient come until departure, they contribute many materials and information flow. For example, when patient arrive hospital, he has to make a medical record before go to see the doctor. Doctor may order patient to do blood test or X-ray before he diagnoses. If patient doesn't have to admit, he will receipt medicines and go back home (Figure 1.2).

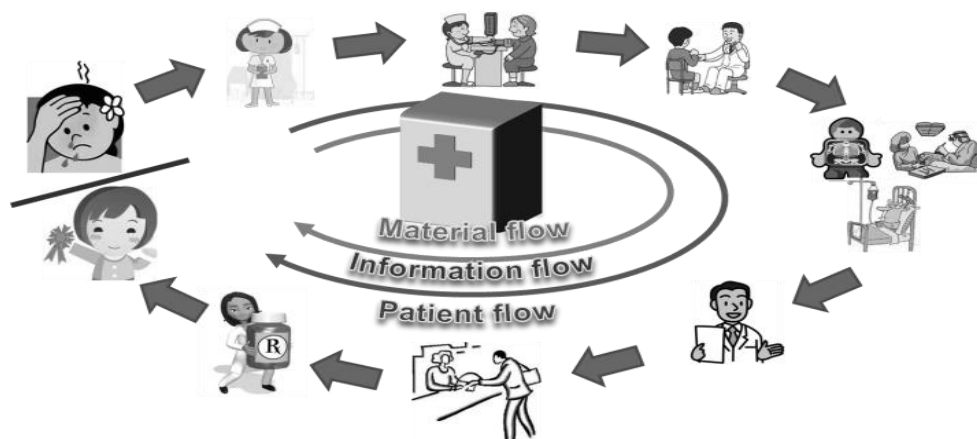


Figure 1.2 Flows in hospital

Thailand has many medium and big hospitals where have problems about finding the appropriate material handling system (MHS) to support amount of internal material handling. Hospitals abroad have the same problems because the numbers of patients increase while the number of worker doesn't increase. They popular use automated material handling system (AMHS) because it responds their requirements.

Thai hospitals should decision carefully because AMHS equipment is expensive. The hospital must spend high investment to install it.

So, this research studies hospital requirement to define criteria for select the appropriate material handling system in the hospital.

1.2 Objective

1.2.1 Define importance selective factors for the appropriate material handling system in hospital.

1.2.2 Evaluate quantity factors of the material handling system by simulation program.

1.3 Scope of work

This research studies hospital requirements to define selective factors of the material handling system in hospital. We use information from case study hospital where is the medium private hospital in the middle Bangkok to test selection factors. They have a problem about delivery specimens, blood, medicines, and documents internal hospital. They require using automated material handling system (AMHS) and want to evaluate the AMHS design before installation. Pneumatic Tube system is alternate AMHS for this case study. We use ARENA version 11 for simulate system to evaluate some selective factor.

CHAPTER II

BACKGROUND OF THEORY AND LITERATURE REVIEW

This chapter will show the summary of discussion about background theory, literature review of this research and analyze literature review.

2.1 Background Theory

This section will discuss on the background theory that composes of 5 main subsections as following, step of Material Handling Design Process, the requirement of Material Handling System (MHS) in hospital, material handling in hospital, alternate Automated Material Handling System (AMHS) in hospital, material handling evaluation with simulation model.

2.1.1 Step of material handling design process

Material handling system (MHS) is a basis process in every business to help all of activities in business goes smoothly. Although, MHS is not making money process, it can reduce operation cost and reduce risk. Many businesses give precedence to choose the appropriate MHS. Before implement any system, we will be confident that system is suitable with the requirement. So, Material Handling System (MHS) Design Process is necessary to do before decision. To ensure that system can make benefit to our businesses. This design process concludes 6 steps which are showed in Figure 2.1.

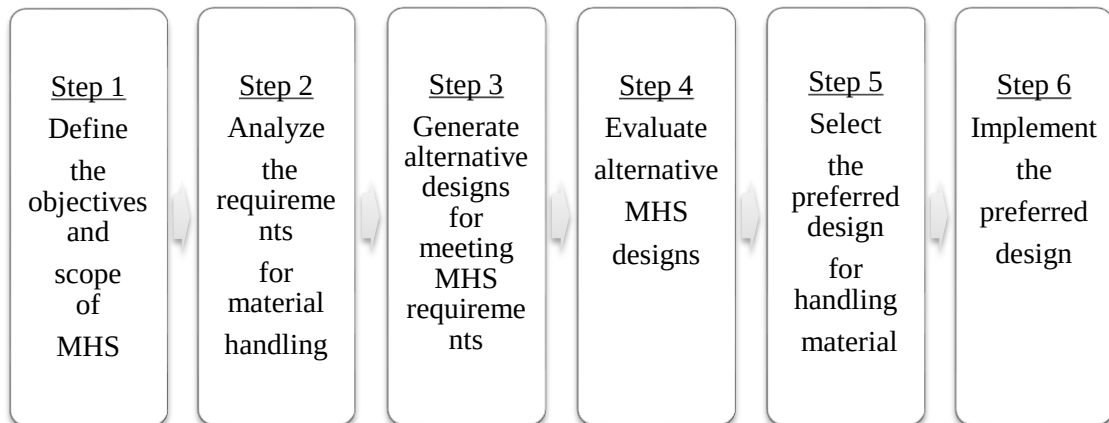


Figure 2.1 Steps of material handling system design process

Step1 is defined the objectives and scope of MHS from the essential requirements that require to use the right method to provide the right amount of the right material at the right place, at the right time, in the right sequence, in the right position, in the right condition, and at the right cost.

(i) Performance movement of materials to move in timely when needed at the desired rate.

(ii) Safe material in movement to the desired place.

(iii) Efficient movement of materials to minimize utilization of storing materials space.

(iv) The lowest cost solution to the materials handling activities.

Step2 analyze the requirement of Material Handling.

Material handling equation (MHE) is popular tool that is used in industrial to analyze the problem and the requirement. Each kind of material has difference characteristic and movement. For the good management of material handling, we must analyze the material movement follow material handling equation that shows in Appendix A.

$$\text{Material} + \text{Move} = \text{Method}$$

Step3 Generate alternative designs for meeting MHS requirements. MHS selection is depended on performance system, efficiency and cost. The factors to be taken into consideration may well include the following Table 2.1.

Table 2.1 Factor to evaluate MHS

Factor	No.	Sub-Factor	Description
Performance	1	Speed	Rapidity of movement of material, within the limits of the production process or plant safety, should be considered
	2	Load capacity	Equipment selected should have great enough load-carrying characteristics to do the job effectively, yet should not be too large and result in excessive operating costs.
	3	Power	Enough power should be available to do the job.
	4	Space	The space required to install or operate materials handling equipment is an important factor in its selection.
Efficiency	5	Maintenance	Equipment selected should be easily maintained at reasonable cost.
	6	Adaptability	The load carrying and movement characteristics of the equipment should fit the materials handling problem.
	7	Flexibility	Where possible the equipment should have flexibility to handle more than one material, referring either to class or size.
	8	Supervision required	As applied to equipment selection, this refers to the degree of automaticity designed into the equipment.
	9	Environment	Equipment selected must conform to any environment regulations.
Cost	10	Cost	The consideration of the cost of the equipment is an obvious factor in its selection.

Step 4 Evaluate alternative MHS designs

Before installation any complex and expensive system, we will evaluate the design that suitable for their demand. To adjust the design follows the requirements. Method to evaluate complex system usually use simulation models which specific for each situation. Evaluate design with simulation model in term of quantity performance

Step 5 Select the preferred design for handling material

The selection of materials handling equipment requires the attaining of proper balance between the production problem, the capabilities of the equipment

available, and the human element involved. Select or comment to suitable design that response requirement

Step 6 Implement the preferred design

2.1.2 Hospital material handling requirement

Hospital requirement is differ from other businesses because the mainly consider is patient safety. So, every activity in hospital must emphasize to make patient safety also MHS in hospital.

Hospital has material movement all day to day so material management is importance to improve efficiency of hospital to make patient safety. The ultimate aim of material handling system in hospital is show in Figure 2.2 that used to define the objectives and scope of material handling system design process.

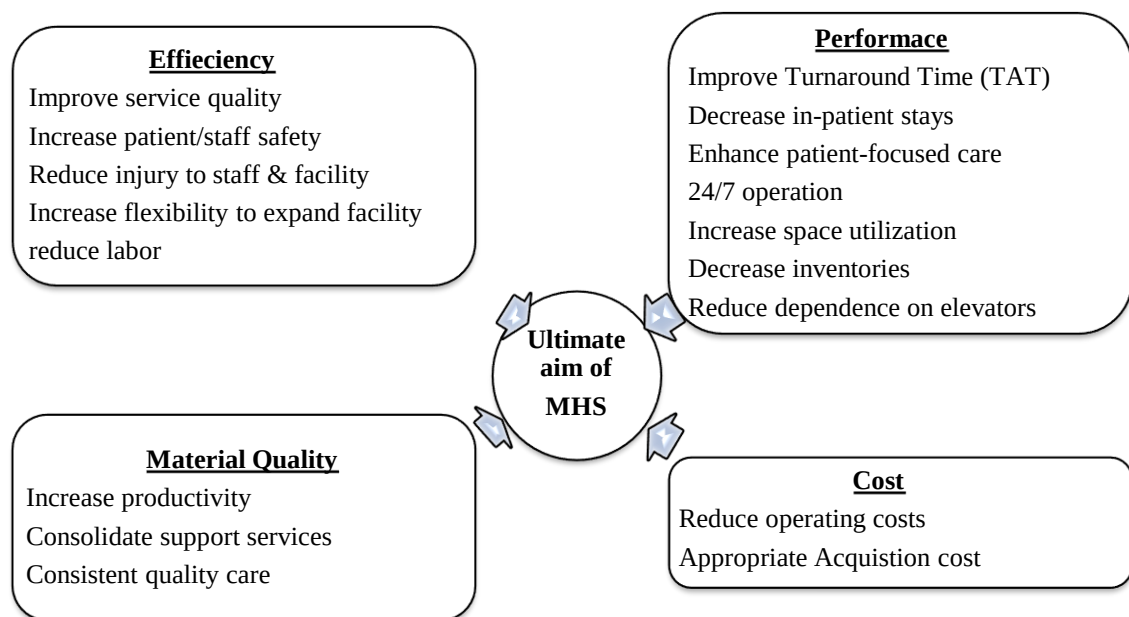


Figure 2.2 Ultimate aims of MHS in hospital

All of these requirements are to be the objective and criteria to consider before select alternative material handling system.

2.1.3 Material handling in hospital

Hospital has many activities which aim to treat patient. The main activities are curing the patients. To ensure the main activities, the support activities must provide products, services and material in timely.

The supporting logistic is coordinated cross-departmental with the flow of goods and information. All logistics processes run within a hospital on a day-to-day basis that include the movement of patient, drug, laboratory goods, medicines, sterile goods, data, document, waste, food, linen and mail. (Figure 2.3)

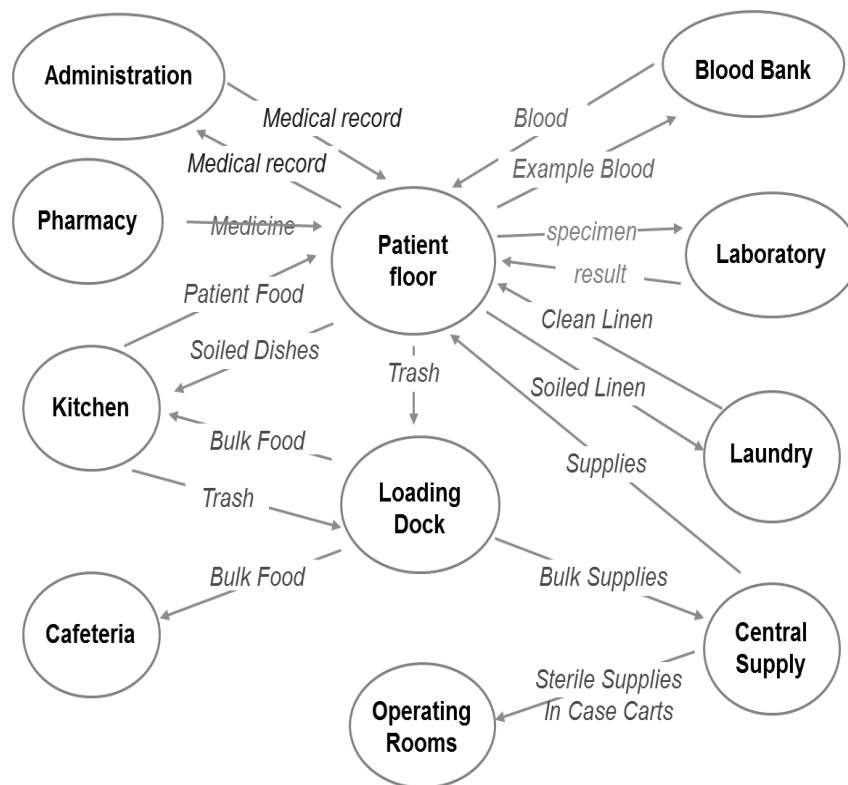


Figure 2.3 Material flows in hospital

To understand the requirement of material handling in hospital must analyze the nature of material in hospital follow appendix A.

Table 2.2 Characteristic of Material handling in hospital

Material	characteristic							
	Weight	Size	Sensitive	Infected control	volume	State	Frequency	Special protocol
Specimen	Low	Small	Y	Y	Low	Solid/liquid	All day	N
Blood	Low	Small	Y	Y	Low	Liquid	All day	N
Medicines	Low	Small	Y	Y	Low	Solid	All day	N
Document	Low	Small	N	N	Low	Solid	All day	N
Food	High	Big	N	Y	High	Solid/liquid	3 times/day	Y
Fabric	High	Big	N	Y	High	Solid	2 times/day	Y
Medical supply	High	Big	N	Y	High	Solid	All day	Y
Medical waste	high	Big	N	Y	High	Solid	Once a day	Y
Oxygen tank	High	Big	N	N	high	Solid	All day	N

** Y: yes, N: no

Specimens include blood example, urine, excrement, saliva or tissues that are collected from checkup room, surgery room or patient room into a protected contamination container. They are sent to test in laboratory. When the test finished, the specimen will be destroy with heat or sent defected waste area. The results are saved in patient record.

Blood is received from donate and kept in blood bank. Sometime blood is sent from Red Cross because blood in hospital is not enough. Blood is used for ไข้ patient in ICU, Emergency room, Surgery room or critical word. Blood delivery is differ from other material because fast move can take degrade of blood quality. So to keep blood quality, the movement must control the temperature and sturdy.

Medicines can classify in to 3 groups, oral, topical and injections. They are delivered from medicine stock to pharmacy, examination room, surgery room and wards to pay to the patients. The dispense medicine to patients must be careful not make a mistake because the wrong medication may affect the safety of life of the patient.

Medical records are treatment history and personal history of the patient which be submitted along with the treatment. Because of medical history affect the accuracy of the diagnosis and precautions for dispensing drugs to patients. Other documents include the document to the signed consent of the patient and documents sent between different departments in the hospital.

Medical support equipment such as rubber gloves, syringes, bandages, cotton wool and water oxygen. This is important in the treatment of patients. They were used in the examination room, emergency room, operating room and recovery room.

Medical device is a small tool such as surgical equipment which these devices must be sterilized to prevent and control infection during transportation. Large equipment such as pressure gauges, Ventilators, etc., it is within the hospital to provide patient transport.

Clothing is not used to direct treatment but it is contact the patient directly. So it must control the cleanliness. Clothing is mostly used in patient rooms. The patient will need to dry off and change cloth 2 times a day. Cloth management in hospital includes doctor gown and surgical gown that must supervise the cleanliness since the wash, transport to the hospital and collecting used clothing to wash.

Sheets are found in mattresses, examination rooms, emergency rooms, operating rooms and patient rooms. They contact with the patient, therefore they must control the infection since the wash, transport and collecting the cloth used to wash. Transport used clothing has an opportunity to spread germs. So, they are required to transport only at nighttime and use the path that is not causing the transmission to patients.

Food will be cooked by controlling cleaner and deliver to the patient was transported recuperating and then back containers used to cleaning. The food is prepared for a specific patient because each patient's disease or condition that has to be different. The food will be transported along the transport container with a lid to prevent contamination and to identify the patient and sent 3 times a day.

Waste from the examination room, operating room and patient rooms categorize with a color of bag. Transport wastes are kept at night to reduce the chance of infection.

Due to the different of properties materials have different transportation such as waste, food clothing and a particular form of transportation that has anti-contamination of germs, medical devices and medical equipment has to be transported and prevent infection. The drug blood specimens, medical records and other

documents are very small item but have amount of transport throughout the day, so it popular used transportation equipment.

Transport equipment in the hospital with a range of the hold containers, the wheelchair until the various systems. The selection of use depends on the volume of goods transport and properties of materials. Most of which hospital trolley are made of stainless steel. So it is designed specifically for use as follows.

Transport blood specimens are using human walk to delivery so it takes so much time. The container can be controlled the temperature to prevent quality damage.

Bulk of drug is sent from pharmacy warehouse to retail pharmacy with cart. The retail pharmacy will pack drug and sent to each patient by dispensing box or wards. The pharmacy cart has special design to separate medicine layer.

Medical support transport equipment is sent to use in the first aid to surgery room. The card has separated many sections to put the medical support set.

Cloths and fabric transport in hospital will include transport clean cloth to patient and take dirty clothes to wash. The amount of transport is large quantity, so the cart will used in this transport. Cleaning cloths are packed in plastic bags to prevent contamination and the fabric used is stored into the bag neatly.

Transporting food will be set as a tray from the kitchen for serve to each patient. Food cart must be divided into distinct layers to provide input tray and must be packed in a container with a lid or plastic wrap.

Materials in hospital are divided by frequency of delivery in to two groups. Schedule delivery's material is show in Figure 2.4 and On-demand delivery's materials are medicines, blood, specimens and documents. These are delivery all day. The increasing number of material is followed the increasing number of patient. That mean, it has opportunity to have an error.

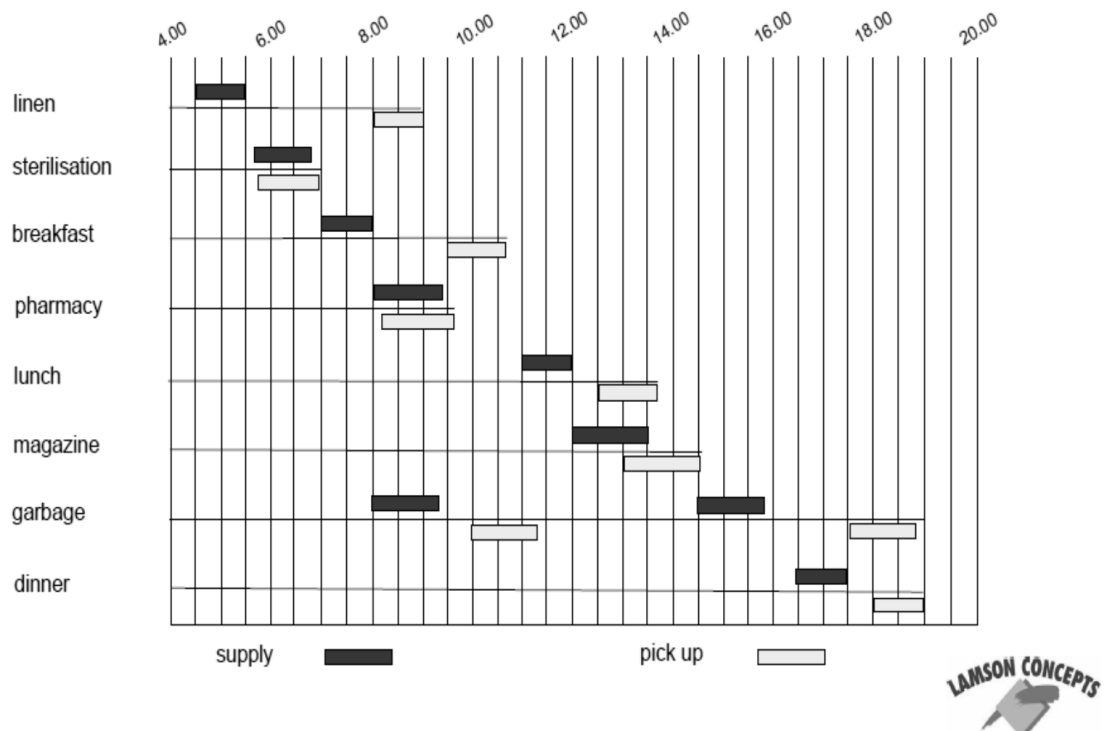


Figure 2.4 Frequency of schedule-delivery's material in one day

2.1.4 Alternated Material handling system in hospital

The method of MHS can classify in to 3 groups follow the Table 2.3. That shows the difference property of each method. If your requirement is consider mainly in low cost, manual method convenient for your business. If your requirement is consider about reduce time and medium cost, mechanized method convenient for you. Automated method is appropriate with the hospital where need high speed and reliably system more than low cost system

Table 2.3 MHS classify by method

MHS by method	Labor	control	capacity	Flexibility	Characteristic					
					weight	volume	speed	Frequency	Acquisition cost	Operating cost
Manual	Human	Human	Low	High	Low	Low	Low	Low	Low	High
Mechanized	Machine	Human	Medium	Medium	High	High	Medium	Medium	Medium	Medium
Automated	Machine	Machine	High	Low	High	High	High	High	High	Low

Now a day, the number of material movement in hospital is growing every year while the number of labor in hospital is constant. So, Automated Material Handling Systems (AMHS) extremely apply in the big hospital. AMHS can call Automated Transport System (ATS). It has many type systems that have different performance. The selection depends on the hospital requirements.

The popular ATS is used in hospital has 4 systems.

2.1.4.1 Track Vehicle System (TVS): Individually powered cars travel on aluminum tracks and transfer units using 24 volt power rails. Track vehicle systems are best for on-demand transport of middle-sized items weighing up to 10 kg / 50 kg. Standardized or specially designed containers transport various kinds of goods along an individually designed network of tracks. Running overhead and behind walls, the system guarantees a fast and secure material transport to essential hospital departments at all times. A fast and reliable transport of material is guaranteed at all times.

System features is fully automated system, customer-specific network of tracks, vehicle payload up to 10 kg / 50 kg, fast transport up to 1 m/s, minimum acoustic noise, Safe handling of sensitive medical Items. Applications are transport of sterilized items, on-demand transport of laboratory items, specimen, and blood products, on-demand transport of pharmaceuticals (medium-sized), on-demand transport of medical items with higher volume or weight, handling of documents, disposal of waste.

Benefits are time saving due to direct connection of departments, 24h operating state, faster availability of test results, minimizing of manual transport, reduction of damaged goods, reduction of transport errors, enhanced workplace safety

Product definition is from Swisslog Healthcare Solutions.

2.1.4.2 Selective Vertical Conveyor (SVC)

Fiberglass tote boxes move vertically on cars between floors & horizontally on roller conveyors. System features is fully automated system, up to 12 totes/minute, up to 60 lbs. capacity, 17"W x 20.5"L x 18" H Tote, from 2 to dozens of stations, designed into new buildings

Benefit can reduces elevator traffic, reduces traffic in common areas, promotes security, fast efficient deliveries, reduces manual transport, enhances staff availability, quite, non-disruptive work environment

2.1.4.3 Automatic Guided Vehicle System (AGV)

AGV is battery powered, computer controlled vehicles move carts between service and nursing areas. Hospitals typically use containers for scheduled transport. Containers weighing up to 450 kg can be transported by the vehicle along a predefined route throughout the corridors and elevators of a facility. A unique on-board laser-guiding-system ensures the vehicle navigates its way through the building as well as detecting any obstacles. On-demand transport is also possible.

System Features are fully automated; vehicle drives along a predefined route, customer-specific driving route, Easy system adjustment and extensions, vehicle carries containers up to 450 kg, transport speed up to 2 m/s, high security standard due to, on-board laser-guiding-system, low maintenance

Applications are transport of meals in special food containers, transport of large quantities of pharmaceuticals, scheduled transport of medical goods, scheduled transport of sterile goods, scheduled transport of linen and laundry, disposal of waste, management of documentation and administration items.

Benefits reduction of staff dealing with manual transport, minimizing of manual transport, 24h operating state, reduction of transport errors, reduction of transport damage to facility and carriers, optimization of transport flows (reduction of bottle-necks), enhanced workplace safety.

2.1.4.4 Pneumatic tube system

Pneumatic tubes (or capsule pipelines or Pneumatic Tube Transport or PTT) are distribution systems which use wind power from the wind generator to move a carrier along the tube, which is set as a network. Pneumatic tube transportation was originally invented by William Murdoch in 1836. Then, it was applied to material handling in bank, supermarket, company, and passenger transportation.

This system is used for non-planned, on-demand transport of items with limited weight and dimensions. The goods are transported in special carriers at high speed through an individually designed system of tubes, facilitated by

forced air pressure. Both short and long distance transport can be realized horizontally and vertically with high precision. Fully automated sending and receiving stations securely hand over the carrier into the transport tube. Special discharging modules ensure the safe handling of sensitive samples.

System features are fully automated, PC-controlled, application-specific tube diameter and tube network, transport of items up to 5 kg, minimum acoustic noise, minimum maintenance requirements, high system availability, gentle and safe handling of sensitive medical items e.g. erythrocyte Concentrate.

Applications are logistics of laboratory items, specimen, and blood products, on-demand transport of pharmaceuticals, on-demand transport of medical items, handling of documents.

Benefits are time saving due to direct connection of departments, 24h operating state, faster availability of test results, minimizing of manual transport, reduction of transport errors

Basic components of pneumatic tube system

- **Carriers** are reusable plastic containers that hold and protect items sent through a pneumatic tube system. Foam inserts can be placed inside a carrier for additional cushioning.

- **Steel tubes**, available in 4" and 6" diameter and mounted inside ceilings and mechanical rooms, form a network through which carriers travel at speeds up to 17 miles per hour.

- **Blowers** are large fans that move carriers through the tubes via vacuum and pressure.

- **Stations** positioned throughout a facility allow personnel to send and receive carriers with the touch of a button.

- **Diverter**s, switching devices used at branching points within a tube network, allow carriers to travel between any two delivery stations.

- **A computer control center** monitors all carrier traffic and calculates the fastest path for each transaction.

2.1.5 The simulation model

For evaluate alternative MHS designs, we normally use simulation model. Especially automated material handling system must use computer simulation to evaluated its.

2.1.5.1 The definition of simulation model

Simulation refers to a broad collection of methods and applications that used to imitate the behavior of real systems, usually on a computer with appropriate software. Due to the complexity of actual work that cannot be tested or modified until the benefits of process will be received, the simulation is an effective tool that use to analyze the current state of the system and find an optimal solution before applied to the actual work . The main objective that applied the simulation is to study the flow of system in various points of view by collect data and analyze to find the optimal solution in the computer programs that used as the guidelines to improve the operation as shown in figure 2.5 with the development of more powerful computers and software, simulation technique has become a very powerful tool that has been applied to many industries including manufacturing, banking, transportation, and hospitality, as well as natural systems in physics, chemistry, biology, and economics.

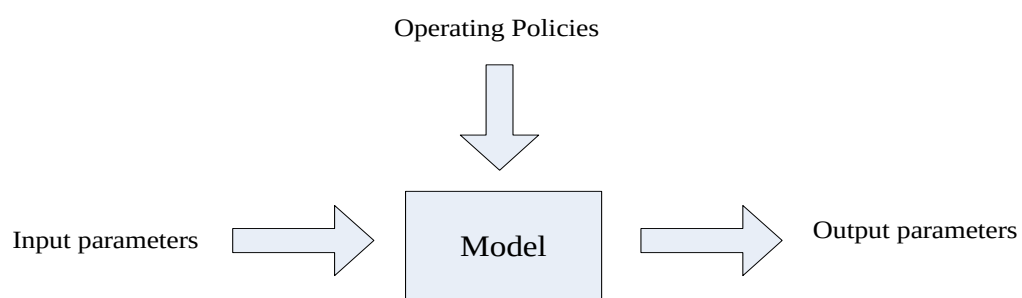


Figure 2.5 Relationship between input and output parameters of simulation model

2.1.5.2 Classification of simulation model

There are a lot of ways to classify simulation models, but one useful way is along these three dimensions:

Static vs. Dynamics, in static simulation models time is not explicit and the analysis can be done in Excel spreadsheets, whereas, the events can be occur sequentially over time and it use specialized software in dynamic simulation models.

Continuous vs. Discrete in continuous models, the state variables change in a continuous way, and not abruptly from one state to another. This type of simulations are most appropriate if the material or information that is being simulated can be described as evolving or moving smoothly and continuously, rather than in infrequent discrete steps or packets. For example, the movement of water through a series of reservoirs and pipes can most appropriately be represented using a continuous simulator. Continuous simulators can also be used to simulate systems consisting of discrete entities if the number of entities is large so that the movement can be treated as a flow. In contrast, discrete models that are the state variables change only at a countable number of points in time. These points in time are the ones at which the event occurs/change in state, such as call centers, factory operations, and shipping facilities in which the material or information that is being simulated can be described as moving in discrete steps or packets. Furthermore, the elements of both continuous and discrete change in the same model, which called mixed continuous-discrete models.

Deterministic vs. Stochastic, a model can have both deterministic and stochastic in the same model. Deterministic models that have no random input and outcomes are precisely determined through known relationships among states and events, without any room for random variation. In such models, a given input will always produce the same output, such as in a known chemical reaction. In comparison, stochastic models use ranges of values for variables in the form of probability distributions.

In conclusion, most operation models in real world situation are dynamic, discrete, and stochastic pattern that called discrete-event simulation

(DES) models. This model has been represented as a chronological sequence of events that occur at an instant in time and marks a change of state in the system.

2.1.5.3 Process to construct the simulation model

Baldwin, et al. (2004) described the process of simulation that will take all 10 steps, as shown in Figure 2.6 the first step is problem formulation that is setting the objectives of the study and the specific issues to be considered. The second step is data collection that based on the objectives of study and defined the conceptual model. Step 3 is the verification which refers to whether the conceptual model is performing properly. After the verification then step 4 is constructing a computer model, which is based on the conceptual model. After that a pilot run is done in step 5. Then, the validation, that is performs in step 6, refers to whether the model is an accurate representation by comparing the operational model with the real system. Steps 7 through 10 are design of experiments for defining the different alternatives for experimentation, production runs for providing performance data on systems designs of interest, output analysis which consists of statistical techniques for analyzing output from production runs, and implementation of model.

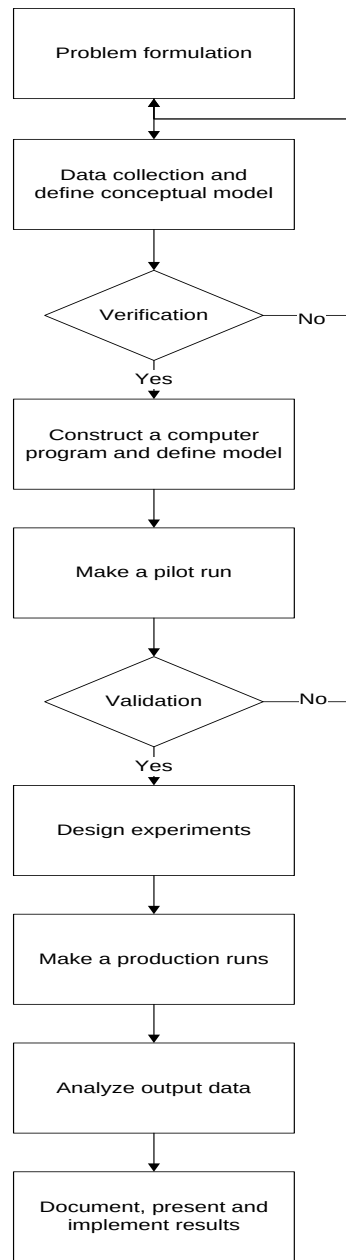


Figure 2.6 Step in a simulation study (Baldwin, et al. 2004)

2.1.2.6 Implement the preferred design includes all this process: selection of suppliers, training, installation, debug and start-up, and performance audits.

2.2 Related literature review

Literature review of this study is dividing into three phase. First phase show the review about Material handling system in hospital and how to selection. Second phase show the review about evaluate material handling by using simulation. Last phase show about Pneumatic tube research.

Material handling has many researches that study about how to select the suitable system. For example, Thoguluva (2006) reviewed and discussed Material handling system in industrial. Satya (2009) , Gu et al.(2007), and Tompkin et al. (2002) studied step of material handling system design start at defining the objective, establishing the scope, generate and evaluate alternative, select prefer system, an implement system.

Matson(1992) Ramazan (1999) study approach for selection material handling system that should be “the right method to provide the right amount of material, at the right place, at the right time, in the right sequence in the right position, in the right condition, and at the right cost” (White and Apple, 1985). The selection step start at analyze the characteristics of material, the attributes of method, and the physical facility.

Osman (2004) Study about a decision support system considering these factors for material handling equipment selection is developed. The factors are a database, a rule base system and multi-attribute decision making modules. The paper introduces the fuzzy information axiom approach and uses it in the selection of material handling equipment. In step of analysis, they analyze material move and method (Amer 2011, Shankar 2006, A.M. El-Tamimi 2004, F.T.S. Chan 2001, L.G. Vargas 1995).

Guilherme (2011) study on improvement in internal material handling management in a large company. The objective was to evaluate the impact of implement new internal material handling management on the internal customer perceptions of cost, safety in service, service reliability, agility and overall satisfaction.

P S Chakraborty (2006) evaluated performance of MHS in term of User friendly, Productivity, Capacity, and safety. Performance was measure by Lead-time, Energy/hour, Transit damage and Man-hours/ product.

Manuel (2001) studied about Multi-Objective analysis of material handling system by using the Analytic Hierarchy Process and computer simulation. Factors were used in this research that included Economical factors, Technical performance and efficiency, environment, and Technical innovation side effect.

Ashish (2012) showed the important of Improving the Delivery system in hospital because well-designed technology result in improve safety, efficiency and reduced cost (T. Bodenheimer and K. Grumbach 2003).

Pneumatic tube transportation was popular used in hospital to transport blood and specimens (Green et al. 1995, Keshgegian and Bull 1992, Tanley et al. 1987, Brooks et al. 1986, Poznanski et al. 1978, Steige and Jones 1974,) and found that system was not effect on blood gas generation (Zahur Zaman et al. 2001, Astles et al. 1996), and no effect on quality of blood (Graham Ellis 2009, Kratz and Salem 2007, Fernandes et al. 2006, Collinson et al. 2002, Hardin et al. 1990) and specimens (Pragay et al. 1980). On the other hand, this system can reduce delivery times in hospitals (Christopher et al. 2003, Guss et al. 2008) to less than manual deliveries. Later, the design of the system was studied and a simple system was simulated to calculate the number of carriers used (MarkW. Isken, et al. 2002).

Mark, et al (2002) used a DES model to analyze PTS of a large tertiary care hospital. The objective of research was to analyze operation of PTS and shown a decision support framework based on defining relevant system performance metric, traffic analysis reporting. The result indicated that efficiency of system are improve when change the priority of queue management.

A DES model is popular used to analyze material handling system in term of planning to selection, evaluate to improve efficiency. For example,

Dima (2003), Rust et al. (2002), Mackulak and Savory (2001), Paprotny (2000), and Pillai (1999) study on a methodology of tackle the problem of design difficult Automated Material Handling Systems for 300mm water fabrication facilities. This paper propose steps of automate material handling design process. That divides in to two levels: architectural and preprocess with simulation model.

The literatures which related to this aim will be summarized in table 2.4.

Table 2.4 Application of DES model

No.	1 st author	Year	Section	Objective	Method	The main of KPIs
1	Greg Werker	2009	DES in hospital	Use DES to improve RT planning process.	DES ARENA	- Reduce planning time -ultimately overall waiting time
2	Zheg Zeng	2011	Simulation in hospital	Simulation to improve quality of care of ED	SIMUL8	-Length of stay -Waiting time
3	Timothy	1999	Simulation evaluate AMHS	Evaluation AMHS	Auto Med	-Average flow time -Average work in process time -throughput per hour (unit)
4	Corlos B.	1995	Simulation evaluate AMHS	Analyze process flow and use evaluate system	ProModel	-Throughput (pc/time unit) -Throughput time (time unit/pc) -Work in process -% in operation -% utilization
5	F.K. Wang	2004	Simulation evaluate AMHS	Performance evaluation of AMHS	AutoMod	-Delivery time -Transport time -Through put
6	K.S. El-Kilany	2004	Simulation evaluate AMHS	Simulation evaluated MHS	GTIA-M&S	-delivery time -transportation time -waiting time -moving time
7	Badreddi ne Jerbi	2011	Simulation	Outpatient in hospital Management	ARENA	-Waiting time -utilization

Table 2.4 Application of DES model (cont.)

No.	1 st author	Year	Section	Objective	Method	The main of KPIs
8	Andrew Potter	2007	Simulation	Evaluted dispatch bay performance	ARENA	-Time in System

2.3 Analysis of literature

In part of consider factor of selection MHS, general business consider about speed, load capacity, power space, maintenance, adaptability, flexibility, and cost of MHS. Difference form Hospital business, they consider about patient safety more than performance of machine or cost. Patient safety may occur from correctly diagnostic and well-time treatment so the hospital must ensure that supporting material will send correctly and fast enough. From literature review, we found 2 popular methods that are AHP and Material Handling Equation (MHE) to analyze MHS requirement but the factors are not cover all hospital requirement. So, this research aims at selection factor of MHS for hospital.

Due to the complexity of material handling system, discrete-event simulation has been proved to be an effective tool that used for two main purposed in the healthcare system. One of these purposes is to evaluate the material handling system and the other is to improve the efficiency of material handling system. From the mentioned literature that illustrate of the prevalence in application of DES model to the various section of material handling. The approach is simulate the operation of system as real operation which used for determine the appropriate system by adjusting of the various scenarios. In addition, the DES model suitable for the complex system which has variables changes only at a countable number of points in time and involve probability.

Key performance indicator (KPI) that is a crucial instruments for the application of DES model has been used to measures and evaluates the performance depend on the various aspects of each research. Form the mentioned literature, the main of KPIs that used to evaluate the performance in the hospital has three indicators as following; delivery time, waiting time and resource utilization there can be a

guideline which uses to select the appropriate KPI for evaluates the performance of material handling system in the case study of hospital.

In the summary, this research will develop DES model of PTS to determine the suitable of the hospital. In addition, the lists of KPIs and scenarios which have been proposed for adjust the system efficiency for the new PTS design. That will be discussed in the chapter 4.

CHAPTER III

RESEARCH METHODOLOGY

This chapter summarize about methodology of this research from the beginning to the ending and show the research time in each step.

3.1 Step of Research methodology

These studies present the method of how to hospital select the appropriate material handling system (MHS). The methodology is separated in 2 phases. First, defines the selective factors to find alternative MHS. Second, Hospital evaluated the performance of alternative MHS by simulation program. So the methodology of this research conducted in 15 steps as following (Figure 3.1).

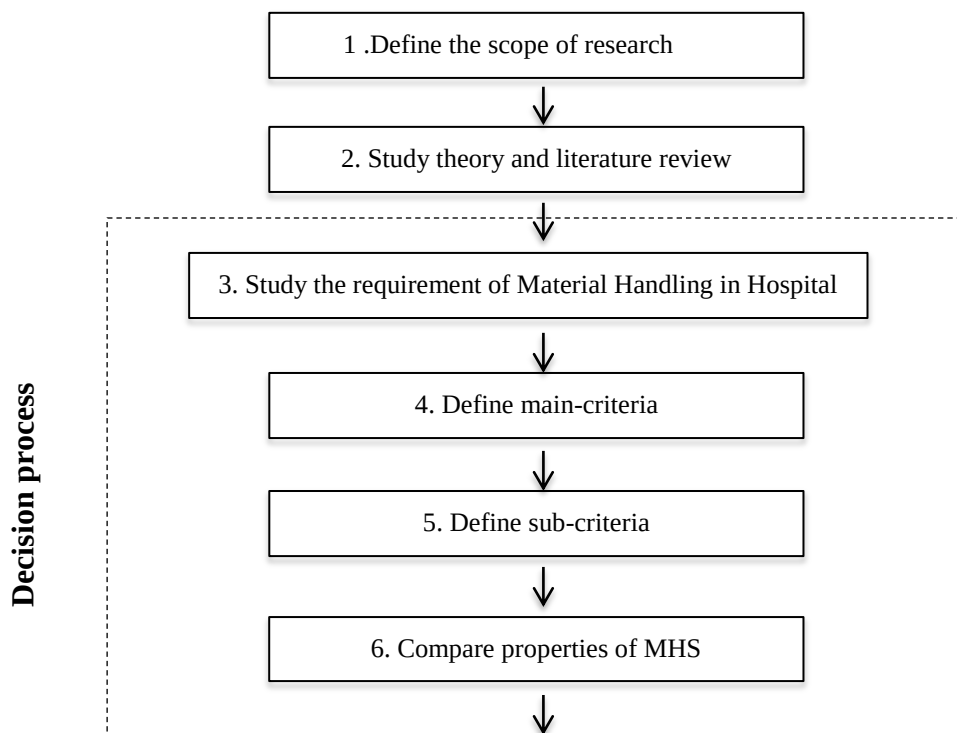


Figure 3.1 Step in research methodology

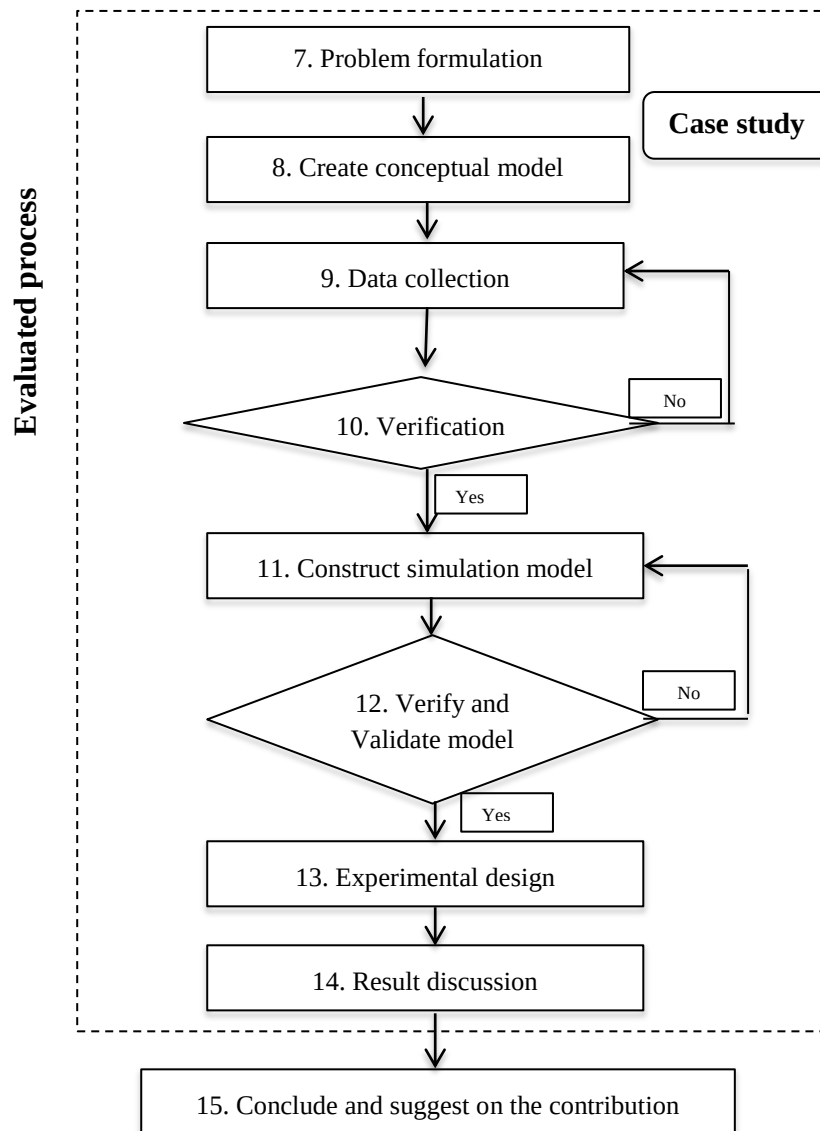


Figure 3.1 Step in research methodology (cont.)

3.1.1 Define the scope of research

This research studies problem of material handling system in hospital and how to select the appropriate MHS. The scope of this study will discuss about material handling selection factors and evaluate the MHS design by using simulation model (ARENA). From case study is appropriate to use Pneumatic tubes system that plan to delivery specimens, blood, medicines, and documents in the hospital.

3.1.2 Study theory and literature review

This step will study theory of material handling system (MHS) in hospital, property of automated MHS and simulation modeling. The Literatures review considers the material handling selection factors and the simulation in material handling system in hospital. The main objective is to define selection factors and evaluate quantity factors of the appropriate of material handling system.

3.1.3 Analyze Material handling in hospital requirement Study MHS Hospital requirement

This step will study about the MHS requirement in hospital. Their objectives differ from industries because hospitals focus on patient safety more than cost. The hospital requires system which works 24 hours on 7 days and can protect material quality while move fast.

3.1.4 Define main-criteria

We match hospital requirements with general selection factors that have 10 factors and found that have some requirement cannot match with general factor. So we define 3 new selection factors in term of material and group all main-factor in part of material, movement, and method that show in figure 3.2.

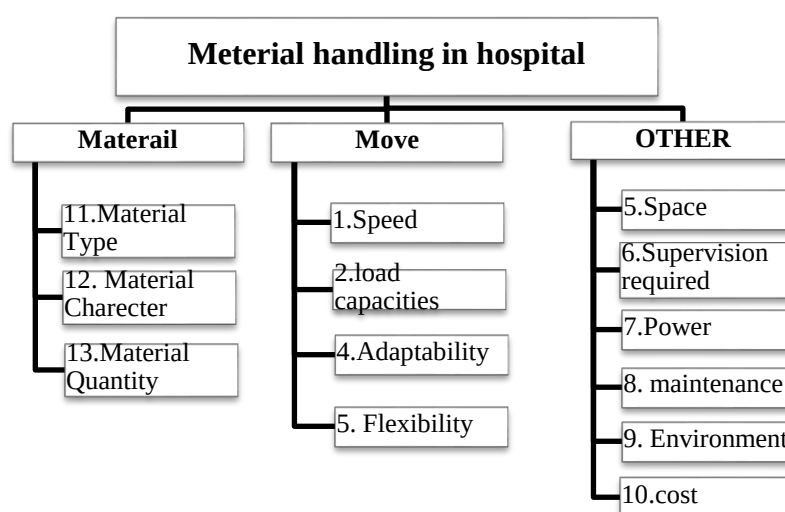


Figure 3.2 Main-criteria for material handling selection

3.1.5 Define sub-criteria from MHE

Hospital has many materials movement which have difference characteristic, type, frequency, source and destination. So to select and design suitable MHS, we will understand and analyze the character of material movement in hospital by using Material Handling Equations (MHE) show in Appendix A.

3.1.6 Compare quality factors with hospital requirement to find alternative material MHS

Material handling requirements from hospital are guide line to select alternated MHS. This step will show property of automated material handling system (AMHS) in term of material, move, and method. AMHS is a complex system. So, discrete event simulation model is used for evaluate the design before installation about time, utilization and capacity.

3.1.7 Problem formulation for simulation

The first step of case study research is studying and understanding the current situations of MHS in hospital. This is an important step that will help to identify problems and determine objectives in this research as well as to find the way to solve the problem by using discrete-event simulation. The challenge of this research is simulate the pneumatic tube system process for evaluate that system can support the hospital demand. For this step, we have to decide data which is impact for modify pneumatic tube design by using what-if scenarios analysis.

3.1.8 Create a conceptual model

For create a conceptual flow, we should to observations and interviews the manager and staff supporting process. This is a framework for constructing the models of pneumatic tube system simulation. Furthermore, the conceptual flow will illustrate what input data that has prepare for using in the simulation model. From the data, this hospital has 4 types of materials that 3 types are sent from 11 locations to many destinations and 1 type is sent from many locations to many locations too. So, we design to create 12 create types. After we analyze their route to generate resource and step of seize resource, we design to generate 32 route types.

3.1.9 Data collection

This step is the collecting data from supporting process department. A preliminary data that has been collected such as type of material, demand of material transportation, the process of PTS, layout of PTS design, and related time in each process, After this should to analyzed and examined the quality of information.

3.1.10 Verification

Due to the different of format in some data that are redundant and unnecessary for this research. Therefore, the collected data must be through the data processing step to set a standard form that used as the input parameters for ARENA model. For example, the actual arrival rate of material transportation will have to generate delivery pattern to the appropriate create job type and logic of PTS process.

3.1.11 Construct a simulation model

In this step, ARENA model is used to simulate the actual operation of PTS that are constructed to analyze the current operation and evaluate performance of PTS design. The ARENA model is allowed to adjust the operational condition that can determined the best operation for the new PTS design.

3.1.12 Verify and validate model

Evaluation is regarded as a crucial step which used to analyze the performance measurement of the DES model. This step will verify that the results from Arena and actual data are not significant different and appropriate enough to simulate the actual operation based on the proposed KPIs including total delivery time in system, waiting time, and machine utilization.

3.1.13 Experimental design

Experiment is designed to simulate event that may occur in future such as increasing demand, eliminate some useless machine parts. The result used to prepare future problem. Other experiment is designed to search the way to improve performance of system.

CHAPTER IV

CASE STUDY ON INFORMATION GATHERING

In this chapter, case study on information gathering consisted of 4.1 alternative material handling in hospital, 4.2 overview of case study, 4.3 simulation modeling and 4.4 simulation's scenario.

4.1 Alternative material handling system in hospital

To choose the appropriate material handling system for hospital, we should consider hospital requirements and match hospital requirements with main-criteria and match sub-criteria from material handling Equation with main-criteria. Compare property of MHS and choose system that can respond the requirements.

4.1.1 Material Handling requirement in hospital

Hospital in Thailand has in fact problem about management of on demand delivery material because it delivery all day. On demand materials include specimen, blood, pharmacy, and document (show in figure 4.1). In the future, when number of patient is growing, the hospital must expand MHS. So, the MHS should support this event.

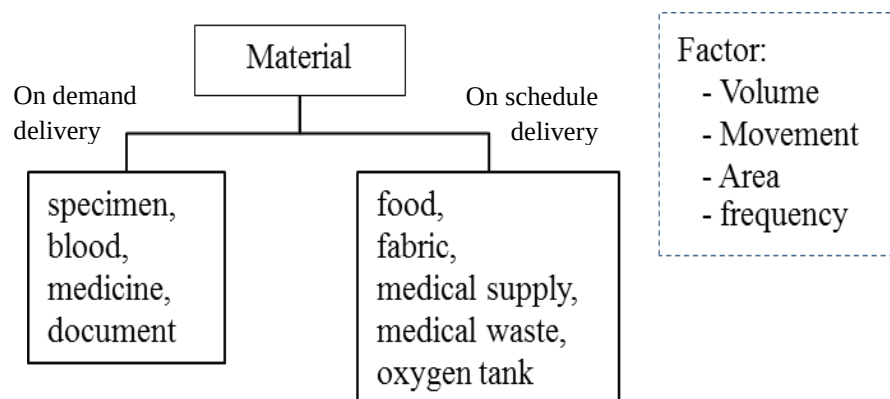


Figure 4.1 Separate group of material

Material Handling Equation (MHE) uses for analyze material that handling in hospital, movement that analyze route of handling and method that analyze constrain of hospital. We group main-criteria into MHE and classify hospital requirement into main-criteria follow the table 4.1.

Table 4.1 Relationship between Material Handling Equation (MHE), Main-criteria and Hospital requirements

MHE	No	Main-Criteria	Hospital		
			General Requirement		Need from MHS
Material	a)	Material Type	1	Consider support service	support many material kind
	b)	Material Character	2	Consider quality care	protect material quality
	c)	Material Quantity	3	Increase productivity	can sent more than one thing at the same time
Movement	d)	Speed	4	Improve turnaround time	want high speed system
			5	Decrease in-patient stays	
			6	Decrease inventory	
	e)	Load capacity	7	reduce dependence on elevators	More than one thing.
	f)	Adaptability	8	Reduce traffic	Can sent many route
	g)	Flexibility	9	Increase Flexibility to expand facility	can sent many route
Method	h)	Environment	10	Reduce injury to staff & facility	want high safety system
			11	Increase patient/staff safety	
	i)	Space	12	Increase space utilization	use low space
	j)	Power	13	reduce labor	not use labor
			14	Enhance patient-focused care	
	k)	Maintenance	15	Improve service quality	not human control
	l)	Supervision required	16	24/7 operation	want automate system
	m)	Cost	17	Appropriate Acquisition cost	Suitable
			18	Reduce Operation cost	low operation cost

Main-criteria are not enough to determine the appropriate MHS, so sub-criteria is generated to compare more information about property of MHS. Some properties are quality factors and some properties are quantity factors that show in figure 4.2.

Table 4.2 Matching sub-criteria with main-criteria

MHE	No	Main-Criteria	Sub-factor		Choice	factor type
Material	a)	Material Type	a1	Status	S/L/Semi	Quality
			a2	Unit type	tube/bottle/pack/sheet/box	Quality
	b)	Material Character	b1	Weight	Light/medium/heavy	Quality
			b2	Size	small/medium/large	Quality
			b3	Volume	low/medium/heavy	Quality
			b4	Temp	control/not control	Quality
			b5	Perishable	high/medium/low protection	Quality
	c)	Material Quantity	c1	Per order	1/many	Quality
			c2	Per move	1/many	Quality
Movement	d)	Speed	d1	Speed/Rate	high/medium/low speed	Quality
			d2	Turnaround time	Minutes	Quantity
			d3	waiting time	Minutes	Quantity
	e)	Load capacity	e1	unit load	light/medium/large	Quality
			e2	Pay load	Kg	Quality
			e3	Frequency per day	On demand/ on schedule	Quality
	f)	Adaptability	f1	Expand ability	low/medium/high level	Quality
			f2	Department	in/out	Quality
			f3	Floor	same/difference	Quality
			f4	Building	Internal/external	Quality
			f5	Design	Old/New	Quality
	g)	Flexibility	g1	Flexibility	low/medium/high level	Quality
			g2	Number of station	Can/ cannot adjust	Quality
			g3	Volume	Can/ cannot adjust	Quality
			g4	Distance	short/long	Quality
			g5	Direction	Vertical/horizontal	Quality
Method	h)	Environment	h1	protect infection	yes/no	Quality
			h2	protect contaminate	yes/no	Quality
	i)	Space	i1	machine size	small/medium/big	Quality
			i2	machine position	in wall/on ceiling/on floor	Quality
			i3	machine movement	in wall/on ceiling/on floor	Quality
			i4	machine utilization	%	Quantity
	j)	Power	j1	Machine Power	Ø	Quality
			j2	number of labor	Reduce/ Increase	Quality
	k)	Maintenance	k1	Control center	Human/computer	Quality
			k2	service quality	Easy/ hard	Quality
	l)	Supervision required	l2	24/7 operation	yes/no	Quality
	m)	Cost	m1	Acquisition cost	Bath	Quantity
			m2	Operation cost	Bath	Quantity

4.1.2 Comparison Alternative material handling system

In the future, the increase of patients' number will force material handling system in hospital change into automated system. Automates systems have difference specification up to the requirement and constraints of each hospital. From literature review, we will analyze the hospital requirement in to what's material want to move, the pattern of material movement and methodologies of move. Compare the requirement with the specification of alternative automated system in Table 4.3 to choose the appropriate system in Table 4.4.

From general hospital requirements that scope specific Automated Material Handling System. The popular system in hospital has 4 systems, Pneumatic tube system (PTS), Track Vehicle System (TVS), Selective Vertical Conveyer (SVC), and Automated Guided Vehicles (AGV).

Table 4.3 Property of automated material handling system

MH E	No	Main-Criteria	Sub-factor		factor type	Automated material handling system			
						PTS	TVS	SVC	AGV
Material	A	Material Type	a1	Status	Quality	S/L	S/L	S/L	S/L
			a2	Unit type	Quality	tube/bottle/ pack/sheet	pack/sheet	box/bottle/ pack/sheet	box/bottle/ pack/sheet
	B	Material Character	b1	Weight	Quality	Light-medium	Light-medium	medium-heavy	Light-Heavy
			b2	Size	Quality	small-medium	small-medium	small-big	small-big
			b3	Volume	Quality	small - medium	Small-medium	medium-hard	medium-hard
			b4	Temp	Quality	Control	Control	not-control	not-control
			b5	Perishability	Quality	high-Protection	medium-Protection	medium-Protection	low-Protection
	C	Material Quantity	c1	Per delivery	Quality	More than 1	More than 1	More than 1	More than 1
			c2	Per move	Quality	More than 1	More than 1	More than 1	More than 1
Movement	D	Speed	d1	Speed/Rate	Quality	1500 ft./min	100 ft./min	12-68 ft./min	20-230ft/min
			d2	Turnaround time	Quantity	depend on design	depend on design	depend on design	depend on design
			d3	waiting time	Quantity	depend on design	depend on design	depend on design	depend on design
	E	Load capacity	e1	Size of unit load	Quality	Small	Medium	Medium	All
			e2	Pay load	Quality	Up to 4.5 kg	Up to 2.7 kg	Up to 12 kg	Up to 450 kg
			e3	Frequency per day	Quality	On demand	On demand/ on schedule	On demand/ on schedule	On demand on schedule

Table 4.3 Property of automated material handling system (cont.)

	No	Main-Criteria	Sub-factor		factor type	Automated material handling system			
						PTS	TVS	SVC	AGV
Movement	F	Adaptability	f1	Expandability	Quality	High	Moderate	Low	High
			f2	Department	Quality	in/out	in/out	Out	in/out
			f3	Floor	Quality	same/difference	same/difference	difference	Same
			f4	Route	Quality	Ext/Internal	Internal	Internal	Internal
			f5	Design	Quality	Old/New	New	New	Old/New
	G	Flexibility	g1	Flexibility	Quality	High	Moderate	Low	Moderate
			g2	Number of station	Quality	Can adjust	Can adjust	Cannot adjust	Can adjust
			g3	Volume	Quality	Can adjust	Cannot adjust	Cannot adjust	Can adjust
			g4	Distance	Quality	Long	Long	short	Long
			g5	Direction	Quality	Vertical /horizontal	Vertical /horizontal	Vertical	Horizontal
Method	H	Environment	h1	protect infection	Quality	Yes	Yes	No	No
			h2	protect contaminate	Quality	Yes (Capsule)	No	Yes (Box)	Yes (Box)
	I	Space	i1	machine size	Quality	Small	Big	Big	Small
			i2	machine position	Quality	Station in walls	Station on ceiling	Station in walls	On floor
			i3	machine movement	Quality	Diverter in ceiling	Diverter on ceiling	In wall	On floor
			i4	machine utilization	Quantity	depend on design	depend on design	depend on design	depend on design
	J	Power	j1	Machine Power	Quality	1Ø & 3Ø	1Ø	1Ø & 3Ø	1Ø & 3Ø
			j2	number of labor	Quality	Reduce	Reduce	reduce	Reduce
	K	Maintenance	k1	Control center	Quality	Computer	Computer	Computer	Computer
			k2	service quality	Quality	Hard	Easy	Hard	Easy
	L	Supervision required	l2	24/7 operation	Quality	Yes	Yes	Yes	Yes
	M	Cost	m1	Acquisition cost	Quantity	depend on design	depend on design	depend on design	depend on design
			m2	Operation cost	Quantity	depend on design	depend on design	depend on design	depend on design

After we compare the property of AMHS, we use scoring method. If AMHS property can support, get 1 point. If AMHS property cannot support, get 0 point. At the end of scoring process, we sum the score and chose the highest score to

be alternative MHS. In this case study, we summarize hospital in case study need and put in table 4.4 and do the scoring process. The result show PTS is alternative MHS for this case study hospital.

Table 4.4 scoring and chose alternative MHS

MH E	No	Main-Criteria	Sub-factor		summarize Hospital Need	Scoring			
						PTS	TVS	SVC	AGV
Material	A	Material Type	a1	Status	S/L	1	1	1	1
			a2	Unit type	pack/tube/bottle/sheet	1	0	1	1
	B	Material Character	b1	Weight	light-medium	1	1	1	1
			b2	Size	small-medium	1	1	0	0
			b3	Volume	Small	1	1	0	0
			b4	Temp	not heat	1	1	0	0
			b5	Perishability	sturdy fragile	1	1	1	0
	C	Material Quantity	c1	Per delivery	More than 1	1	1	1	1
			c2	Per move	more than 1	1	1	1	1
Movement	D	Speed	d1	Speed/Rate	medium-high	1	1	0	1
			d2	Turnaround time	low	depend on design			
			d3	waiting time	low				
	E	Load capacity	e1	Size of unit load	small	1	0	0	1
			e2	Pay load	low	1	1	1	0
			e3	Frequency per day	on demand	1	1	1	1
	F	Adaptability	f1	Expand ability	High	1	1	0	1
			f2	Department	in/out	1	1	0	1
			f3	Floor	same/difference	1	1	0	0
			f4	Route	Ex/Internal	1	0	0	0
			f5	Design	Old/New	1	0	0	1
	G	Flexibility	g1	Flexibility	High	1	1	0	1
			g2	Number of station	Can adjust	1	1	0	1
			g3	Volume	Can adjust	1	0	0	1
			g4	Distance	Long	1	1	0	1
			g5	Direction	Vertical/horizontal	1	1	0	0
Method	H	Environment	h1	protect infection	Need	1	1	0	0
			h2	protect contaminate	Need	1	0	1	1
	I	Space	i1	machine size	Small	1	0	0	1
			i2	machine position	not on the floor	1	1	1	0
			i3	machine movement	not on the floor	1	1	1	0
			i4	machine utilization	high	depend on design			
	J	Power	j1	Machine Power	low	1	1	1	1
			j2	number of labor	reduce	1	1	1	1
	K	Maintenance	k1	Control center	Computer	1	1	1	1
			k2	service quality	easy	0	1	0	1
	L	Supervision required	l2	24/7 operation	Yes	1	1	1	1
	M	Cost	m1	Acquisition cost	appropriate	depend on design			
			m2	Operation cost	low				
					summarize	32	26	15	22

Many hospitals in Thailand popular use Pneumatic tube system (PTS) because it can deliver on demand and can send between buildings. PTS is complex

and expensive system. Hospital should evaluate the design before installation to control cost. The layout usually make from supplier so hospital should evaluate the design system before installation.

The hospital in case study has this problem, so we will use their data to simulate PTS design by ARENA simulation.

4.2 Overview of case study

In this chapter, overview of the case study consisted of overview the hospital operation, material handling (MH) in hospital, delivery demand of MH, and the operation of Pneumatic Tube System (PTS) will be discussed.

4.2.1 Overview of the hospital Operation

Hospital in case study is a medium private hospital where service general treatment, special treatment and health checkup. Their vision is to be a premier tertiary healthcare provider, dedicated to international quality, customer focused care through a dedicated healthcare team, effective leadership and up to date technology. The hospital wants to be international standardize hospital, so must develop the quality of treatment to be fast and safety.

The hospital has many building because of the limitation of location. The physical layout is showed in Figure 4.2.

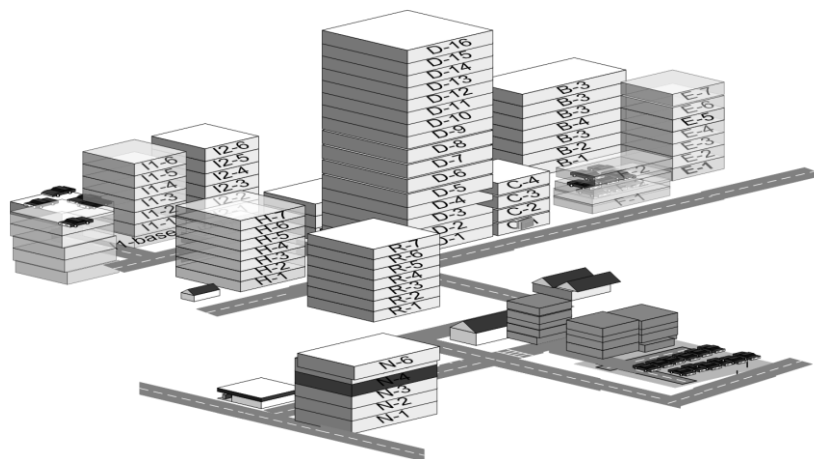


Figure 4.2 Physical layout of hospital in case study

The hospital opens 24 hours but the specialist doctor will arrival the ward at 9 and start treatment out-patient at 10. Then, they finish work at 5 o'clock.

This hospital has 5 Laboratory rooms. Two rooms of all provide service from 8 -5. Other rooms open 24 hours. The hospital has 13 Dispatching rooms which use same safety stock. When the medicines are short, they will borrow from other rooms.

Patients are Thai and international who come to treat, surgery or health checkup. This patient flow is the following diagram as showed in Figure 4.3.

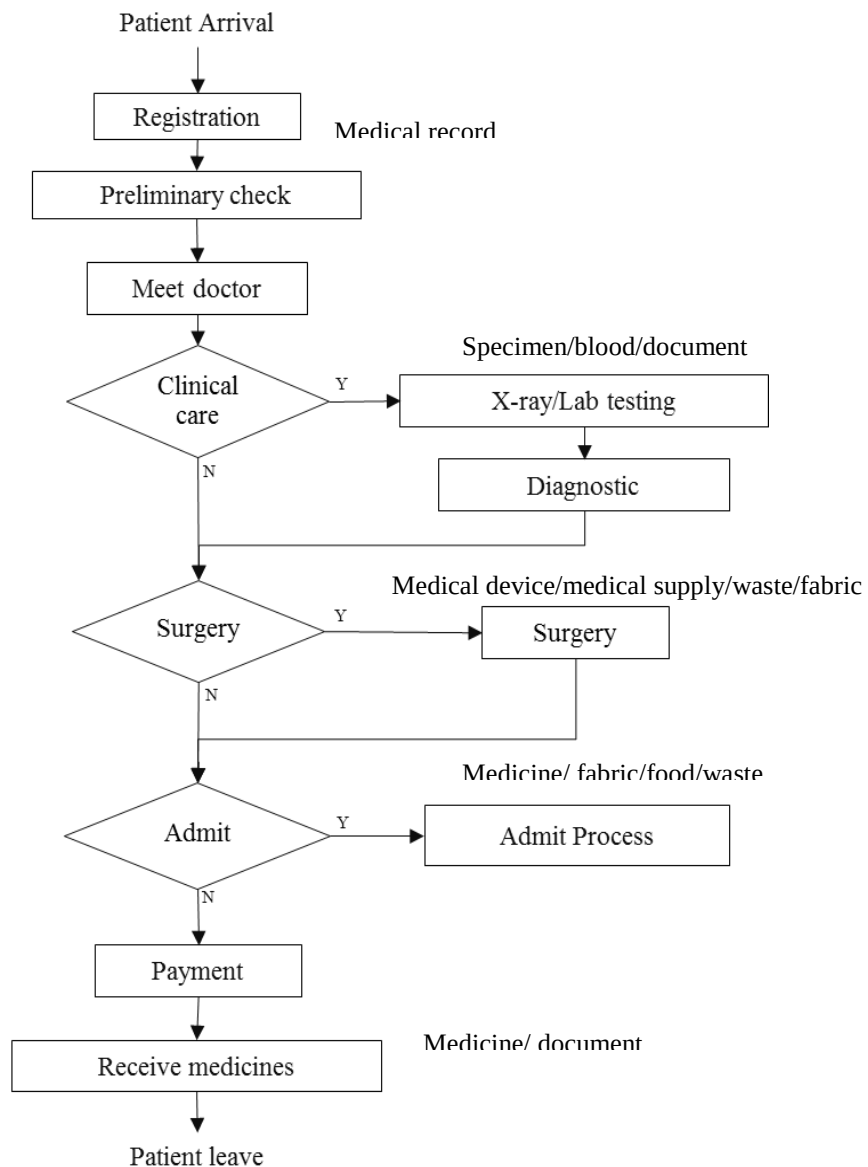


Figure 4.3 Patient flow in hospital include material flow in hospital

4.2.2 Material handling (MH) in hospital

The treatment processes make patient flow, material flow and information flow. The information of patient was collect in electronic file such as patient's record and X-ray file except importance document that need signature remain paper. The improvement of the service should increase efficiency of material flow compose Specimen, Blood, medicines, document, fabric, medical supply, medical wastes, food, and oxygen tank. For choosing the appropriate process of MH should consider about characteristic of material that show in Table 4.5.

Table 4.5 Characteristic of material in hospital

Material	characteristic							
	Weight	Size	Sensitive	Infected control	volume	State	Frequency	Special protocol
Specimen	Low	Small	Y	Y	Low	Solid/liquid	All day	N
Blood	Low	Small	Y	Y	Low	Liquid	All day	N
Medicines	Low	Small	Y	Y	Low	Solid	All day	N
Document	Low	Small	N	N	Low	Solid	All day	N
Food	High	Big	N	Y	High	Solid/liquid	3 times/day	Y
Fabric	High	Big	N	Y	High	Solid	2 times/day	Y
Medical supply	High	Big	N	Y	High	Solid	All day	Y
Medical waste	high	Big	N	Y	High	Solid	Once a day	Y
Oxygen tank	High	Big	N	N	high	Solid	All day	N

(Y: yes N: no)

The materials are delivery throughout the day that included Specimen, Blood, Medicines and Document. Each kind has a difference characteristic and delivery pattern.

4.2.2.1 Specimen is a sample which taken from patient. Most of specimens are urine or semen for test in laboratory. Old system, specimens are sent to compile at the Control Room (CR) after that worker send them to the laboratory. The result of testing will send back by computer system. So it is one delivery pattern. This hospital has 5 CR that locate in 2 building show in Table 4.6.

Table 4.6 Location of the Control Room

Building	Station	Receive specimen from building
W	99	W>D>H>R
D	93	D>H>R
	89	D>H>R
	90	D
	88	D>W>I

4.2.2.2 Blood has two delivery patterns.

- Blood form Blood Bank (BB) is sent to wards such as ICU operation room and ward that locate in building D, H, R, W and I

- Blood is sent from examination room, health check-up department, and wards to Blood Bank (BB). Sending room is located in building D, H, R, W and I.

4.2.2.3 Medicines are sent from medicine store to wards and dispatch room. This hospital has 4 medical stores that are divide into 2 group inpatient and outpatient. The location of medical stores is showed in Table 4.7. Sometime dispatch room does not have enough medicines so they borrow some medicines from other dispatch room in urgent situation.

Table 4.7 Location of the Pharmacy

Type of pharmacy	Station	Send medicines to building
Inpatient	7	D>H>I
	25	H>R
Outpatient	96	D>H>R
	97	D>I>W

4.2.2.4 Document is sent between words and other departments all the day. The sending location is spread in building D, H, I, R and W except building E.

From above information, materials in this hospital have three pattern of delivery. The pattern of each material is concluded in Table 4.8.

- One-to-many is sent from one location to many locations.

- Many-to-one is sent from many locations to only one location.
- Many-to-many are sent from many to locations to many locations.

Table 4.8 Delivery pattern of MHS

Material handling	Operation Room	No. of operation room	No. of delivery pattern	Delivery pattern	Origin	Destination
Specimen	Control room (CR)	5		many to one	Examination rooms/ Wards	Control room
Blood	Blood Bank (BB)	1		many to one	Examination rooms/ Wards	Blood Bank
				one to many	Blood Bank	Wards
Medicine	Medical store (PH)	4		one to many	Medical store	Dispensing rooms/ Wards
Document		-		many to many	Examination rooms/ Wards	Examination rooms/ Wards

4.2.3 Demand pattern

MH in this hospital has about 99,500 jobs/ month. There is internal hospital transportation about 22,000 jobs /month that are divided by kind of material in term of proportion follow in figure 4.4.

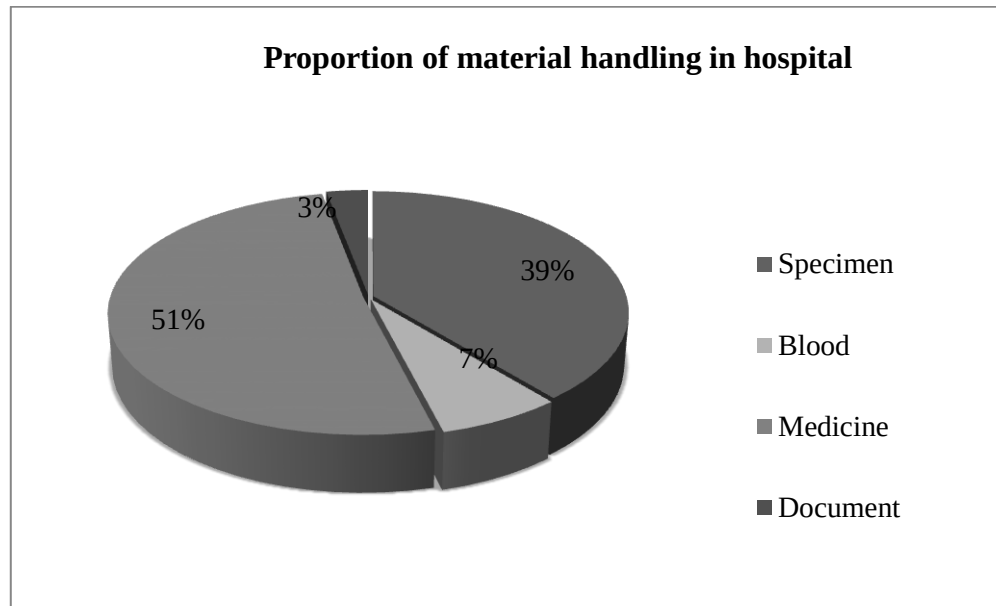


Figure 4.4 Proportion of MH in hospital

The highest volume of MH is about 3800 jobs/ day that are divided by source of delivery demand follow figure 4.5.

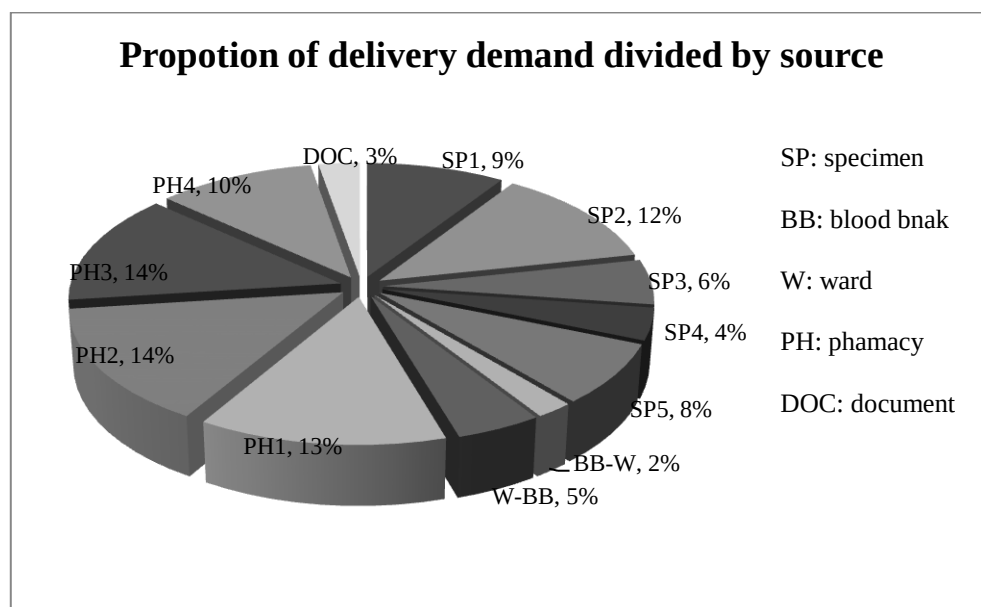


Figure 4.5 Proportion of the delivery demand divided by source

Figure 4.6 show the delivery demand rate in each hour of the day. Mostly kind delivery demand has peak time at 9-12 am, but the delivery demand of medicine has 2 peak times. Another peak time is at midnight because it is time to refill medical stock at ward.

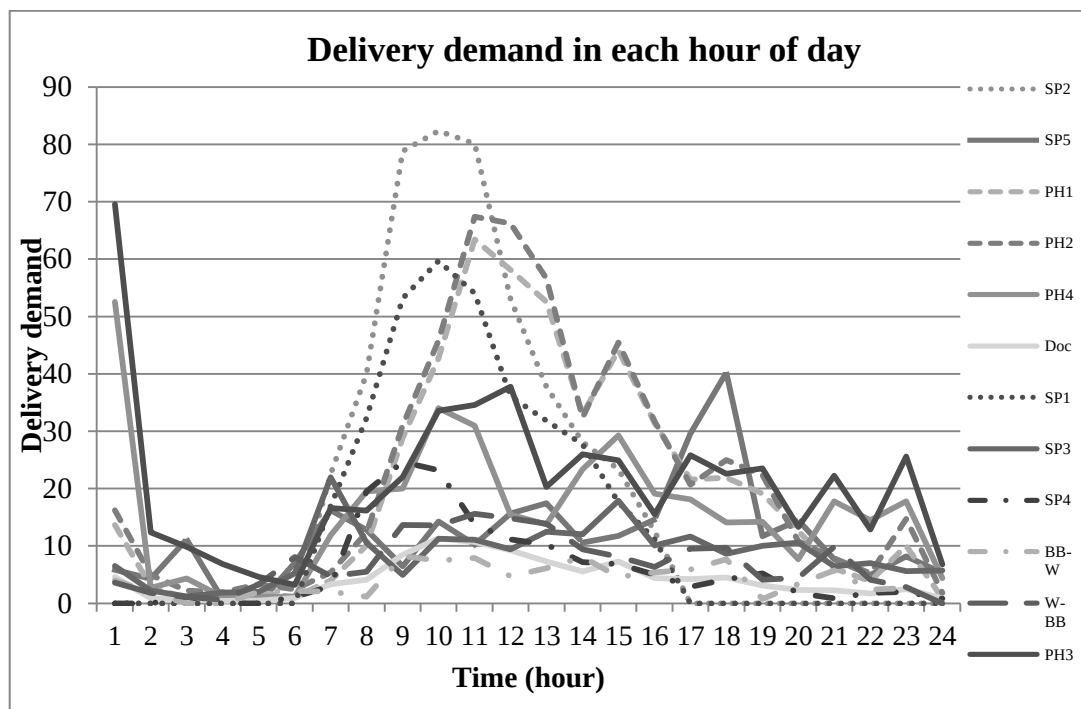


Figure 4.6 Delivery demand rate

4.2.4 Pneumatic Tube System (PTS)

PTS is the material handling system (MHS) which use wind power to move the material in carrier along the pipeline. It is popular use in bank, supermarket, and hospital because it is fast, reliable, flexible and safety system. PTS is a flexible system, the efficiency of the system depend on the design. In this section will discuss about physical layout design from the supplier of PTS, the component of PTS and simple delivery process of PTS

4.2.4.1 Physical layout design

The physical layout of PTS is design base on the restriction of hospital physical. This hospital has 6 buildings D, E, R, H, I, and W. Supplier designs to install 99 stations that are groups into 22 zones and connect together with diver units and transfer units follow the figure 4.7

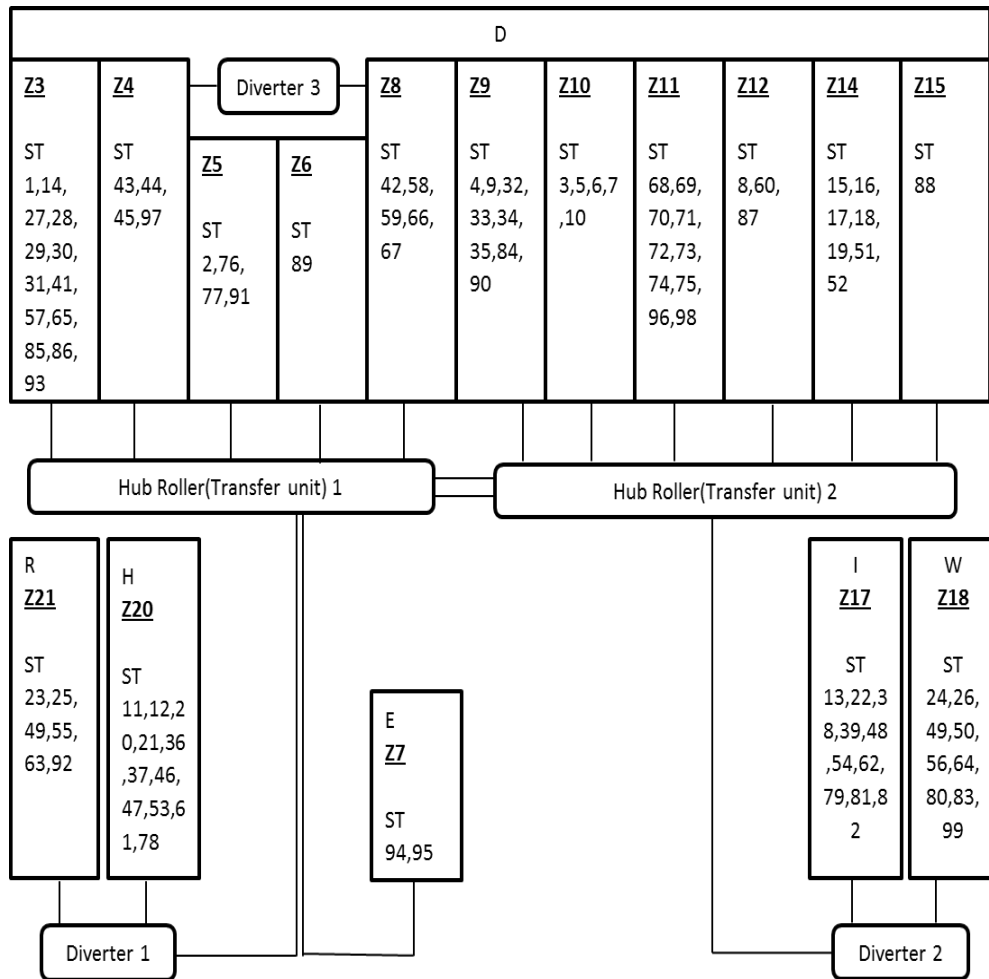


Figure 4.7 PTS design layout

4.2.4.2 Component of PTS design

- Carrier is a package to fill medicines, specimens, blood and document and move along the pipeline. It has a tight lid and made from resistant plastic and water leakage proof. This hospital choose 6 inch diameter of carrier.

- Station is a part of machine that is used for send and receives carriers. The supplier designs to install 99 stations. The location of station is showed in Table 4.9

Table 4.9 Location of stations

Zone	Building	No. of station	Station
1		-	Power line
2		-	Power line
3	D	13	1,14,27,28,29,30,31,41,57,65,85,86,93
4	D	10	42,58,59,66,67
5	D	4	2,76,77,91
6	D	1	89
7	E	2	94,95
8	D	5	42,58,59,66,67
9	D	5	4,9,32,33,34,35,84,90
10	D	8	3,5,6,7,10
11	D	4	68,69,70,71,72,73,74,75,96,98
12	D	3	8,60,87
13		-	Power line
14	D	7	15,16,17,18,19,51,52
15	D	1	88
16		-	Power line
17	I	10	13,22,38,39,48,54,62,79,81,82
18	W	9	24,26,40,50,56,64,80,83,99
19		-	Power line
20	H	11	11,12,20,21,36,37,46,47,53,61,78
21	R	6	23,25,49,55,63,92
22		-	Power line

- Blower is a wind generator use to blow and suck the carrier.

Each zone has one blower, so each zone can move only one carrier per time. This design has 22 blowers connect to 22 zones and each zone has difference capacity for carrier waiting area follow Table 4.10.

Table 4.10 Characteristic of Blowers

Blower of zone	Carrier can stop	Capacity carrier waiting		Blower of zone	Carrier can stop	Capacity carrier waiting
Zone 1	Y	1 carrier		Zone 12	Y	7 carriers
Zone 2	Y	1 carrier		Zone 13	Y	1 carrier
Zone 3	Y	7 carriers		Zone 14	Y	7 carriers
Zone 4	Y	7 carriers		Zone 15	Y	7 carriers
Zone 5	Y	7 carriers		Zone 16	Y	1 carrier
Zone 6	Y	7 carriers		Zone 17	Y	7 carriers
Zone 7	Y	7 carriers		Zone 18	Y	7 carriers
Zone 8	Y	7 carriers		Zone 19	Y	1 carrier
Zone 9	Y	7 carriers		Zone 20	Y	7 carriers
Zone 10	Y	7 carriers		Zone 21	Y	7 carriers
Zone 11	Y	7 carriers		Zone 22	Y	1 carrier

Y = yes, N= no

-Diverter is an equipment use to change the route of carrier moving by switch pipes. It is controlled by central control system.

-Diverter unit is an equipment use to exchange carrier between two zones. This design has 3 diverter follow Table 4.11

Table 4.11 Diverter unit description

Diverter unit	connect between zone		Carrier can stop	Capacity of carrier waiting
1	20	21	Y	1 carrier
2	17	18	Y	1 carrier
3	4	8	Y	1 carrier

Y = yes, N= no

- Transfer Unit (Hub Roller) is big equipment that use for exchange carrier between many zones. Their capacity is 14. This designs use two transfer units. That's show in Table 4.12.

Table 4.12 Transfer unit description

Transfer unit	connect between zone	Carrier can stop	Capacity of waiting area
1	1,2,3,4,5,6,7,8	Y	14 carrier
2	9,10,11,12,13,14,15,16	Y	14 carrier

Y = yes, N= no

-Pneumatic Tube is pipelines connect to be network. This design uses 6" diameter pipe.

-Central control center is control the operation of PTS.

-Power line is pipelines use to connect between diverter unit and transfer unit. That's show in Table 4.13.

Table 4.13 Power line description

Power line	connect between		Carrier can stop	Capacity of waiting area
1	Diverter 1	transfer unit 1	Y	1
2	Diverter 2	transfer unit 2	Y	1
3	transfer unit 1	transfer unit 2	Y	1

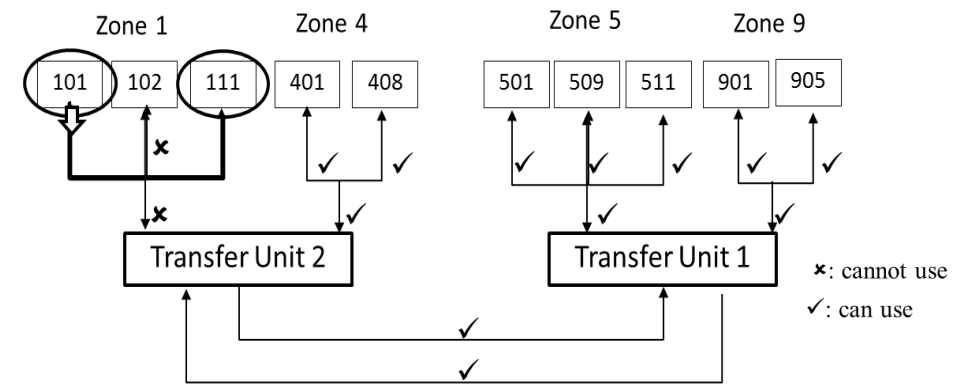
Y = yes, N= no

4.2.4.3 PTS Operation

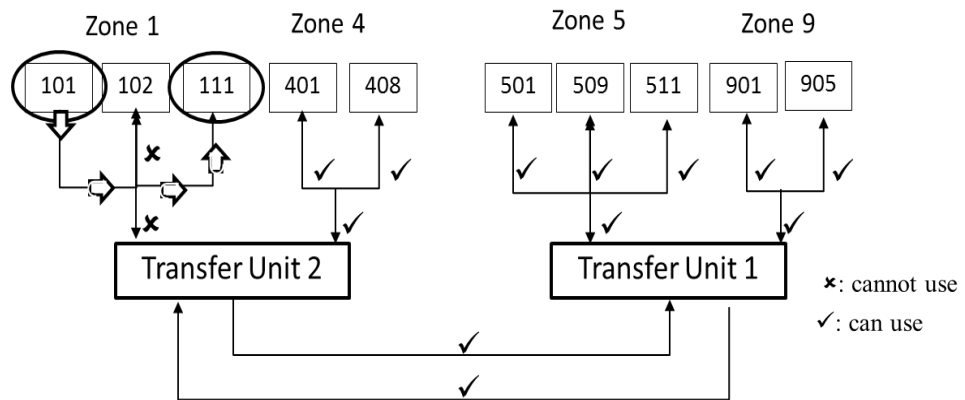
The delivery demands use many routes to transport. The process must send the carrier from origin station to the destination station. Some route the origin and destination station is in the same zone but some route is between zones. The way of send difference zone may use diverter unit or transfer unit or both. The using of equipment is effect to other delivery. Some route must wait and some route is continuing. In this section will explain the simple operation of PTS in 3 pattern of delivery route.

Resource is seized as a couple of joint equipment such as zone-blower, blower-transfer unit, transfer unit-zone etc.

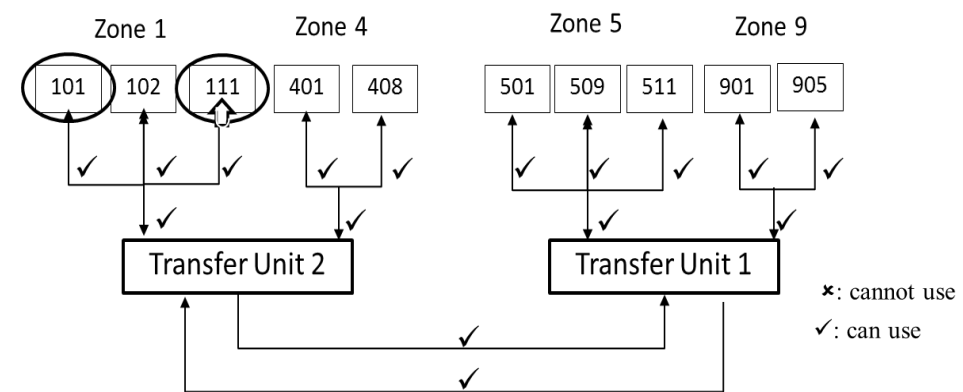
(1) Delivery in same zone: The sending station is in the same zone with the destination station. One zone has one blower, so the carrier can move only one in zone per time. Other station in this zone does not work and the carriers which come from other zone must wait. Figure 4.8 show the step of carrier movement. Step 1 is the user press the destination station on the machine. The control system will seize resource for this delivery so the destination station and other station in this zone can order but it does not send at this time. Other zone can order and send normally. If the other order uses the resource that has seized already, the carrier has to wait in other component before connect to the seized resource. Step 2 is the carrier move along the way. Step3 is the carrier arrives to the destination station so the controlled system will release all of resource.



step 1



step2



step3

Figure 4.8 Common process of the delivery intra-zone

(2) Different zone but use the same diverter or the same transfer unit: the step of sending is showed in figure 4.9 (from station 101 to 408)

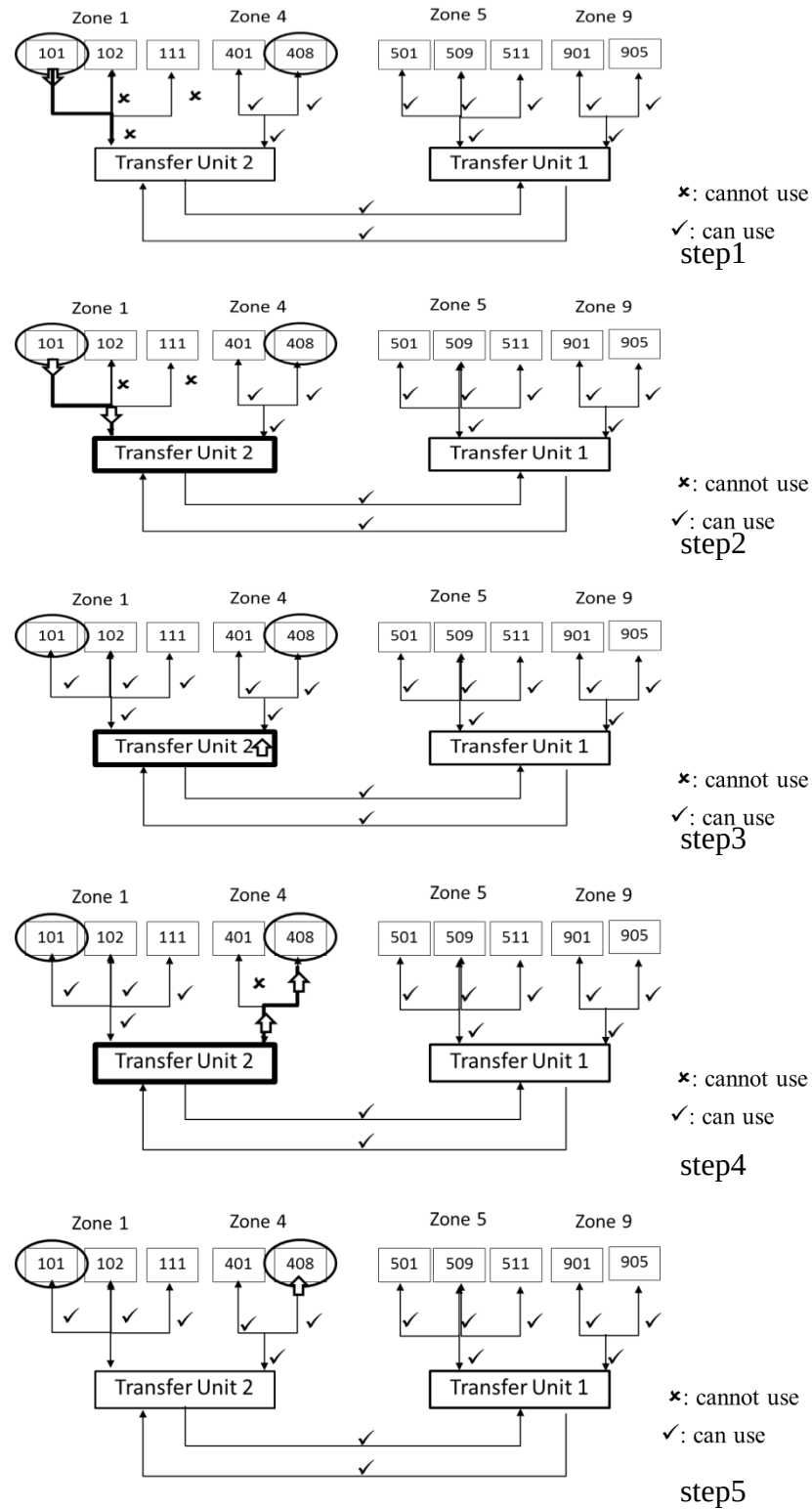


Figure 4.9 Common process of the delivery in different zone but same transfer unit

(3) Different zone and different diverter or different transfer unit: the step of sending is showed in figure 4.10 (from station 101 to 509)

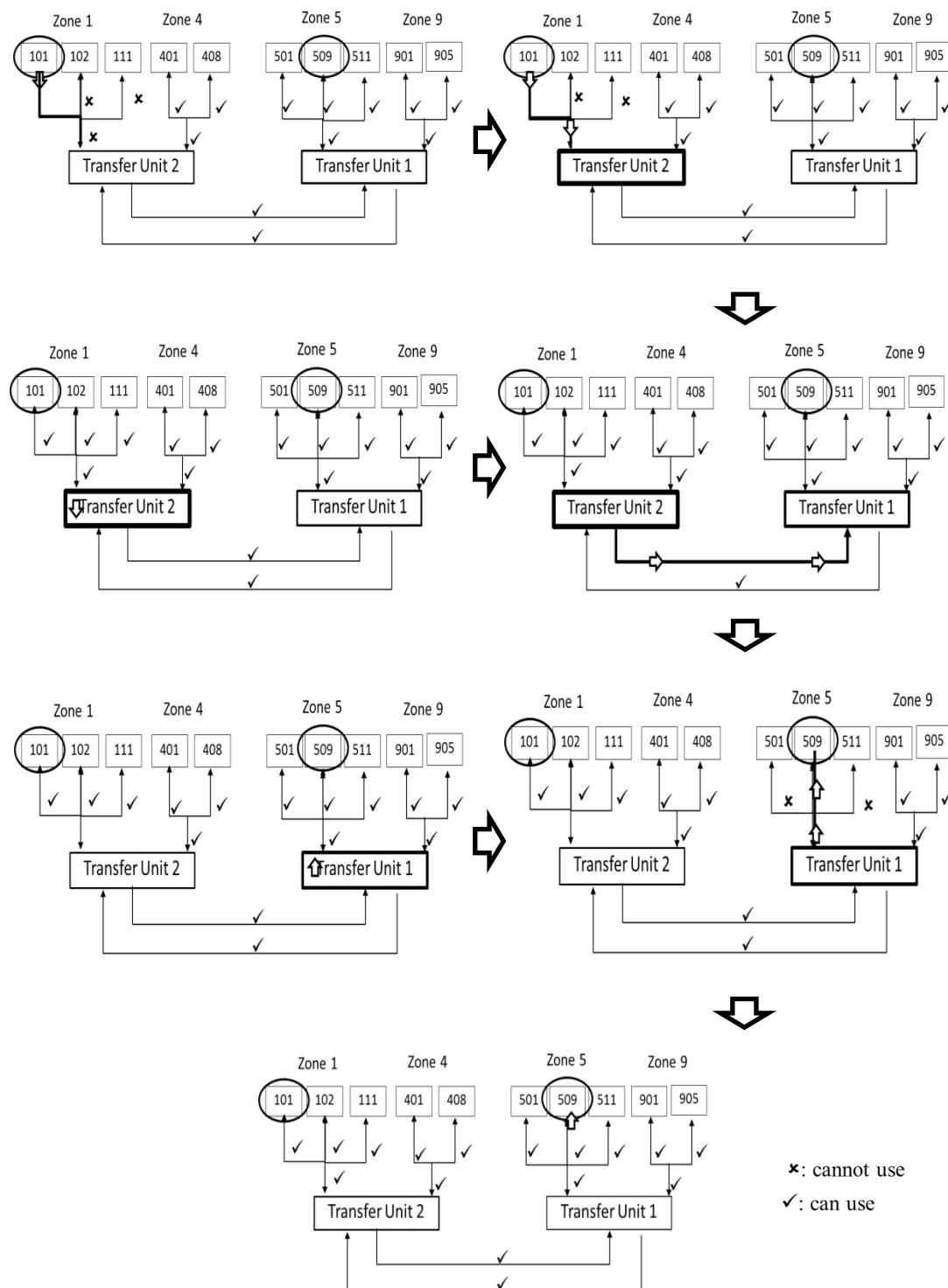


Figure 4.10 Common process of the delivery in different zone and transfer unit

4.2.4.4 Objective of the evaluate MHS

In time, MH in hospital uses peoples and mobile transporters but the transportation still slowly and makes some mistake. After we consider selection factor, the result show this hospital appreciates to use PTS to solve the problem. The targets are:

- Evaluate the PTS design that can support demand.
- Reduce delivery time and improve service level
- Improve reliability of MHS

4.2.4.5 KPI of simulation model

Simulation model is construction to evaluate PTS design that can support the objective of MHS improvement. That show in Table 4.14.

Table 4.14 KPI of PTS simulation model

No	Objective	KPI	Description
1	Evaluate the PTS design	-% utilization - Average total time in each route type	-Using capacity of resource -number of job vs. using time
2	Reduce delivery time and improve service level	-Maximum total time of system -Average total time -Average Waiting time - Service level	-all job must sent in 10 min. -Delivery time from source station to destination station -Waiting time in queue before sent to next resource -95% delivery in 3 min.
3	Improve reliability of MHS	-Number of use	Number of use in each component

4.3 PTS simulation modeling

4.3.1 Conceptual flow

Conceptual flow (Figure 4.11) is show step of simulation model construction that must clarify of delivery process before modeling.

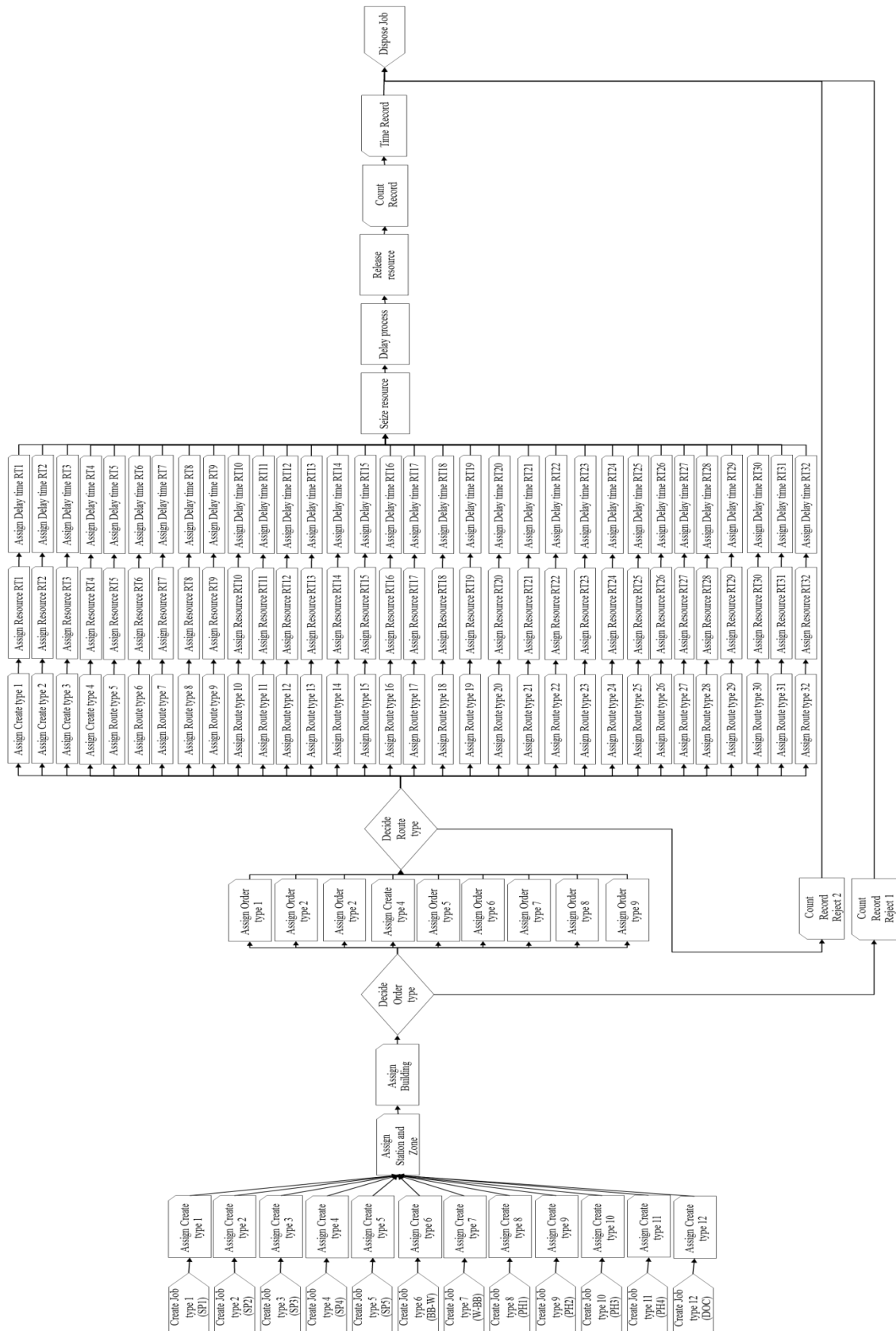


Figure 4.11 Conceptual flow of simulation modeling.

4.3.2 Prepare data

Data from hospital is difficult to put in the simulation model, so we should prepare data and change to better pattern.

4.3.2.1 Delivery demand

We will change in to percentage of job and create input data every hour. That show in Table 4.15.

Table 4.15 Delivery demand rate

Type	SP1	SP2	SP3	SP4	SP5	BB-W	W-BB	PH1	PH2	PH3	PH4	Doc
Rate	%job	%job	%job	%job	%job	%job	%job	%job	%job	%job	%job	%job
0-1	0.00%	0.00%	3.43%	0.00%	2.43%	4.12%	2.37%	2.87%	2.97%	13.98%	14%	4.84%
1-2	0.00%	0.00%	0.98%	0.00%	1.39%	2.06%	1.18%	0.61%	0.93%	2.36%	1%	0.91%
2-3	0.00%	0.00%	0.49%	0.68%	3.47%	0.00%	0.59%	0.20%	0.37%	1.77%	1%	0.80%
3-4	0.00%	0.00%	0.98%	0.00%	0.35%	0.00%	0.59%	0.20%	0.37%	1.38%	0%	0.41%
4-5	0.00%	0.00%	0.98%	0.00%	0.00%	2.06%	1.78%	0.41%	0.56%	0.98%	0%	0.50%
5-6	0.00%	0.00%	2.45%	0.68%	2.43%	2.06%	5.33%	0.20%	0.37%	0.79%	0%	0.88%
6-7	4.93%	5.23%	10.78%	2.05%	5.56%	2.06%	2.96%	0.82%	1.12%	2.95%	3%	3.47%
7-8	9.57%	8.50%	4.90%	13.70%	4.51%	1.03%	2.96%	2.05%	2.04%	2.95%	5%	4.84%
8-9	15.94%	17.21%	2.45%	15.75%	2.08%	8.25%	7.69%	5.94%	5.95%	4.53%	5%	8.06%
9-10	17.10%	18.30%	5.39%	16.44%	4.86%	8.25%	7.69%	8.81%	8.55%	6.89%	8%	10.18%
10-11	15.94%	17.21%	5.39%	9.59%	3.47%	8.25%	9.47%	12.91%	12.64%	6.69%	8%	10.70%
11-12	10.72%	11.55%	4.41%	7.53%	5.56%	5.15%	9.47%	12.30%	12.08%	7.48%	4%	8.97%
12-13	9.28%	8.28%	5.88%	6.85%	5.90%	6.19%	7.69%	10.66%	10.22%	4.13%	4%	7.43%
13-14	7.83%	6.10%	5.88%	4.79%	3.82%	8.25%	5.33%	6.56%	6.13%	5.12%	6%	6.00%
14-15	5.51%	5.01%	8.82%	4.79%	4.17%	4.12%	4.73%	9.43%	8.92%	4.72%	8%	6.60%
15-16	3.19%	2.61%	4.90%	3.42%	5.21%	6.19%	3.55%	6.35%	6.13%	3.35%	5%	4.54%
16-17	0.00%	0.00%	5.88%	2.05%	11.11%	6.19%	5.92%	4.10%	4.09%	5.12%	5%	4.10%
17-18	0.00%	0.00%	3.92%	2.74%	15.28%	8.25%	5.92%	4.51%	4.46%	4.53%	4%	4.32%
18-19	0.00%	0.00%	4.90%	3.42%	4.17%	1.03%	2.37%	4.10%	4.28%	4.72%	4%	3.14%
19-20	0.00%	0.00%	4.90%	1.37%	5.21%	4.12%	2.37%	2.46%	2.23%	2.76%	2%	2.23%
20-21	0.00%	0.00%	2.94%	0.68%	2.78%	6.19%	5.92%	1.43%	1.49%	4.33%	4%	2.31%
21-22	0.00%	0.00%	3.43%	1.37%	1.74%	3.09%	2.37%	0.82%	0.93%	2.36%	4%	1.57%
22-23	0.00%	0.00%	2.94%	1.37%	2.78%	3.09%	1.78%	2.05%	2.79%	4.72%	5%	2.45%
23-24	0.00%	0.00%	2.94%	0.68%	1.74%	0.00%	0.00%	0.20%	0.37%	1.38%	1%	0.74%

4.3.2.2 Prepare station delivery pair

From the data, it has many station delivery pairs. Specimen blood and pharmacy have more than 250 station delivery pairs, so we will arrange the data in rank. We found that rank 1-9 hold more than 60% of demand, so we will assign specific delivery pair stations and demand only that ranks 1-9 follow Table 4.16. Other delivery demands will use random numbers to assign station delivery pairs.

Table 4.16 Rank of station delivery pairs

Create Type		SP1	SP2	SP3	SP4	SP5	BB-W
Station Source		99	93	89	90	88	95
Station Destination	Rank 1	40	29	43	4	19	42
	Rank 2	22	11	42	34	3	56
	Rank 3	13	15	65	32	64	43
	Rank 4	26	17	36	35	40	36
	Rank 5	39	31	46	33	72	44
	Rank 6	62	85	85	9	56	55
	Rank 7	48	23	63	-	70	64
	Rank 8	54	21	11	-	16	46
	Rank 9	64	43	44	-	17	34

Create Type		W-BB	PH1	PH2	PH3	PH4
Station Destination		95	7	26	96	97
Station Source	Rank 1	42	3	53	43	72
	Rank 2	56	5	63	65	71
	Rank 3	43	19	55	44	68
	Rank 4	36	16	46	42	32
	Rank 5	55	6	36	67	70
	Rank 6	50	10	47	66	75
	Rank 7	44	15	61	46	34
	Rank 8	32	57	78	59	56
	Rank 9	67	28	0	58	62

4.3.2.3 Prepare step of seize resource

Delivery pairs will map with source zone and destination zone. The routes can be divided into 9 order types following Table 4.17 (column: 1 = order type and 2 = concept). Then, we analyze the steps of seize resource, so 9 order types are divided into 32 route types following Table 4.17 (column: 3 = route type and 4 = main resource).

Table 4.17 Assign order type and route type

Order type	Concept	Route Type	Main resource
1	Same Zone	1	Same Zone
2	Different Zone in same Transfer Unit	2	H1
		3	H2
3	Different Zone sent to Difference Transfer Unit	4	H1-H2
		5	H2-H1
4	Different Zone in same Diverter Unit	6	D1
		7	D2
		8	D3
5	Different Zone sent from Diverter Unit to Transfer Unit	9	Z20-D1-H1
		10	Z21-D1-H1
		11	Z17-D2-H2
		12	Z18-D2-H2
6	Different Zone sent from Transfer Unit to Diverter Unit	13	H1-D1-Z20
		14	H1-D1-Z21
		15	H2-D2-Z17
		16	H2-D2-Z18
7	Different Zone sent from Diverter Unit to 2 Transfer Unit	17	Z20-D1-H1-H2
		18	Z21-D1-H1-H2
		19	Z17-D2-H2-H1
		20	Z18-D2-H2-H1
8	Different Zone sent to Different Transfer Unit and send to Diverter Unit	21	H1-H2-D2-Z17
		22	H1-H2-D2-Z18
		23	H2-H1-D1-Z20
		24	H2-H1-D1-Z21
9	Different Zone sent from Diverter Unit to Different Transfer Unit and sent other Diverter Unit	25	Z20-D1-H1-H2-D2-Z17
		26	Z20-D1-H1-H2-D2-Z18
		27	Z21-D1-H1-H2-D2-Z17
		28	Z21-D1-H1-H2-D2-Z18
		29	Z17-D2-H2-H1-D1-Z20
		30	Z17-D2-H2-H1-D1-Z21
		31	Z18-D2-H2-H1-D1-Z20
		32	Z18-D2-H2-H1-D1-Z21

4.3.2.4 Prepare delivery process time

Delivery process of PTS uses time between each resource to be delivery times. Travel time between stations in the same zone is showed in Table 4.18 - 4.31. Travel time between zone and transfer units (or diverters) is showed in Table 4.32.

Table 4.18 Time sending between station in zones 3

Station	1	14	28	29	27	85	31	30	41	86	57	65	93
1		5.83	7.50	9.17	10.83	12.50	9.17	10.83	12.50	14.17	15.83	17.50	10.83
14	5.83		5.83	7.50	9.17	10.83	12.50	9.17	10.83	12.50	14.17	15.83	9.17
28	7.50	5.83		5.83	7.50	9.17	7.50	9.17	10.83	12.50	14.17	15.83	7.50
29	9.17	7.50	5.83		7.50	9.17	7.50	9.17	10.83	12.50	14.17	15.83	1.67
27	10.83	9.17	7.50	7.50		4.17	7.50	9.17	10.83	12.50	14.17	15.83	9.17
85	12.50	10.83	9.17	9.17	4.17		7.50	9.17	10.83	12.50	14.17	15.83	10.83
31	9.17	12.50	7.50	7.50	7.50	7.50		5.83	7.50	9.17	10.83	12.50	9.17
30	10.83	9.17	9.17	9.17	9.17	9.17	5.83		5.83	7.50	9.17	10.83	10.83
41	12.50	10.83	10.83	10.83	10.83	10.83	7.50	5.83		4.17	5.83	7.50	12.50
86	14.17	12.50	12.50	12.50	12.50	12.50	9.17	7.50	4.17		2.50	4.17	14.17
57	15.83	14.17	14.17	14.17	14.17	14.17	10.83	9.17	5.83	2.50		1.67	15.83
65	17.50	15.83	15.83	15.83	15.83	15.83	12.50	10.83	7.50	4.17	1.67		17.50
93	10.83	9.17	7.50	1.67	9.17	10.83	9.17	10.83	12.50	14.17	15.83	17.50	

Table 4.19 Time sending between station in zone4

Station	43	44	45	97
43		5.83	7.50	9.17
44	5.83		5.83	7.50
45	7.50	5.83		7.50
97	9.17	7.50	7.50	

Table 4.20 Time sending between station in zone5

Station	2	91	76	77
2		13.33	19.17	16.67
91	13.33		9.17	12.50
76	19.17	9.17		10.83
77	16.67	12.50	10.83	

Table 4.21 Time sending between station in zone7

station	94	95
94		7.50
95	7.50	

Table 4.22 Time sending between station in zone8

station	42	58	59	66	67
42		7.50	9.17	12.50	14.17
58	7.50		4.17	5.83	7.50
59	9.17	4.17		7.50	2.50
66	12.50	5.83	7.50		2.50
67	14.17	7.50	2.50	2.50	

Table 4.23 Time sending between station in zone9

station	4	9	90	84	34	32	33	35
4		5.83	14.17	10.83	7.50	9.17	10.83	12.50
9	5.83		10.83	7.50	10.83	12.50	14.17	15.83
90	14.17	10.83		15.83	17.50	19.17	20.83	22.50
84	10.83	7.50	15.83		12.50	14.17	15.83	17.50
34	7.50	10.83	17.50	12.50		4.17	5.83	7.50
32	9.17	12.50	19.17	14.17	4.17		2.50	4.17
33	10.83	14.17	20.83	15.83	5.83	2.50		4.17
35	12.50	15.83	22.50	17.50	7.50	4.17	4.17	

Table 4.24 Time sending between station in zone10

station	7	5	10	3	6
7		4.17	7.50	10.83	12.50
5	4.17		7.50	10.83	7.50
10	7.50	7.50		4.17	10.83
3	10.83	10.83	4.17		4.17
6	12.50	7.50	10.83	4.17	

Table 4.25 Time sending between station in zone11

station	96	69	68	70	71	98	72	74	73	75
96		10.83	13.33	6.67	8.33	10.00	11.67	13.33	15.00	16.67
69	10.83		2.50	4.17	5.83	7.50	9.17	10.83	12.50	14.17
68	13.33	2.50		2.50	4.17	5.83	7.50	9.17	10.83	12.50
70	6.67	4.17	2.50		1.67	3.33	5.00	6.67	8.33	10.00
71	8.33	5.83	4.17	1.67		1.67	3.33	5.00	6.67	8.33
98	10.00	7.50	5.83	3.33	1.67		1.67	3.33	5.00	6.67
72	11.67	9.17	7.50	5.00	3.33	1.67		1.67	3.33	5.00
74	13.33	10.83	9.17	6.67	5.00	3.33	1.67		1.67	3.33
73	15.00	12.50	10.83	8.33	6.67	5.00	3.33	1.67		1.67
75	16.67	14.17	12.50	10.00	8.33	6.67	5.00	3.33	1.67	

Table 4.26 Time sending between station in zone12

station	8	87	60
8		17.50	9.17
87	17.50		26.67
60	9.17	26.67	

Table 4.27 Time sending between station in zone14

station	15	16	17	18	19	51	52
15		7.50	10.83	14.17	15.83	17.50	19.17
16	7.50		5.83	7.50	9.17	12.50	14.17
17	10.83	5.83		3.33	11.67	14.17	15.83
18	14.17	7.50	3.33		12.50	14.17	15.83
19	15.83	9.17	11.67	12.50		4.17	5.83
51	17.50	12.50	14.17	14.17	4.17		2.50
52	19.17	14.17	15.83	15.83	5.83	2.50	

Table 4.28 Time sending between station in zone17

station	79	13	22	82	81	38	39	48	54	62
79		5.83	9.17	5.83	7.50	9.17	10.83	14.17	15.83	17.50
13	5.83		4.17	5.83	7.50	9.17	10.83	12.50	14.17	15.83
22	9.17	4.17		5.83	7.50	10.83	12.50	14.17	15.83	17.50
82	5.83	5.83	5.83		2.50	5.83	7.50	9.17	10.83	12.50
81	7.50	7.50	7.50	2.50		5.83	7.50	10.83	12.50	14.17
38	9.17	9.17	10.83	5.83	5.83		4.17	5.83	7.50	9.17
39	10.83	10.83	12.50	7.50	7.50	4.17		4.17	5.83	7.50
48	14.17	12.50	14.17	9.17	10.83	5.83	4.17		2.50	4.17
54	15.83	14.17	15.83	10.83	12.50	7.50	5.83	2.50		1.67
62	17.50	15.83	17.50	12.50	14.17	9.17	7.50	4.17	1.67	

Table 4.29 Time sending between station in zone18

station	83	80	26	24	40	50	56	64
83		5.83	7.50	10.83	12.50	14.17	15.83	17.50
80	5.83		5.83	7.50	10.83	12.50	14.17	15.83
26	7.50	5.83		4.17	7.50	9.17	10.83	12.50
24	10.83	7.50	4.17		5.83	9.17	10.83	12.50
40	12.50	10.83	7.50	5.83		7.50	9.17	10.83
50	14.17	12.50	9.17	9.17	7.50		1.67	3.33
56	15.83	14.17	10.83	10.83	9.17	1.67		1.67
64	17.50	15.83	12.50	12.50	10.83	3.33	1.67	

Table 4.30 Time sending between station in zone20

station	78	11	12	21	20	36	37	46	47	53	61
78		5.83	7.50	9.17	10.83	12.50	14.17	15.83	17.50	19.17	20.83
11	5.83		4.17	5.83	7.50	9.17	10.83	12.50	14.17	15.83	17.50
12	7.50	4.17		5.83	5.83	7.50	9.17	10.83	12.50	14.17	15.83
21	9.17	5.83	5.83		4.17	5.83	7.50	9.17	10.83	12.50	14.17
20	10.83	7.50	5.83	4.17		4.17	5.83	7.50	9.17	10.83	12.50
36	12.50	9.17	7.50	5.83	4.17		4.17	5.83	7.50	9.17	10.83
37	14.17	10.83	9.17	7.50	5.83	4.17		7.50	9.17	10.83	12.50
46	15.83	12.50	10.83	9.17	7.50	5.83	7.50		2.50	4.17	5.83
47	17.50	14.17	12.50	10.83	9.17	7.50	9.17	2.50		4.17	5.83
53	19.17	15.83	14.17	12.50	10.83	9.17	10.83	4.17	4.17		2.50
61	20.83	17.50	15.83	14.17	12.50	10.83	12.50	5.83	5.83	2.50	

Table 4.31 Time sending between station in zone21

station	92	23	25	49	55	63
92		5.83	9.17	12.50	14.17	15.83
23	5.83		4.17	9.17	12.50	14.17
25	9.17	4.17		5.83	9.17	10.83
49	12.50	9.17	5.83		4.17	5.83
55	14.17	12.50	9.17	4.17		2.50
63	15.83	14.17	10.83	5.83	2.50	

Table 4.32 Travel time from zone to transfer unit and diverter transfer

Zone	Transfer Unit1(min)	Transfer Unit2(min)	Diverter Transfer 1 (min) R&H Building	Diverter Transfer 2 (min) I&W Building	Diverter Transfer 3 (min) D Building
Zone 1	0.20	0.20	0.20	0.20	0.20
Zone 2	0.20	0.20	0.20	0.20	0.20
Zone 3	0.17	0.12	0.20	0.20	0.25
Zone 4	0.17	0.12	0.17	0.25	0.25
Zone 6	0.17	0.12	0.25	0.20	0.25
Zone 7	0.17	0.12	0.58	0.58	0.58
Zone 8	0.20	0.12	0.25	0.25	0.17
Zone 9	0.17	0.12	0.25	0.25	0.20
Zone 10	0.12	0.17	0.25	0.25	0.20
Zone 11	0.12	0.17	0.25	0.25	0.20
Zone 12	0.12	0.17	0.25	0.25	0.20
Zone 13	0.20	0.20	0.20	0.20	0.20
Zone 14	0.12	0.17	0.25	0.25	0.20
Zone 15	0.12	0.17	0.25	0.25	0.20
Zone 16	0.20	0.20	0.20	0.20	0.20
Zone 17	0.20	0.20	0.25	0.12	0.25
Zone 18	0.20	0.20	0.25	0.12	0.25
Zone 19	0.20	0.20	0.20	0.20	0.20
Zone 20	0.20	0.17	0.12	0.25	0.25
Zone 21	0.20	0.17	0.12	0.25	0.25
Zone 22	0.20	0.20	0.20	0.20	0.20

4.3.3 Methodology of constructive simulation model

Methodology constructive simulation model of this preliminary case study can be divided into six basic steps (picture of simulation show in appendix B):

4.3.3.1 Create Demand Type

The 12 created job types set delivery demand rate as percentage of rate per hour show in table 4.33.

Table 4.33 percentage of job in each hour for 12 created job.

%of jobs in each hour	1 Specimens	2 Specimen	3 Specimens	4 Specimens	5 Specimens	6 BB to ward	7 Ward to BB	8 Pharmacy_OPD	9 Pharmacy_OPD	10 Pharmacy_IPD	11 Pharmacy_IPD	12 Document
0-1	0%	0%	3%	0%	2%	4%	2%	3%	3%	14%	14%	5%
1-2	0%	0%	1%	0%	1%	2%	1%	3%	1%	2%	1%	1%
2-3	0%	0%	0%	1%	3%	0%	1%	3%	0%	2%	1%	1%
3-4	0%	0%	1%	0%	0%	0%	1%	3%	0%	1%	0%	0%
4-5	0%	0%	1%	0%	0%	2%	2%	3%	1%	1%	0%	0%
5-6	0%	0%	2%	1%	2%	2%	5%	3%	0%	1%	0%	1%
6-7	5%	5%	11%	2%	6%	2%	3%	3%	1%	3%	3%	3%
7-8	10%	8%	5%	14%	5%	1%	3%	3%	2%	3%	5%	5%
8-9	16%	17%	2%	16%	2%	8%	8%	3%	6%	5%	5%	8%
9-10	17%	18%	5%	16%	5%	8%	8%	3%	9%	7%	8%	10%
10-11	16%	17%	5%	10%	3%	8%	9%	3%	13%	7%	8%	11%
11-12	11%	12%	4%	8%	6%	5%	9%	3%	12%	7%	4%	9%
12-13	9%	8%	6%	7%	6%	6%	8%	3%	10%	4%	4%	7%
13-14	8%	6%	6%	5%	4%	8%	5%	3%	6%	5%	6%	6%
14-15	6%	5%	9%	5%	4%	4%	5%	3%	9%	5%	8%	7%
15-16	3%	3%	5%	3%	5%	6%	4%	3%	6%	3%	5%	5%
16-17	0%	0%	6%	2%	11%	6%	6%	3%	4%	5%	5%	4%
17-18	0%	0%	4%	3%	15%	8%	6%	3%	4%	5%	4%	4%
18-19	0%	0%	5%	3%	4%	1%	2%	3%	4%	5%	4%	3%
19-20	0%	0%	5%	1%	5%	4%	2%	3%	2%	3%	2%	2%
20-21	0%	0%	3%	1%	3%	6%	6%	3%	1%	4%	4%	2%
21-22	0%	0%	3%	1%	2%	3%	2%	3%	1%	2%	4%	2%
22-23	0%	0%	3%	1%	3%	3%	2%	3%	3%	5%	5%	2%
23-24	0%	0%	3%	1%	2%	0%	0%	3%	0%	1%	1%	1%
Total	100%	100%	100%	100%	100%	100%	100%	3%	100%	100%	100%	100%

4.3.3.2 Assign Create type

Assign number for each job type as Table 4.34 in column Att_create type.

Table 4.34 Assign attribute create type

Delivery type	Create type	Att_create type	Delivery type	Create type	Att_create type
Specimen	SP1	1	Pharmacy	PH1	8
	SP2	2		PH2	9
	SP3	3		PH3	10
	SP4	4		PH4	11
	SP5	5	Document	DOC	12
Blood	BB-W	6			
	W-BB	7			

4.3.3.3 Assign station delivery pair

For create type 1-11 that has already assigned 1 station at the first step, this step will assign a delivery station pair. We will assign specific delivery pair stations and demand only that ranks 1-9 follow. Other delivery demands will use random numbers to assign station delivery pairs. (Table 4.35)

Table 4.35 Rank 1-9 of each 11 create type

Create type		Rank								
		1	2	3	4	5	6	7	8	9
1	station code	40	22	13	26	39	62	48	54	64
	% job	41.45%	13.62%	13.33%	8.12%	6.09%	2.03%	1.74%	1.74%	1.74%
2	station code	29	11	15	17	31	85	23	21	43
	% job	34.42%	6.32%	5.23%	4.79%	3.70%	3.27%	3.05%	2.61%	2.61%
3	station code	43	42	65	36	46	85	63	11	44
	% job	10.29%	7.35%	6.86%	6.37%	5.88%	5.88%	5.88%	5.39%	5.39%
4	station code	4	34	32	35	33	9			
	% job	74.66%	18.49%	2.74%	2.74%	0.68%	0.68%			
5	station code	19	3	64	40	72	56	70	16	17
	% job	17.71%	11.81%	6.94%	6.25%	5.56%	4.86%	4.51%	4.17%	4.17%
6	station code	42	56	43	36	44	55	64	46	34
	% job	17.53%	11.34%	8.25%	7.22%	6.19%	5.15%	5.15%	4.12%	4.12%
7	station code	42	56	43	36	55	50	44	32	67
	% job	10.65%	7.10%	6.51%	5.92%	5.33%	4.73%	4.14%	4.14%	4.14%
8	station code	3	5	19	16	6	10	15	57	28
	% job	16.17%	14.31%	10.59%	9.85%	6.69%	4.83%	4.09%	3.72%	3.53%
9	station code	53	63	55	46	36	47	61	78	
	% job	19.31%	17.93%	17.24%	16.55%	11.03%	8.97%	8.28%	0.69%	
10	station code	43	65	44	42	67	66	46	59	58
	% job	21.26%	12.20%	9.06%	8.27%	7.28%	7.09%	5.12%	4.13%	3.54%
11	station code	72	71	68	32	70	75	34	56	62
	% job	13.52%	12.24%	10.97%	9.95%	9.44%	8.67%	7.91%	4.59%	4.08%

For create type 12 that does not assign station before. From data, we found more than 5,000 delivery pairs that are hard to assign and the delivery demand is similar. So we use random numbers to assign station delivery pairs. First, we use random numbers to assign a source station. Then, we use a new random number to assign the destination station. Before assigning the destination station, we must check that the destination station is not the same as the source station. If it is the same number, we will change the number of the destination station.

4.3.3.4 Assign zone

Assign zone source and destination link from station source and destination. That's show in Table 4.36.

Table 4.36 Assign attribute zone

Att_zone	Att_Station
3	1,14,27,28,29,30,31,41,57,65,85,86,93
4	42,58,59,66,67
5	2,76,77,91
7	94,95
8	42,58,59,66,67
9	4,9,32,33,34,35,84,90
10	3,5,6,7,10
11	68,69,70,71,72,73,74,75,96,98
12	8,60,87
14	15,16,17,18,19,51,52
15	88
17	13,22,38,39,48,54,62,79,81,82
18	24,26,40,50,56,64,80,83,99
20	11,12,20,21,36,37,46,47,53,61,78

4.3.3.5Assign Building

Assign building source and destination link from zone source and destination. That's show in Table 4.37.

Table 4.37 Assign Attribute building

Building	Att_building	Att_zone
E	1	7
R	2	21
H	3	20
I	4	17
W	5	18
D OPD	6	3,9,10,14
D IPD	7	4,8,11
D Other	8	5,6,12,15

4.3.3.6 Assign order and route type

This step is importance to control the right place delivery.

Assign Order type and route type follow these conditions (Table 4.38)

Table 4.38 Order types and Route type's condition.

Delivery Rules (Order Type)		Route Type	Route Pattern	
1	Same Zone	1	Source station	Same Zone
2	Different Zone in same Transfer Unit	2		H1
		3		H2
3	Different Zone sent to Difference Transfer	4		H1-H2
		5		H2-H1
4	Different Zone in same Diverter Unit	6		D1
		7		D2
		8		D3
5	Different Zone sent from Diverter Unit to Transfer Unit	9		Z20-D1-H1
		10		Z21-D1-H1
		11		Z17-D2-H2
		12		Z18-D2-H2
6	Different Zone sent from Transfer Unit to Diverter Unit	13		H1-D1-Z20
		14		H1-D1-Z21
		15		H2-D2-Z17
		16		H2-D2-Z18
7	Different Zone sent from Diverter Unit to 2 Transfer Unit	17		Z20-D1-H1-H2
		18		Z21-D1-H1-H2
		19		Z17-D2-H2-H1
		20		Z18-D2-H2-H1
8	Different Zone sent to Different Transfer Unit and send to Diverter Unit	21		H1-H2-D2-Z17
		22		H1-H2-D2-Z18
		23		H2-H1-D1-Z20
		24		H2-H1-D1-Z21
9	Different Zone sent from Diverter Unit to Different Transfer Unit and sent other Diverter Unit	25		Z20-D1-H1-H2-D2-Z17
		26		Z20-D1-H1-H2-D2-Z18
		27		Z21-D1-H1-H2-D2-Z17
		28		Z21-D1-H1-H2-D2-Z18
		29		Z17-D2-H2-H1-D1-Z20
		30		Z17-D2-H2-H1-D1-Z21
		31		Z18-D2-H2-H1-D1-Z20
		32		Z18-D2-H2-H1-D1-Z21

4.3.3.7 Start Delivery Process

The process starts when a carrier is put into the source station and the destination station code is entered. The central control system will evaluate the route. Then, it will seize the resource and move it through the route step by step. Many jobs can be sent at the same time if the carrier cannot use the same resource.

The process will start when the job seizes the destination resource part 1 and seizes the source resource part 1. Then, the carrier moves to destination resource part 1. After this, the job releases the source resource part 1 and seizes the secondary destination resource. The movement of the carrier will seize and release resources step by step until the carrier arrives at its destination station.

The seize resource step of 32 route types is different. We will use route type 22 as an example, which has high volume and many steps of seize resource. Route type 22: H1->H2->D2->Z18 as in Table4.39.

Table 4.39 PTS Process of Route type 22

Resource	Seize	Release
Source Zone	A2	B3
Blower of source Zone	A1	C5
Transfer unit 1	B4	D7
Connection line T1-T2	C6	E9
Transfer unit 2	D8	F13
Diverter2 RL Path	E10	G17
Connection line T2-D2	E11	F14
Diverter 2	E12	F15
Zone Destination	F16	G18

Route type 22 is transportation of a carrier from source zone (zone 3, 4, 5, 6, 7, or 8) to destination zone (zone 18). First, the job seizes the pipeline of source zone (step A1) and then seizes the source zone (step A2). Next, the carrier moves (first run). When, the carrier arrives at the first destination, the job will start step B. The job will be repeated from step A1 to G18, until the process finishes.

4.3.3.8 Record statistical information

We will record statistics to evaluate the system in terms of Count, Time and Utilization.

Count: Delivery demand (station/ zone/ building/order type/ route type), Number of seized resources

Time: Average total time, Wait time before sending, Time in tube (zone/ building/ order type/ route type)

Utilization: % Utilization, Number busy, Number in Queue, Wait time in queue (resources)

Create 12 delivery types and assign station source and destination

4.3.3.9 Model validation

Model validation compares the results from the simulation with real data that are equal in terms of delivery demand in station, zone and building. Time in tube calculated from the simulation model must be more than the summarized movement time of equipment in the route. If that hypothesis is correct, the model has reliability

4.3.4 Scenario

Simulation model can test interested situation before installation. That's show in Table 4.40.

Table 4.40 Scenario of PTS simulation model

No.	Scenario	Change module	KPI
1	Growing of patient rate 10% for 5 years	Arrival rate	-Delivery time - Waiting time
2	Reduce capacity of waiting area	Resource capacity	- Delivery time -Waiting time - Utilization

CHAPTER V

RESULT AND DISCUSSION

In this chapter, result and discussion is divided into 2 phase 5.1 case study's result and 5.2 simulation scenario result.

5.1 Case study's Result

The requirements of case study hospital use for generate alternative automated material handling system (AMHS). After consider selective factors, we ensure that the case study hospital should use pneumatic tube system (PTS). Because, PTS is complex and expensive system, we should evaluate the design before installation by using simulation modeling.

The simulation model of pneumatic tube system represents 3,800 delivery demands per day that move between 6 buildings include 22 zones and 99 stations. The delivery routes are divided into 32 route types that use different resource. The simulation run setup is one day run length, and 30 replications. The resulting of run time is approximately 9.92 minutes.

The simulation outputs show the average total time of material delivery is 37.34 ± 0.46 seconds, most of which the waiting time is 2.08 ± 0.2 seconds or 5% of the total time. This system cans delivery material from source to destination that finishes in 3 min. at 95% service level show in Table 5.1.

Table 5.1 KPI: service level 95% in 3 minutes (180 seconds)

Service level	Delivery time in each building (second)							
	D IPD	D OPD	D other	E	H	I	R	W
80%	60	50	50	65	60	60	45	70
90%	70	55	55	70	70	70	60	85
95%	75	60	60	80	75	75	75	90
100%	140	190	170	145	210	210	210	165

The objective of simulation is evaluation the PTS design in term percentage of utilization and average total time in each route type. Resource utilization of this design is low (show in figure 5.1) that means this design can support the growing demand in future or it is over design for present demand. From the result diverter 3 is not used so we can eliminate this component. In addition, Transfer units 1 and 2 are used by 50% of all jobs, so these are the center of transmission. The prevention policy should recommend maintaining this component.

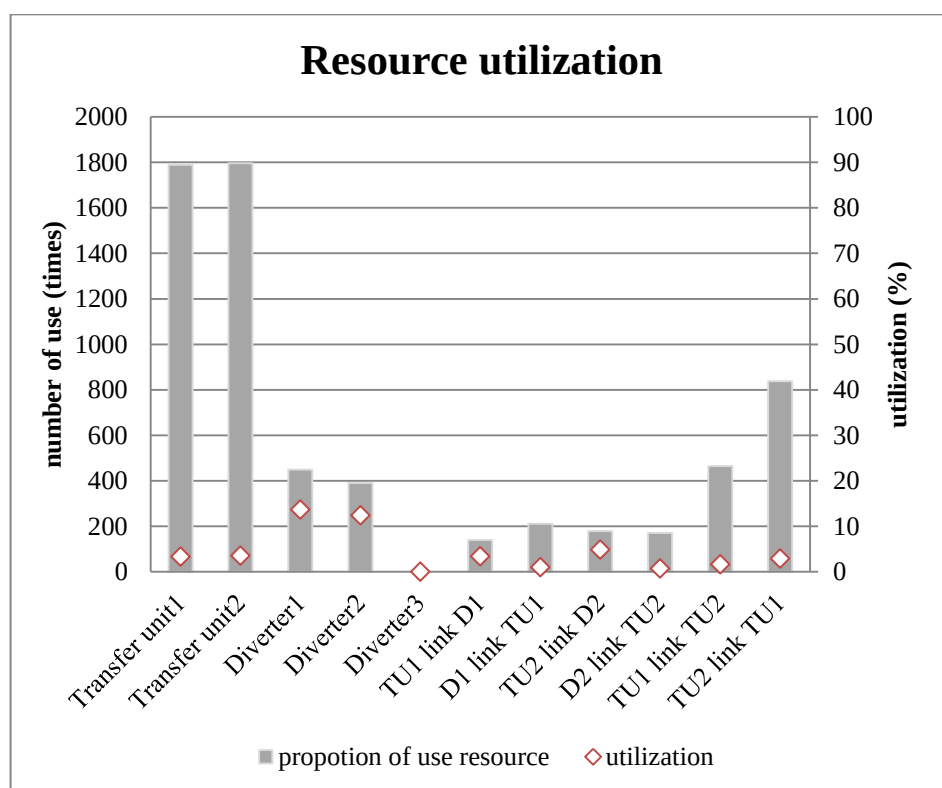


Figure 5.1 resource utilization

The structure of the hospital has 6 buildings. Building D is the biggest and holds 65% of delivery demand. Building D is divided into 11 zones that can be subdivided into 3 groups: D IPD (zones 4, 8, 11), D OPD (zones 3, 9, 10, 14), and D Other (zones 5, 6, 12, 15). Figure 5.2 show the highest delivery demand is in building D OPD and use average total time 22 seconds. This building has high volume of delivery demand but use not much time that means the D OPD building is generated the suitable zone. The 2nd delivery demand is in building D IPD and use average total

time 55 second. So, we will consider especially delivery destination in building D IDP and found this building send out of building more than sent between zones in the building. We conclude that inappropriate zoning the station in building D IDP.

For improve efficiency of this system should to design the stations which have delivery job together in same zone.

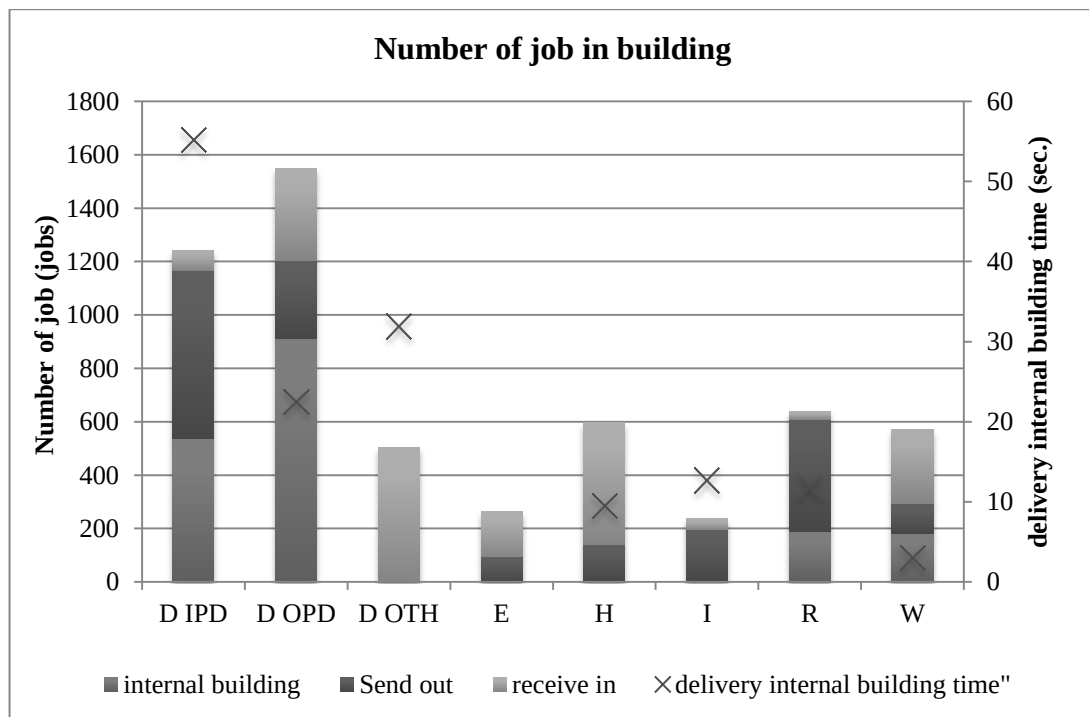


Figure 5.2 Job in building

Performance evaluate by the number of job vs. delivery time. We will present in term of zone and route types in figure 5.3 and 5.4.

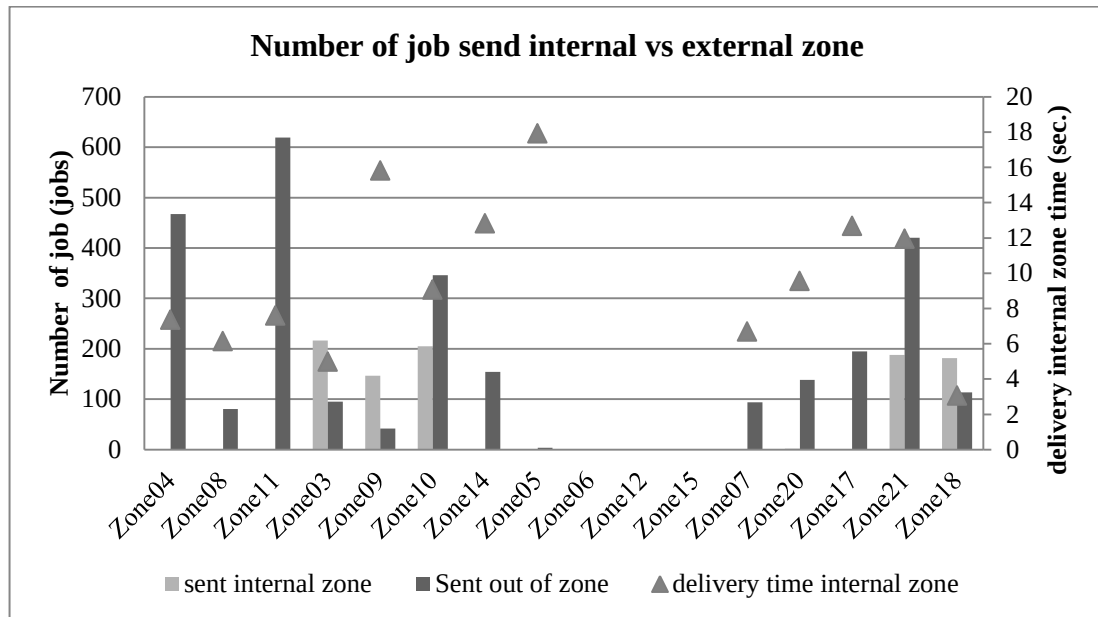


Figure 5.3 Job in Zone

Figure 5.3 shows information about the appropriate station design in zone should have low delivery time. Every zone use low delivery time. Zones 03, 09, 10, 21, and 18 have delivery jobs which send internal zone. It uses lower time than send out of zone. The light bars are present sending internal zone. If the light bars are high value that means zoning is suitable.

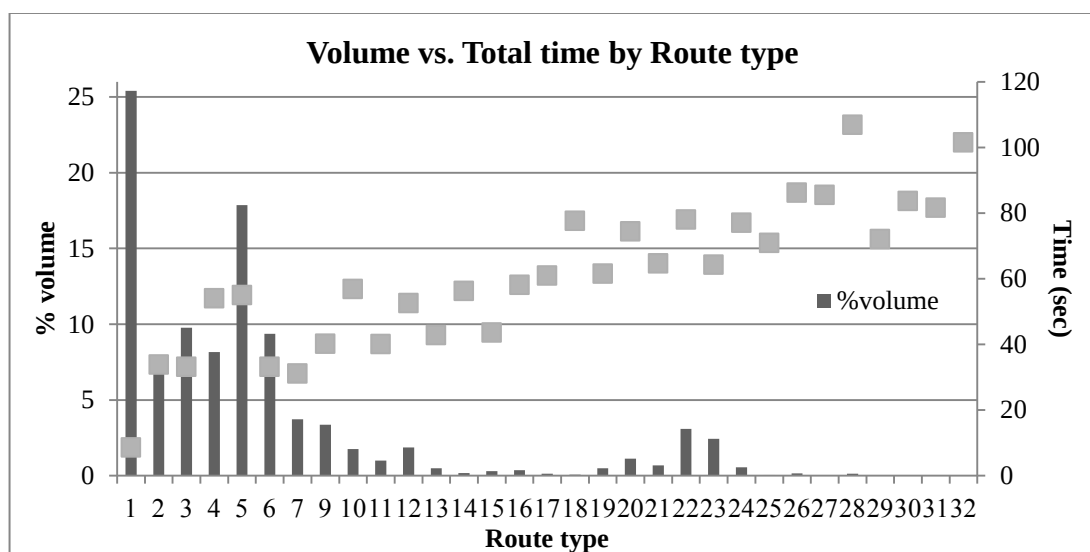


Figure 5.4 Job in route type

The distance of sending increases follow the increasing of route type number. Route type 1 is the shortest because it send internal zone. Route type 32 is the longest distance. Because it sends from zone pass 2 diverters and 2 transfer units. So, the delivery time should direct variation with distance. Figure 5.4 show number of job and delivery time in each route type. Route type 8 has not value because diverter 3 is not used. All of route type is send finish less than 2 min that mean the performance of this design is good.

5.2 Sensitivity Analysis

The sensitivity analysis for the future, increased delivery demand up to 120%, 140%, 160%, 180%, 200% and 220%. The results show that the system can support the transportation. When the delivery demand is increased to 220%, the average total time is 49.26 seconds and the maximum total time is 207.24 seconds (Table 5.2). The simulation result is in appendix C.

Table 5.2 Sensitivity result of increasing demand 10% every year

YearUp10%		Cal Factor	Total time
0	1.00	1.00	37.34
1	1.10	1.10	37.75
2	1.21	1.20	38.16
3	1.33	1.40	38.79
4	1.46	1.60	40.31
5	1.61	1.80	41.70
6	1.77	2.00	43.78
7	1.95	2.20	49.26

The sensitivity analysis for reduce investment shows that we can reduce capacity of transfer units to 7. So the results differ from normal by less than 1% (Table 5.4). The simulation result is in appendix 4.

Table 5.4 Sensitivity result of reduces capacity of transfer unit 1 and 2.

	Transfer unit capacity						
	14	7	6	5	3	2	1
Total demand	3711.60	3711.60	3711.17	3707.40	3726.57	3706.87	3724.20
Delivery time	37.34	37.34	37.37	37.35	37.61	39.08	84.48
Waiting time	2.08	2.08	2.08	2.06	2.33	3.77	52.94
Transfer unit 1 utilization	0.03	0.07	0.08	0.09	0.15	0.23	0.58
Transfer unit 2 utilization	0.03	0.07	0.08	0.10	0.16	0.24	0.60

CHAPTER VI

CONCLUSION AND RECOMMENDATION

This chapter is divided into 2 phases, 6.1 conclusion of this research and 6.2 recommendations for develop this research in future.

6.1 Conclusion

The aim of this study was to define the selective factors of material handling system in the hospital and use simulation to evaluate the material handling system. After study, we found that general selection factor of MHS consider only efficiency and cost. But for hospital, they interested in patient safety, to make I true hospital should control all the process are correct and well-time. So, MHS selection factors in hospital focus on protect material quality, move fast and correct, and can support all delivery. The research summarize in table that use for analyze and compare properties to select appropriate MHS.

This research illustrates the common step to evaluate the appropriate material handling system in the hospital. Beginning step consider the hospital requirement and define selective factors. The important factors are divided into 2 type; quality factors and quantity factors.

Quality factors evaluate property of system by consider the nature of material, characteristic of movement and method for delivery. This research compare the hospital requirements with properties of material handling systems for generate alternative material handling system.

Quantity factors evaluate performance of alternative material handling system. Discrete Event Simulation is a tool for testing the performance and various scenarios before implementation. This research shows step of construction simulation model at the beginning step; preparing data and evaluate system model. The evaluation

criteria of material handling system is about design, performance and management system which measure by delivery time, waiting time, utilization etc.

A medium private hospital in Bangkok has been used as a case study. In the future, the increasing of patient will urge the hospital to adopt the better material handling system. If the automated system is considered, the hospital needs to ensure the appropriate of this complex and sensitive system before installation.

After compare alternative material handling system for the case study hospital, we found pneumatic tube system is suitable for this hospital and their quantity factors are measured by using simulation that confirm the system is appropriate with the hospital requirements. The simulation results demonstrate the overdesign by using the diverter 3. Transfer units 1 and 2 have higher risk to break down, so the maintenance plan must be careful at this part. This system has enough capacity for support the increasing demand in the future: if the growth rate is 10% per year, this system can provide support for more than 5 years.

6.2 Recommendation

This selection factor can use as a master model of studying Material handling selection. It can analyze the appropriation MHS that suitable for their hospital requirements because the model give precedence to material quality, time and safety more than cost. However, this model cans develop scoring process to make it more reliability.

This simulation model can evaluate the design before installation. To develop this model to be more realistic should use more accuracy information. There are two limitations that need to replace. First, the accuracy of section transportation time, second, the accuracy of the patient numbers since the operation in the hospital is unstable, it difficult to speculate the number of patient who will come on each day. If we use the real number of sending instead of percentage of each type sending per day, we will get the more realistic simulation.

REFERENCES

- Andrew Potter, Biao Yang, Chandra Lalwani (2007). A simulation study of dispatch bay performance in the steel processing industry. *European Journal of Operational Research*, 567-578.
- A.M.El-Tamimi, I. Hussain (2004). Selection of Material handling equipment using a hybrid approach, *The 2nd IIEC-2004*.
- Amer M. Momani, Abdulaziz A, Ahmed (2011). Material Handling equipment Selection using Hybrid Monte Carlo Simulation and analytic hierarchy Process. *World Academy of science, Engineering and Technology* 59, 953-958.
- Apple, J. M. (1972). Material handling system Design. *Roland press*, New York.
- Ashish Gupta, Ramesh Sharda. (2012). Improving the science of Healthcare Delivery and Informatics using Modeling Approaches. *Decision Support System*.
- Astles J, Lubarsky D, Lon B, Sedor FA, Toffaletti JG. (1996). Pneumatic transport exacerbates interference of room air contamination in blood gas samples. *Arch Path Lab Med*, 642-647.
- Badreddine Jerbi, Hichem Kamoun (2011). Multi-objective study to implement outpatient appointment system at Hedi Chaker Hospital. *Simulation Modeling Practice and Theory*, 1363-1370.
- Baldwin L, Eldabi PT and Paul RJ (2004). Simulation in healthcare management: A soft approach (MAPIU). *Simulation Model Pract Th*, 12, 541-557.
- B.P. Yang (1996). ICMES: intelligent consultant system for material handling equipment selection and evaluation. *J Manuf Syst*, 15(5), 325-333.
- Brooks JJ, Hamilton B, Li Volsi VA, Pietra GG (1986). Use a “pneumatic” tube in anatomic pathology, *Am J Clin Pathol*, 669-673.
- Carlos B., Ramirez Cerda (1995). Performance evaluation of an automated handling system for a machining line using simulation. *Winter Simulation Conference*, 881-888.

- Christopher M.B. Fernandes, MD (2003). Pneumatic Tube Delivery System for Blood Samples Reduces Turnaround Times Without Affecting Sample Quality. *The American College of Emergency Physicians Research*.
- Collinson PO, John CM, Gaze DC, Ferrigan LF, Cramp DG (2002). Changes in blood gas samples produced by a pneumatic tube system. *J Clin Pathol*, 105-107.
- Dima Nazzal, Douglas A. Bodner (2003). A simulation-based design framework for automated material handling system in 300mm fabrication facilities. *Proceedings of the 2003 Winter Simulation Conference*, 1351-1358.
- Fernandes CM, Worster A, Eva K, Hill S, McCallum C (2006). Pneumatic Tube delivery system for blood samples reduces turnaround time without affecting sample quality. *J Emerg Nurs*, 139-143.
- F.K. Wang, J.T. Lin (2004). Performance evaluation of an automated handling system for a water fab. *Robotics and Computer-Integrated Manufacturing*, 20, 91-100.
- F.T.S. Chan, R.W.L. Ip, H. Lau (2001). Integration of expert system with analytic hierarchy process for the design of material handling Equipment selection system. *Material Processing Technology*, 116, 137-145.
- Graham Ellis (2009). An episode of increased hemolysis due to a defective pneumatic air tube delivery system. *Clinical Biochemistry*, 42, 1265–1269.
- Green M (1995). Successful alternative to alternate site testing. Use of a pneumatic tube system to the central laboratory. *Arch Pathol Lab Med*, 943-947.
- Greg Werker, Antoine Saure, John French, Steven Shechter (2009). The use of discrete-event simulation modeling to improve radiation therapy planning processes. *Radiotherapy and Oncology*, 92, 76-82.
- Guss DA, Chan TC, Killeen JP (2008). The impact of a pneumatic tube and computerized physician order management on laboratory turnaround time. *Ann Emerg Med*, 181-185.
- Gu, J., Goetschalckx, N., McGinnis, LF. (2007). Research on warehouse operation: a comprehensive review. *European journal of Operational Research*, 177(1), 1-21.
- Guilherme Bermann Borges Vieira, Giovana Savitri Pasa, Maria Beatriz Nunes de Oliveira Borsa, Gabriel Sperandio Milan, Alberto Pandolfo (2011).

- Material handling Management: A Case Study. *Journal of Operations and Supply Chain Management*, 4 (2), 19-30.
- Hardin G, Quick G, Ladd DJ (1990). Emergency transport of AS-1 red cell unit by pneumatic tube system. *J Trauma*, 346-348.
- Iris F.A. Vis (2006). Survey of research in the design and control of automated guided vehicle systems. *European Journal of Operational Research*, 170, 677–709.
- Jalal Nikoukaran and Ray J. Paul (1999). Software selection for simulation in manufacturing: a review. *Simulation Practice and Theory*, 7, 1-14
- Kambiz Tabibzadeh (1989). Simulation system for material handling system design. *Computers & Industrial Engineering*, 17, 270-273
- Keshgegian AA, Bull GE (1992). Evaluation of a soft-handed computerized pneumatic tube specimen delivery system. *Am J Clin Path*, 535-540.
- Kratz A, Salem RO, Van Cott EM (2007). Effect of a pneumatic tube system on routine and novel hematology and coagulation parameters in healthy volunteers. *Arch Pathol Lab Med*, 293-296
- K.S. El-Kilany, P. Young and M.A. El Baradie (2004). Generic tool for modeling and simulation of semiconductor intra-bay material handling system. *Material Processing Technology*, 155-156, 1927-1934.
- L.G. Vargas, E.H. Forman (1995). The analytic hierarchy process: A New Paradigm. New Orleans.
- Manual D. Rosseyyi, Francesco Selandari (2001). Multi-objective analysis of hospital delivery systems. *Computer & Industrial Engineering* 41, 309-333.
- Mackulak, G., P. Savory (2001). A simulation Based Experiment for Comparing AMHS Performance in a Semiconductor Fabrication Facility. *IEEE Transactions on semiconductor Manufacturing*, 273-280.
- Mark W. Isken and Steven J. Littig (2002). Simulation Analysis of Pneumatic Tube Systems. *Medical Systems*, Vol. 26, No. 1, February 2002.
- Matson J.O., J.M. Mellichamp, S.R. Swaminatham (1992). EXCITE: Expert consultant for in Plant Transportation equipment. *International Journal of Production Research*, 30(8), 1969-1983.
- Osman Kulak, Sule Itir Satoglu, M. Bulent Durmusoglu (2004). Multi-attribute

- material handling equipment selection using information axiom. *The Third International Conference on Axiomatic Design*.
- Paprotny, I., J. Shiau, Y. Huh, and G. Mackuluk (2000). Simulation Based Comparison of semiconductor AMHS Alternative: Continuous Flow vs. Overhead Monorail. *Proceeding of the 2000 winter Simulation Conference*, 1333-1338.
- Pengfei Yi, Santhosh K. George, Jomon Aliyas Paul, Li Lin (2010). Hospital capacity planning for disaster emergency management. *Socio-Economic Planning Sciences*, 44, 151-160.
- Pillai, D., T. Qu inn, K. Kryder, D. Charlson (1999). Integration of 300mm Fab Layouts and Material Handling Automation. *Proceedings of the 1999 Winter Simulation Conference*, 23-26.
- Poznanski W, Smith F, Bodlye FG (1978). Implementation of a pneumatic tube system for transport of blood specimens. *Am J Clin Path*, 291-295.
- Pragay DA, Fan P, Brinkley S, Chilcote ME (1980). A computer directed pneumatic tube system: its effects on specimens. *Clin Biochem*, 259-261.
- P S Chakraborty, G Majumder, B Sarkar (2006). Performance evaluation of material handling system for warehouse. *Material handling for warehouse*, 325-329
- Ramazan YAMAN (2001). A Knowledge-Based Approach for Selection of Material Handling Equipment and Material Handling System Pre-design, *Turk J Engin Environ Sci*, 267-278.
- Rust, K., R. Wrigh, M. Shopbell (2002). Comparative Analysis of 300 mm Automated Material Handling System of 300 mm Automated Material Handling System. *Modeling and analysis of semiconductor Manufacturing Conference*, 240-245.
- Tanley PC, Wallas CH, Abram MC, Richarddson LD (1987). Use of pneumatic tube system for delivery of blood bank products and specimens. *Transfusion*, 196-198.
- T. Bodenheimer, K. Grumbach (2003). Electronic technology: A spark to revitalize primary care? *Journal of American Medical Association*, 290(2), 259-264.
- Thoguluva Raghavan Vijayaram (2006). Materials handling technology and significance of expert systems to select appropriate handling equipment in

- engineering industries: A review. *Journal of Scientific & Industrial Research*, Vol.65, 619-624.
- Timothy S. Meinert, G. Don Taylor, John R. English (1999). A modular approach for automated material handling system. *Simulation Practice and Theory*, 7, 15-30.
- Tompkins, J.A., White, J.A., Bzer, Y.A., Tanchoco, J.M.A. (2002). Facilities planning. Willey. New York, NY.
- Satya S. Chakravorty (2009). Improving distribution operations: Implementation of material handling systems. *Int. J. Production Economics*, 89-106.
- Shankar Chakraborty, Debabrata Banik (2006). Design of material handling equipment selection model using analytic hierarchy process. *Int J Adv Manuf Technol*, 288, 1237-1245.
- Steige H, Jones JD (1974). Evaluation of pneumatic tube system for delivery of load specimens. *Chin Chem*, 1160-1164.
- White A.J., J.M. Apple (1985). Material Handling Requirements are Altered Dramatically by CIM Information Link. *Industrial Engineering*, 42-28.
- Yvonne Letman (2002). Design of a suitable production management system for a manufacturing company. *Computers & Industrial Engineering*.
- Zahur Zaman, Maurits Demedts (2001). Blood gas analysis: POCT versus central laboratory on samples sent by a pneumatic tube system. *Clinica Chimica Acta*, 307, 101–106.
- Zhen Zeng, Xiaojo Ma, Yao Hu, Jingshan Li, PhD, Deborah Bryant (2011). A simulation study to improve quality of care in emergency department of a community hospital. *Journal of Emergency Nursing*.

APPENDICES

Appendix A
Material Handling Equation

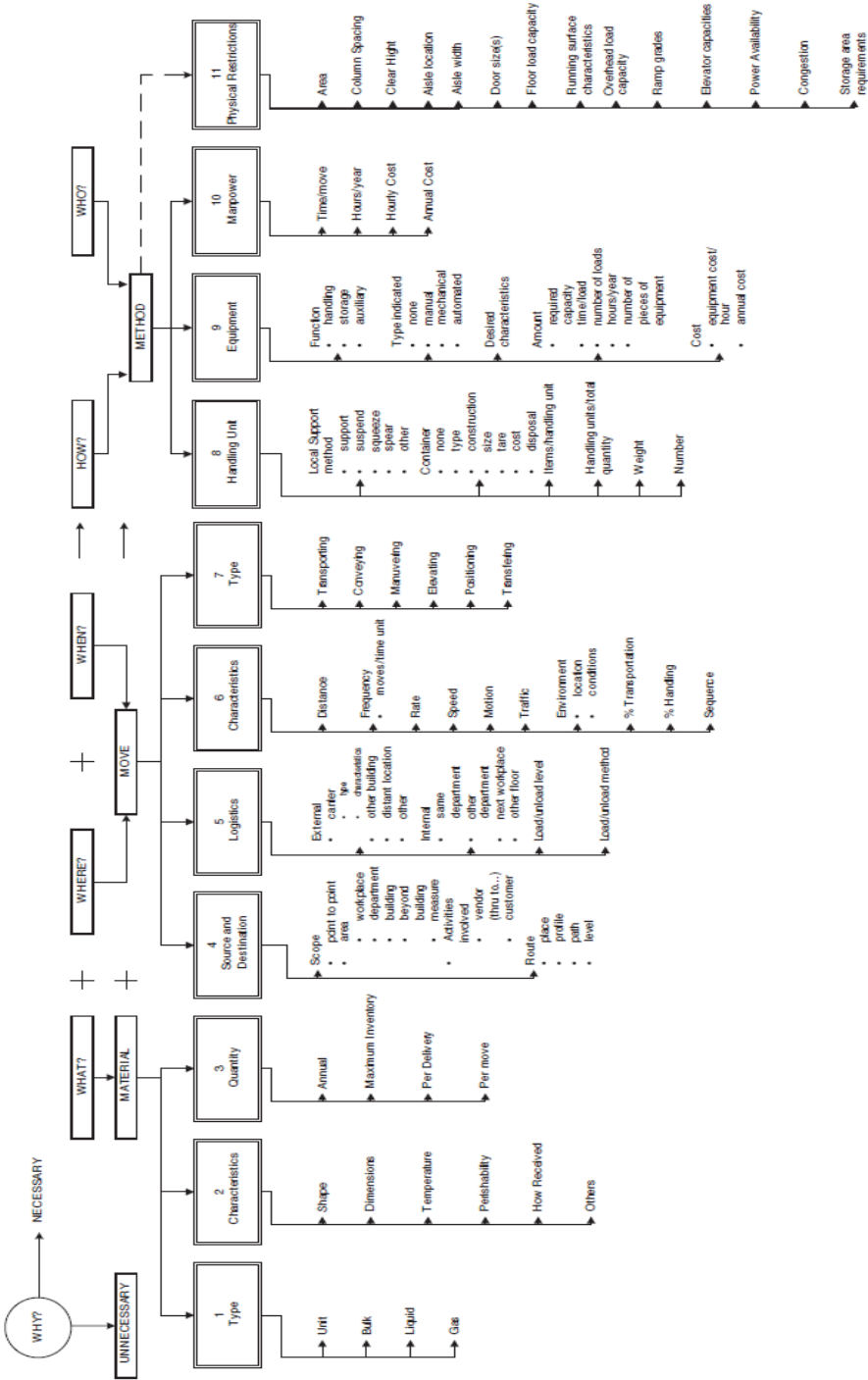
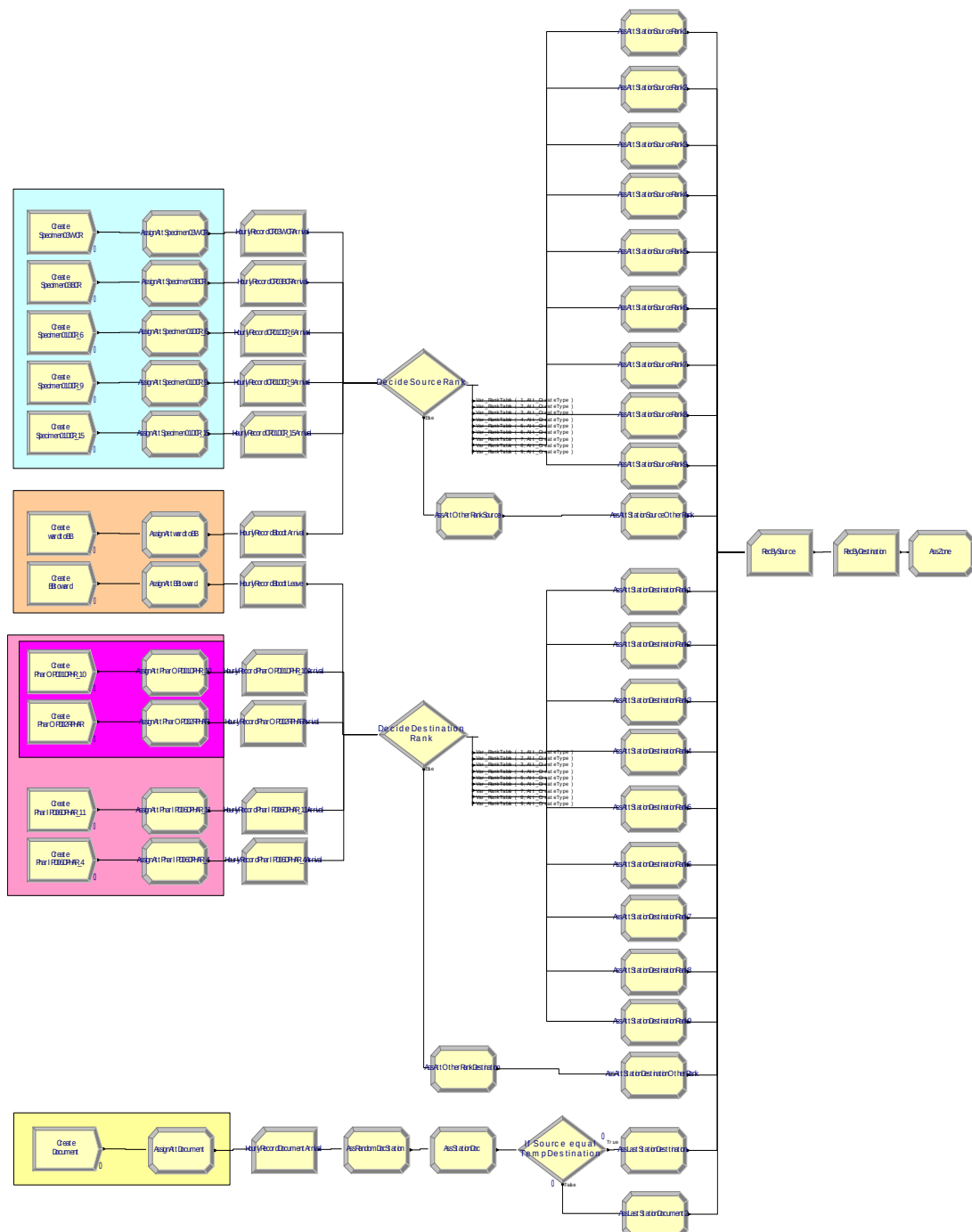


Figure 1.15 Material handling equation (Source: Courtesy of James M. Apple, Jr.)

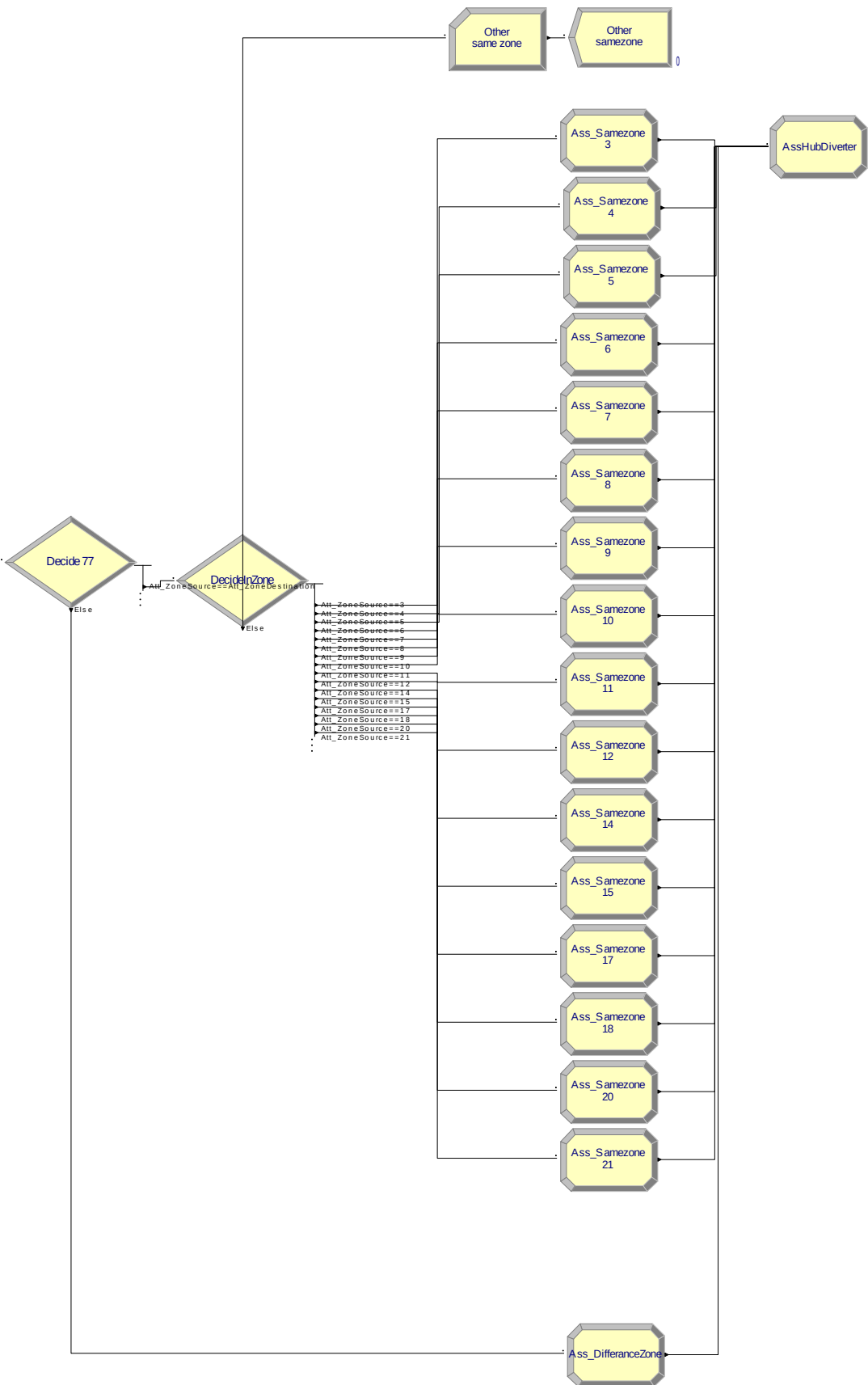
Appendix B

Construction simulation modeling

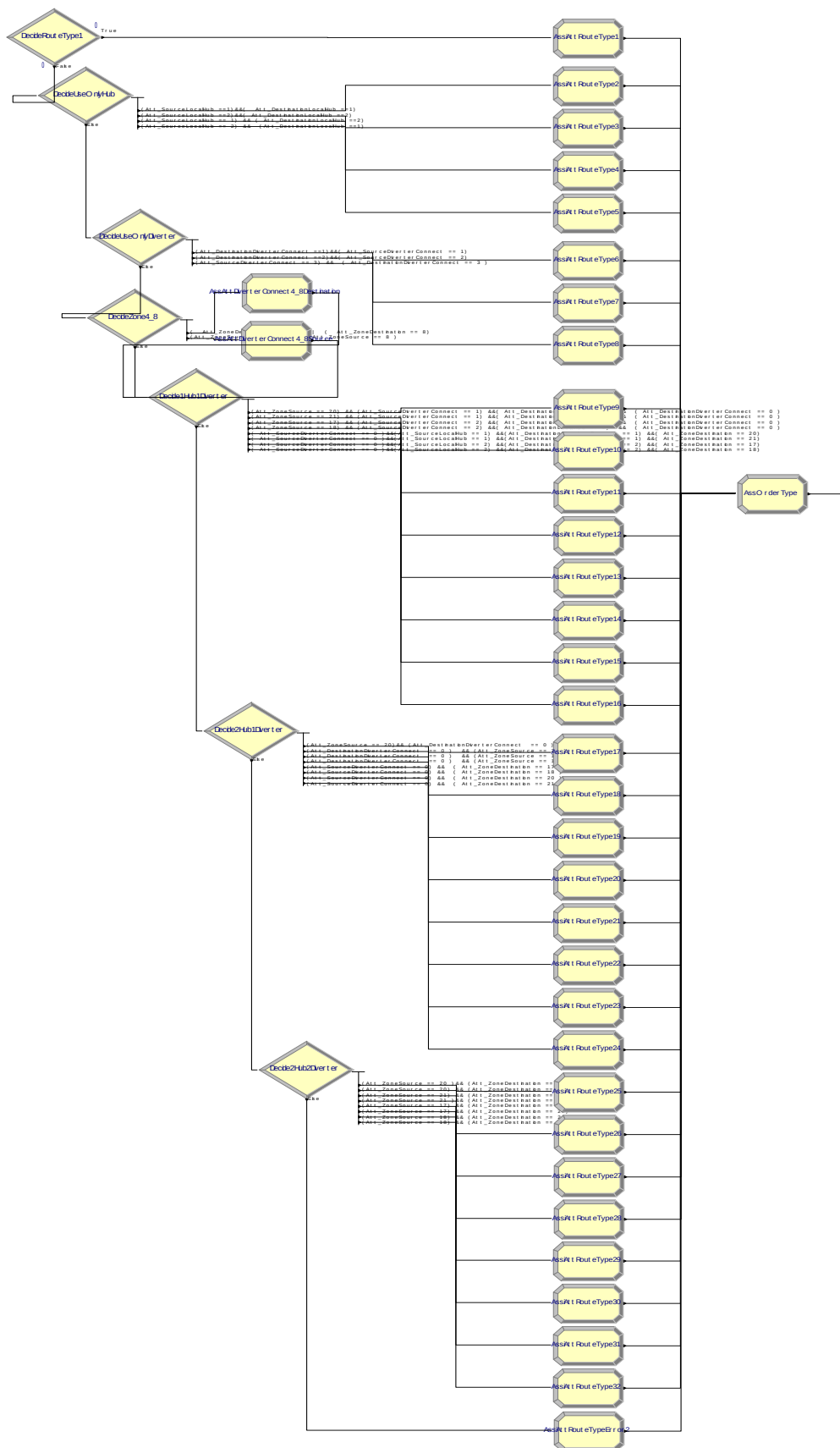
Create 12 demand type



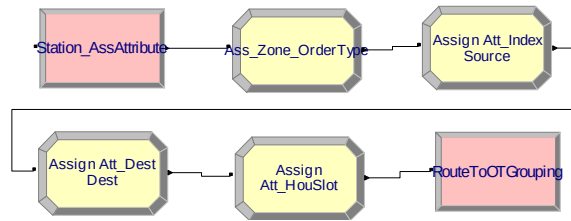
Decide send internal zone or external zone



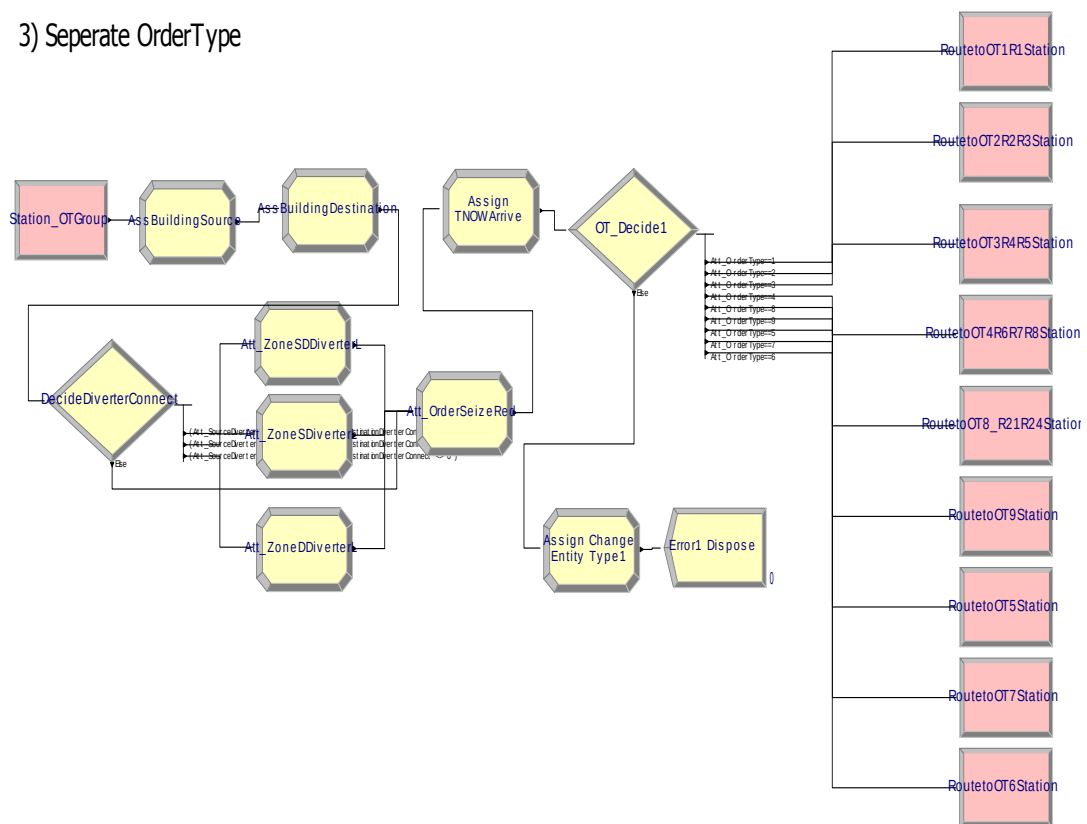
Decide route type and assign route type and order type



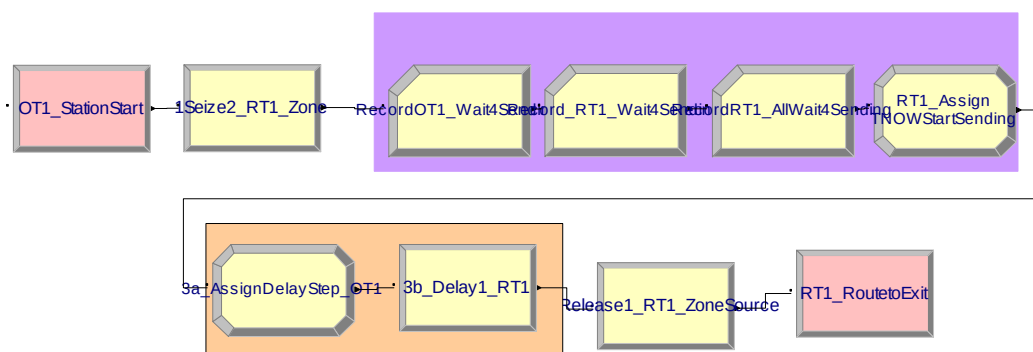
Assign Extra attribute



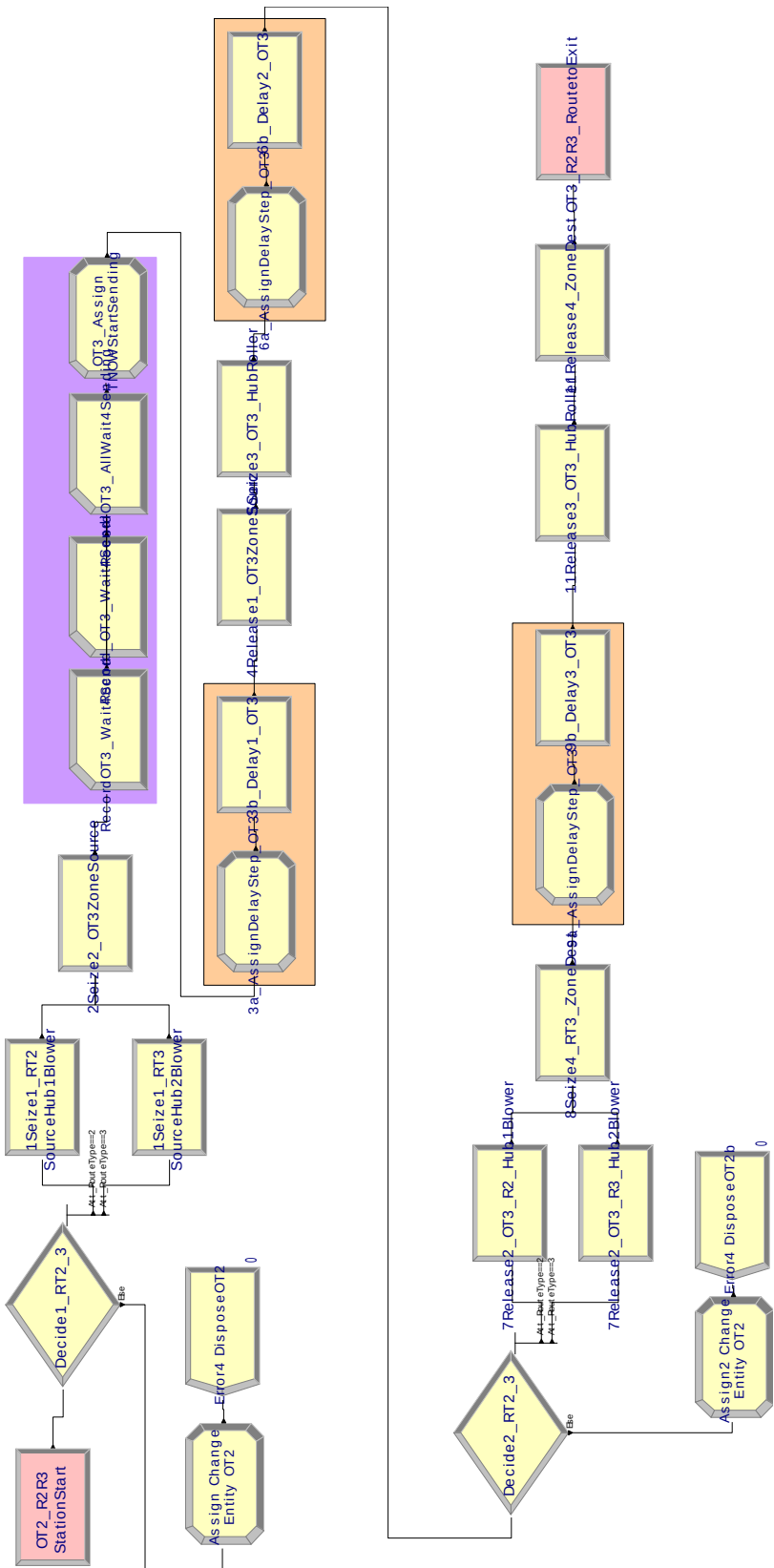
3) Seperate OrderType



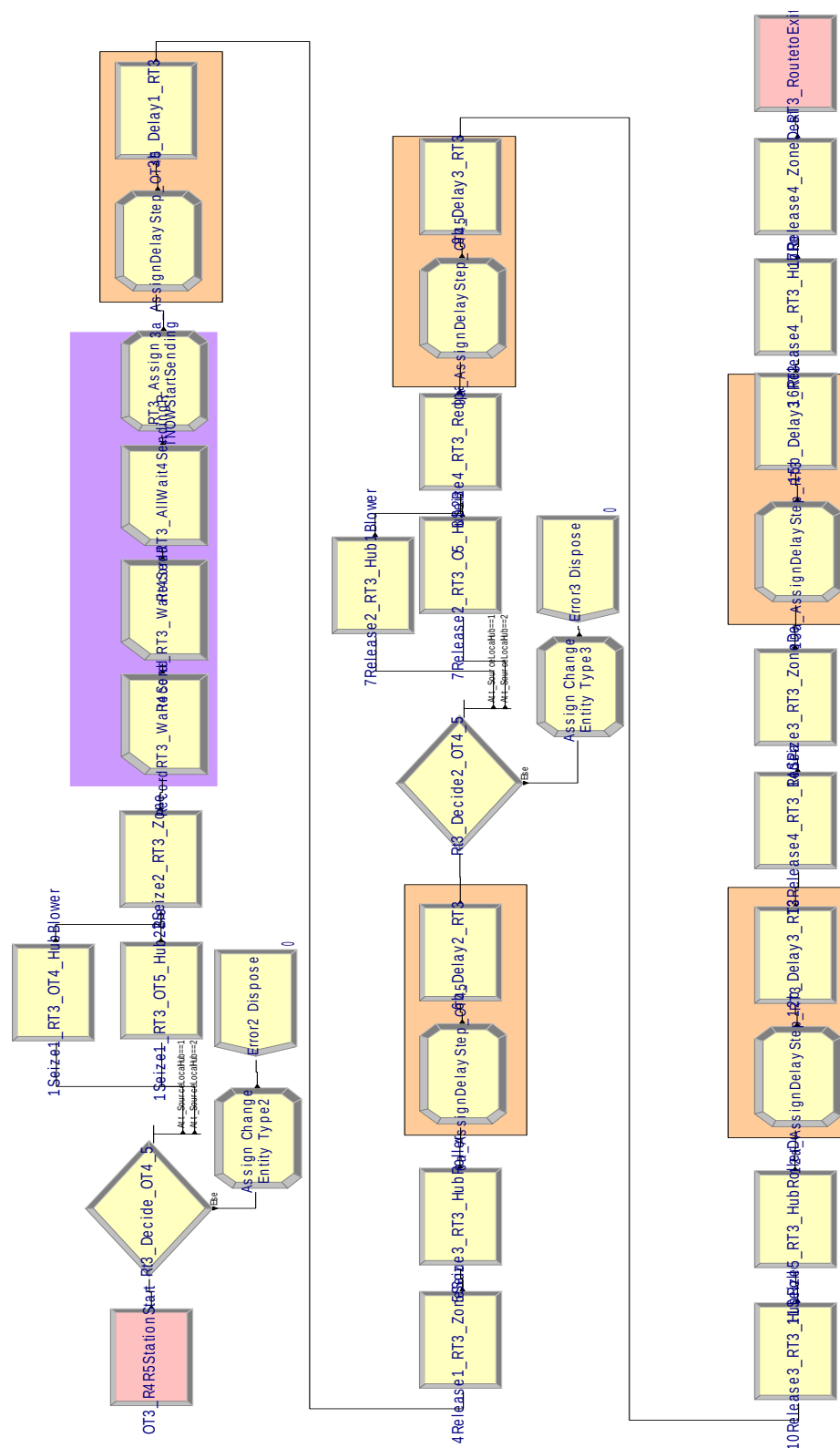
Step of order type 1



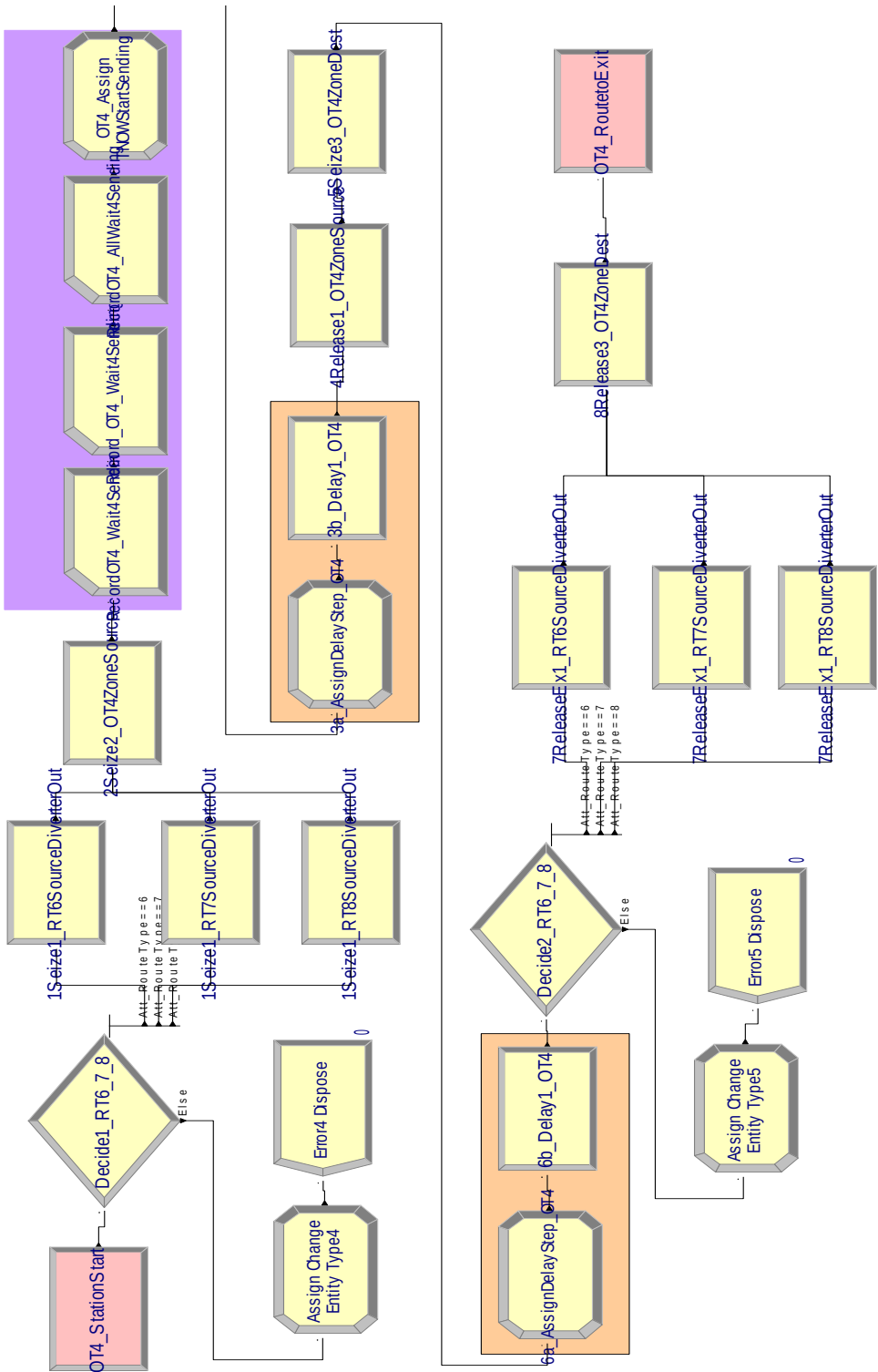
Step of order type 2



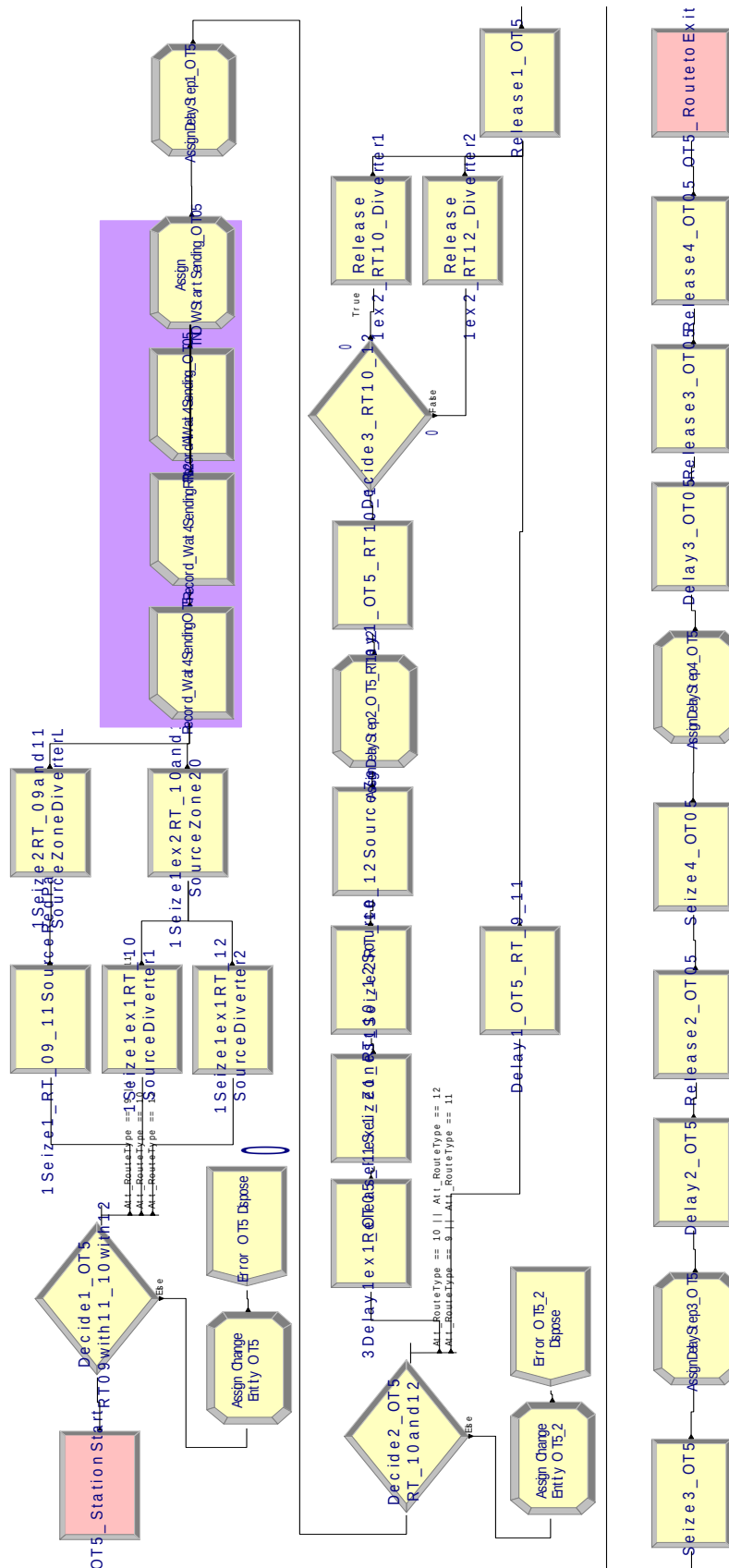
Step of order type 3



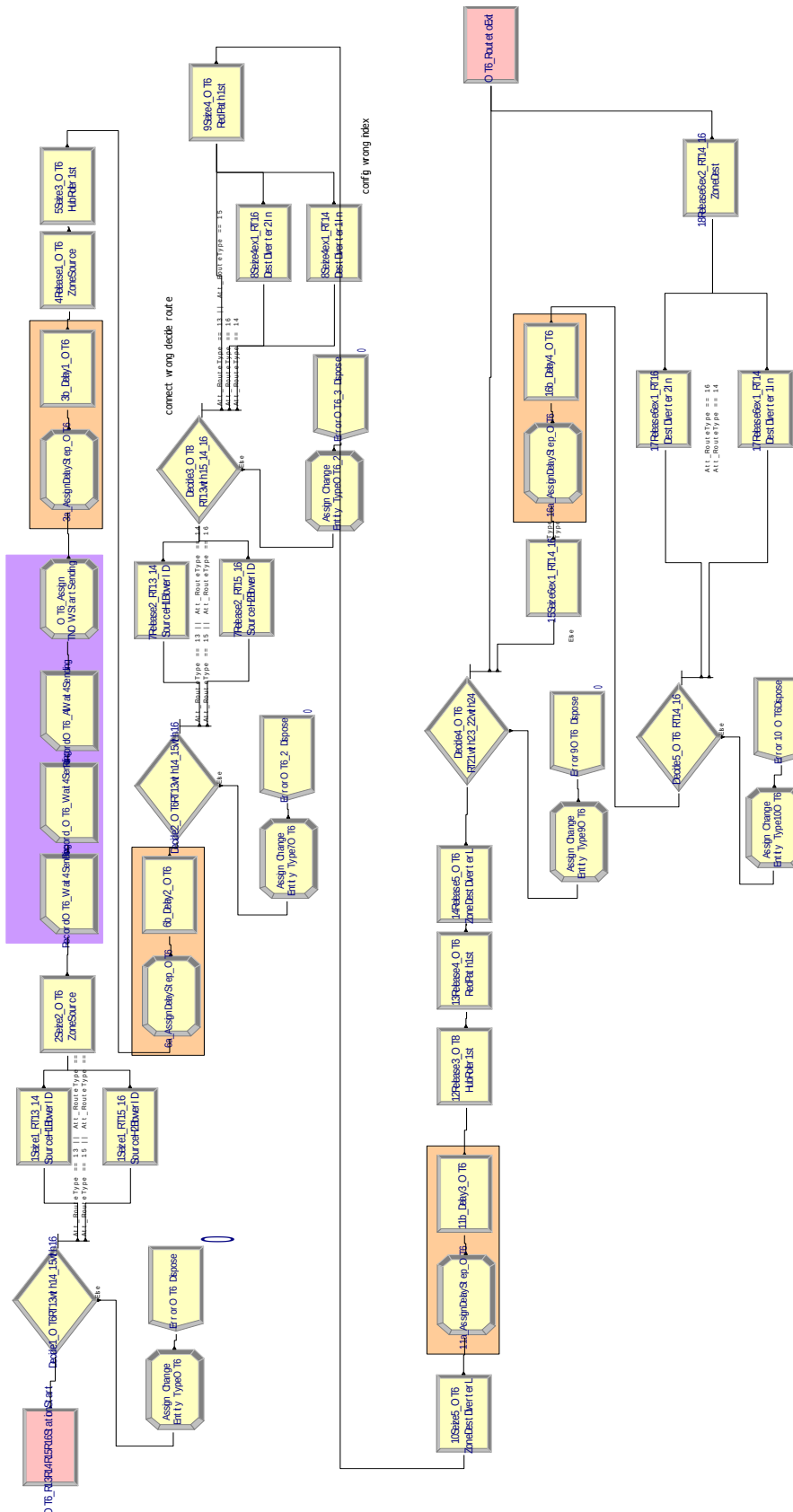
Step of order type 4



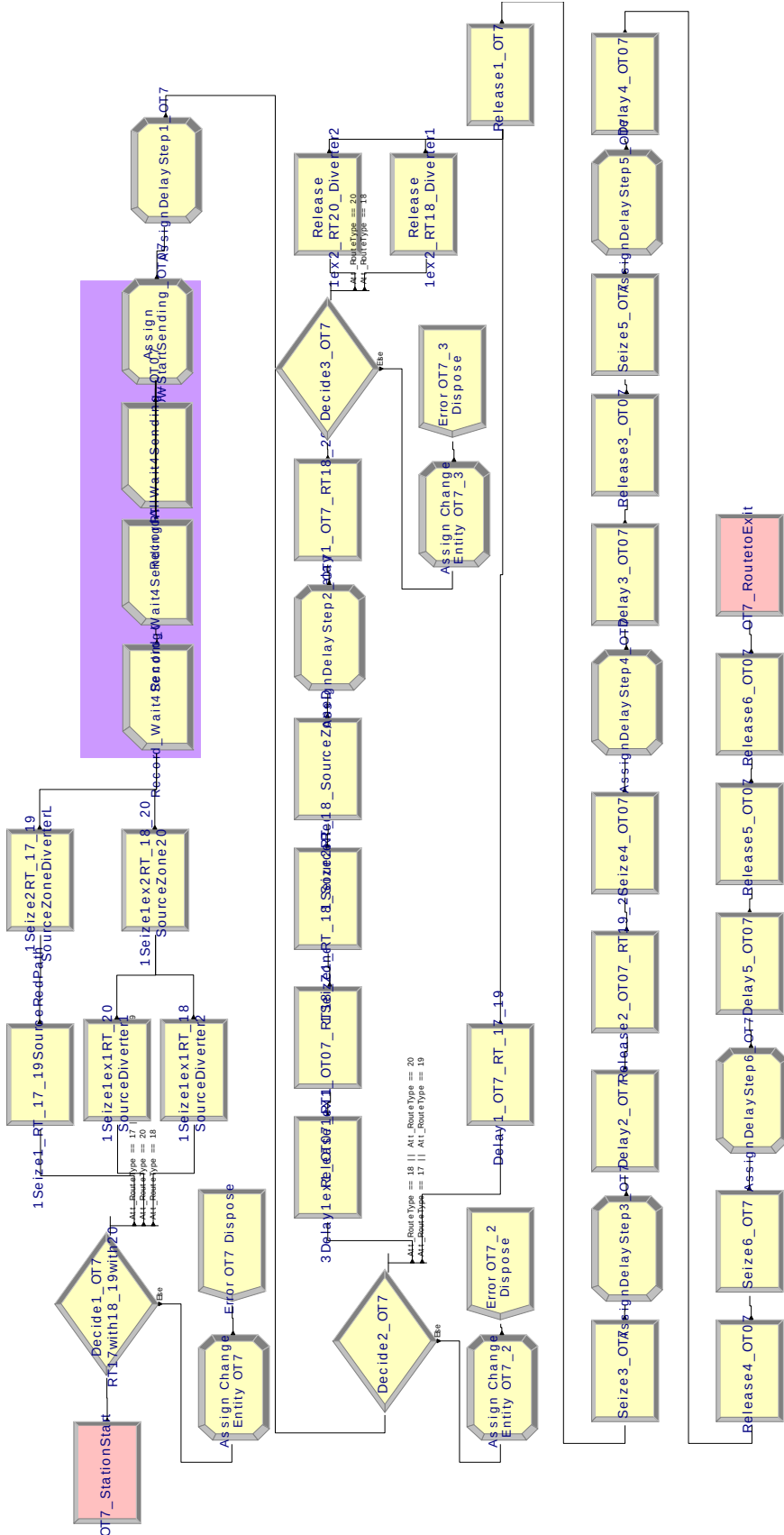
Step of order type 5



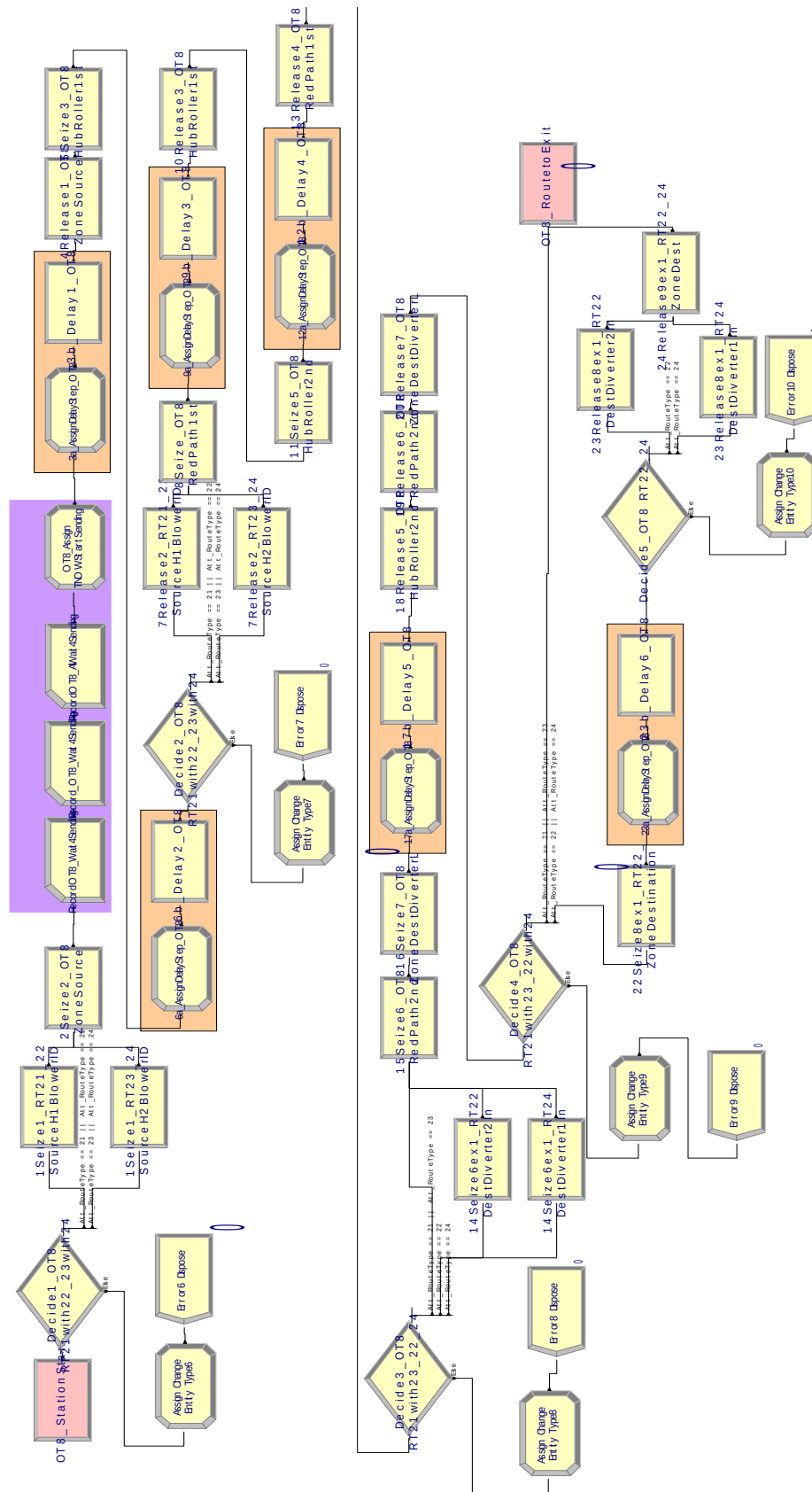
Step of order type 6



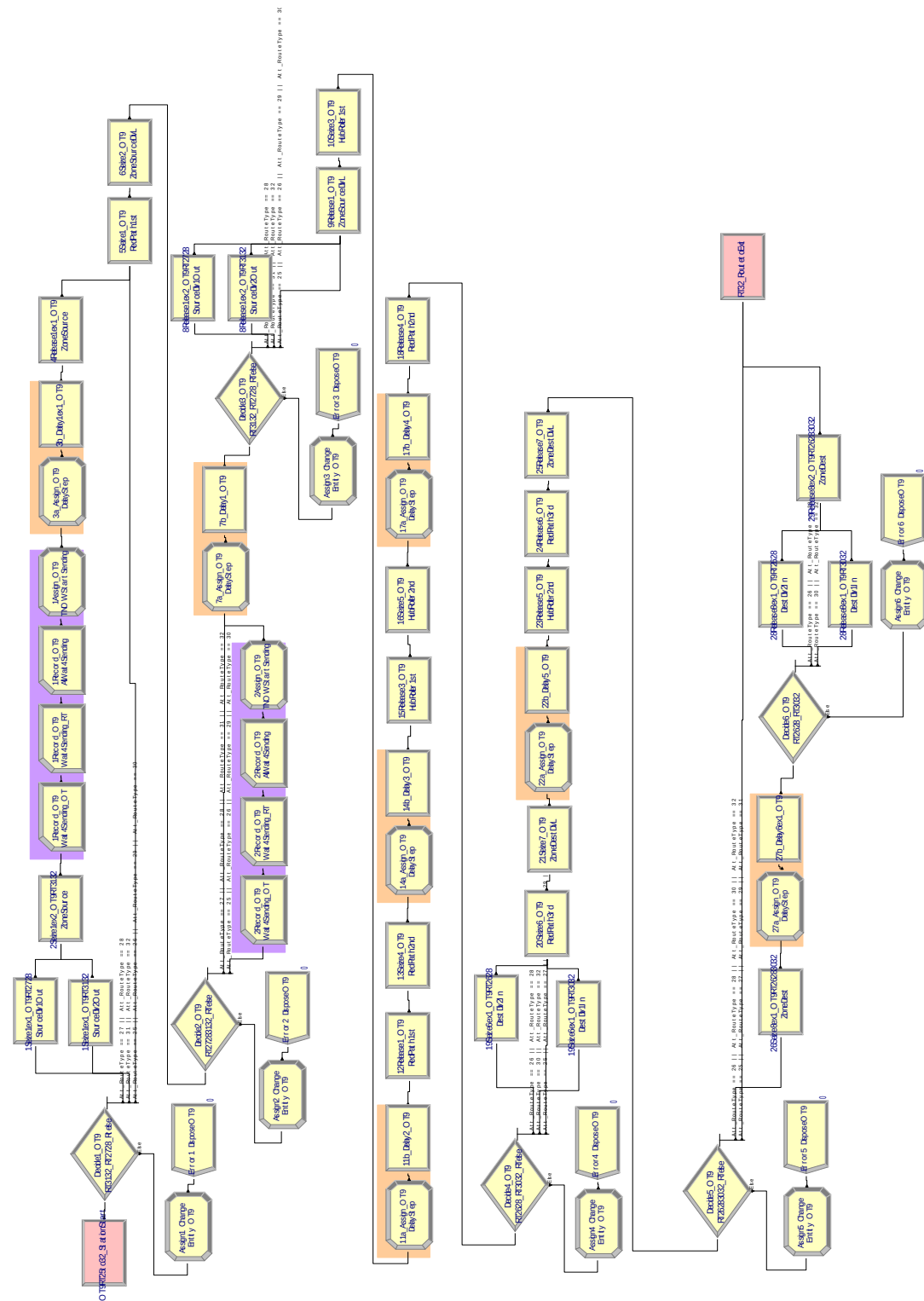
Step of order type 7



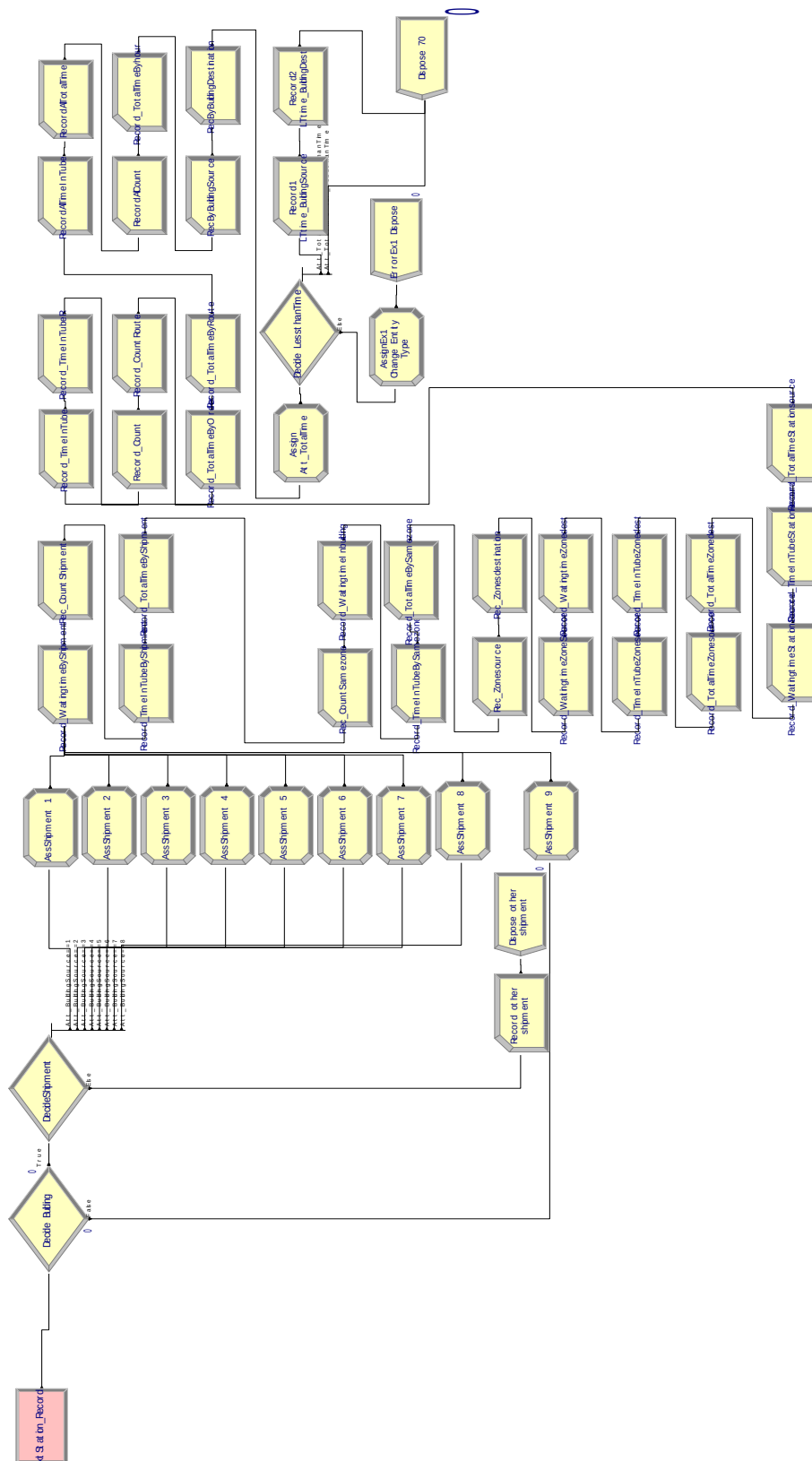
Step of order type 8



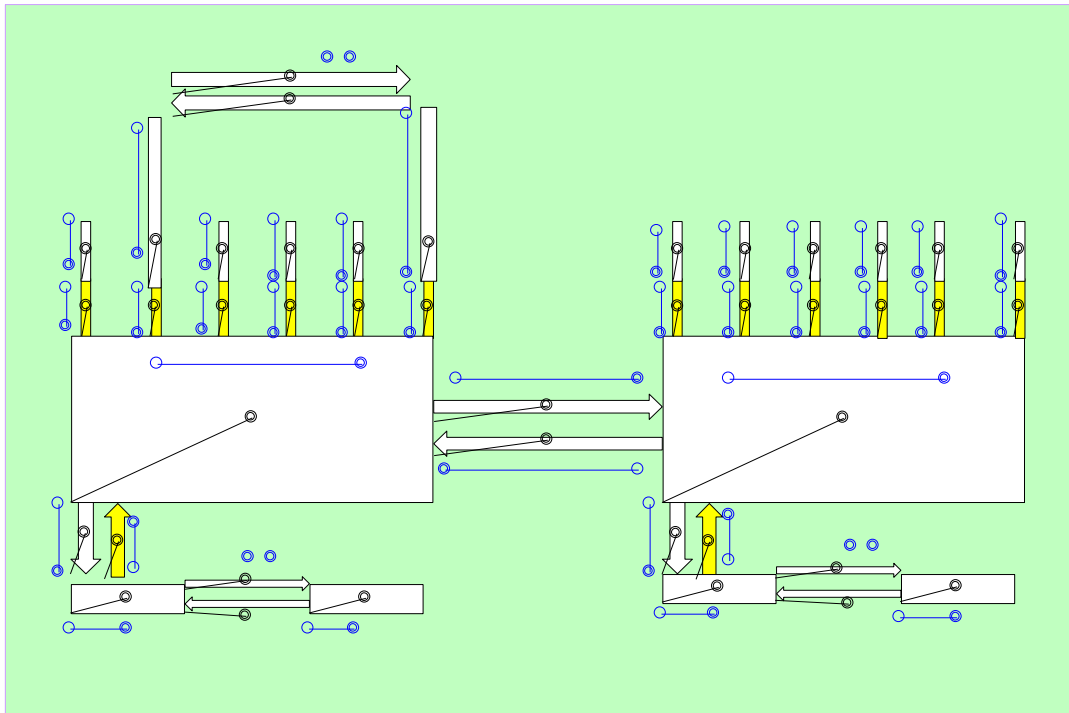
Step of order type 9



Record statistic



Graphic in simulation



Appendix C

Simulation Result

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Count_CreateType01	341	350	353	326	324	357	354	346	335	347
Count_CreateType02	432	496	463	434	453	447	426	442	459	437
Count_CreateType03	208	189	213	224	224	202	210	220	225	207
Count_CreateType04	153	149	160	167	159	143	128	142	146	142
Count_CreateType05	306	288	316	279	275	295	292	291	305	291
Count_CreateType06	109	108	114	103	92	105	101	97	102	100
Count_CreateType07	171	140	164	169	165	172	163	157	159	146
Count_CreateType08	486	492	482	456	487	487	494	487	501	529
Count_CreateType09	491	517	587	557	564	533	525	531	584	536
Count_CreateType10	484	470	494	514	491	564	511	527	464	523
Count_CreateType11	415	388	402	387	383	389	373	413	355	391
Count_CreateType12	97	109	96	94	91	91	95	107	107	94
Counter_BuilddingDestination1	171	140	164	169	165	172	163	157	159	146
Counter_BuilddingDestination2	225	226	266	229	228	228	218	248	237	211
Counter_BuilddingDestination3	424	421	463	453	478	467	451	434	485	470
Counter_BuilddingDestination4	49	48	38	47	42	47	39	41	48	53
Counter_BuilddingDestination5	449	470	484	453	434	464	478	461	434	475
Counter_BuilddingDestination6	1243	1293	1268	1225	1263	1256	1215	1244	1234	1300
Counter_BuilddingDestination7	603	608	621	619	593	648	592	644	599	578
Counter_BuilddingDestination8	529	490	540	514	505	503	516	530	546	510
Counter_BuilddingSource1	109	108	114	103	92	105	101	97	102	100
Counter_BuilddingSource2	558	589	665	616	623	603	597	619	661	615
Counter_BuilddingSource3	146	147	156	113	128	130	130	144	160	126
Counter_BuilddingSource4	198	218	210	199	202	208	210	206	196	188
Counter_BuilddingSource5	292	282	303	289	276	306	279	269	270	305
Counter_BuilddingSource6	1199	1228	1214	1186	1209	1194	1188	1196	1238	1227
Counter_BuilddingSource7	1188	1122	1178	1199	1176	1236	1163	1222	1112	1179
Counter_BuilddingSource8	3	2	4	4	2	3	4	6	3	3
Counter_ByOrder01	922	969	984	961	965	958	930	940	962	935
Counter_ByOrder02	688	630	688	626	645	628	665	659	659	636
Counter_ByOrder03	943	933	951	989	953	1013	931	998	932	974

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Counter_ByOrder04	442	490	509	483	503	486	483	475	513	492
Counter_ByOrder05	298	300	316	266	269	297	269	304	317	292
Counter_ByOrder06	54	45	58	52	40	53	54	55	58	59
Counter_ByOrder07	66	62	74	72	67	63	68	55	49	67
Counter_ByOrder08	263	246	249	251	249	266	253	250	225	275
Counter_ByOrder09	17	21	15	9	17	21	19	23	27	13
Counter_ByRoute01	922	969	984	961	965	958	930	940	962	935
Counter_ByRoute02	300	266	288	289	288	266	290	280	282	254
Counter_ByRoute03	388	364	400	337	357	362	375	379	377	382
Counter_ByRoute04	323	302	307	300	295	319	284	327	284	294
Counter_ByRoute05	620	631	644	689	658	694	647	671	648	680
Counter_ByRoute06	298	333	357	353	362	335	337	325	379	352
Counter_ByRoute07	144	157	152	130	141	151	146	150	134	140
Counter_ByRoute08	0	0	0	0	0	0	0	0	0	0
Counter_ByRoute09	128	129	137	102	109	115	114	125	141	110
Counter_ByRoute10	58	63	65	56	49	61	56	73	69	74
Counter_ByRoute11	38	38	40	42	43	45	42	41	39	35
Counter_ByRoute12	74	70	74	66	68	76	57	65	68	73
Counter_ByRoute13	20	12	25	21	15	23	21	20	23	23
Counter_ByRoute14	9	9	12	5	6	7	2	10	7	7
Counter_ByRoute15	11	14	11	14	10	9	11	8	13	12
Counter_ByRoute16	14	10	10	12	9	14	20	17	15	17
Counter_ByRoute17	6	6	8	5	6	2	5	6	2	9
Counter_ByRoute18	4	1	2	1	6	1	7	4	1	1
Counter_ByRoute19	12	20	18	24	13	9	20	10	19	13
Counter_ByRoute20	44	35	46	42	42	51	36	35	27	44
Counter_ByRoute21	34	30	20	29	28	32	21	25	28	35
Counter_ByRoute22	110	118	131	128	110	110	122	113	102	127
Counter_ByRoute23	104	72	79	76	93	107	88	86	77	94
Counter_ByRoute24	15	26	19	18	18	17	22	26	18	19
Counter_ByRoute25	2	1	1	0	3	4	2	4	3	2
Counter_ByRoute26	7	8	6	4	5	6	4	7	10	5
Counter_ByRoute27	1	1	4	0	0	1	0	2	2	1
Counter_ByRoute28	2	5	4	2	4	6	8	6	4	3
Counter_ByRoute29	1	1	0	1	2	3	2	2	2	0
Counter_ByRoute30	2	2	0	0	2	1	3	1	2	1
Counter_ByRoute31	2	2	0	2	1	0	0	1	2	1
Counter_ByRoute32	0	1	0	0	0	0	0	0	2	0
CounterP_ByOrder01	922	969	984	961	965	958	930	940	962	935

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
CounterP_ByOrder02	688	630	688	626	645	628	665	659	659	636
CounterP_ByOrder03	943	933	951	990	953	1013	931	999	932	974
CounterP_ByOrder04	442	490	509	483	503	486	483	475	513	492
CounterP_ByOrder05	298	300	316	266	269	297	269	304	317	292
CounterP_ByOrder06	54	45	58	52	40	53	54	55	58	59
CounterP_ByOrder07	66	62	74	72	67	63	68	55	49	67
CounterP_ByOrder08	263	246	249	251	249	266	253	250	225	275
CounterP_ByOrder09	17	21	15	9	17	21	19	23	27	13
CounterP_ByRoute01	922	969	984	961	965	958	930	940	962	935
CounterP_ByRoute02	300	266	288	289	288	266	290	280	282	254
CounterP_ByRoute03	388	364	400	337	357	362	375	379	377	382
CounterP_ByRoute04	323	302	307	301	295	319	284	327	284	294
CounterP_ByRoute05	620	631	644	689	658	694	647	672	648	680
CounterP_ByRoute06	298	333	357	353	362	335	337	325	379	352
CounterP_ByRoute07	144	157	152	130	141	151	146	150	134	140
CounterP_ByRoute08	0	0	0	0	0	0	0	0	0	0
CounterP_ByRoute09	128	129	137	102	109	115	114	125	141	110
CounterP_ByRoute10	58	63	65	56	49	61	56	73	69	74
CounterP_ByRoute11	38	38	40	42	43	45	42	41	39	35
CounterP_ByRoute12	74	70	74	66	68	76	57	65	68	73
CounterP_ByRoute13	20	12	25	21	15	23	21	20	23	23
CounterP_ByRoute14	9	9	12	5	6	7	2	10	7	7
CounterP_ByRoute15	11	14	11	14	10	9	11	8	13	12
CounterP_ByRoute16	14	10	10	12	9	14	20	17	15	17
CounterP_ByRoute17	6	6	8	5	6	2	5	6	2	9
CounterP_ByRoute18	4	1	2	1	6	1	7	4	1	1
CounterP_ByRoute19	12	20	18	24	13	9	20	10	19	13
CounterP_ByRoute20	44	35	46	42	42	51	36	35	27	44
CounterP_ByRoute21	34	30	20	29	28	32	21	25	28	35
CounterP_ByRoute22	110	118	131	128	110	110	122	113	102	127
CounterP_ByRoute23	104	72	79	76	93	107	88	86	77	94
CounterP_ByRoute24	15	26	19	18	18	17	22	26	18	19
CounterP_ByRoute25	2	1	1	0	3	4	2	4	3	2
CounterP_ByRoute26	7	8	6	4	5	6	4	7	10	5
CounterP_ByRoute27	1	1	4	0	0	1	0	2	2	1
CounterP_ByRoute28	2	5	4	2	4	6	8	6	4	3
CounterP_ByRoute29	1	1	0	1	2	3	2	2	2	0
CounterP_ByRoute30	2	2	0	0	2	1	3	1	2	1
CounterP_ByRoute31	2	2	0	2	1	0	0	1	2	1

[illegible]

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Create01_Period22	0	0	0	0	0	0	0	0	0	0
Create01_Period23	0	0	0	0	0	0	0	0	0	0
Create01_Period24	0	0	0	0	0	0	0	0	0	0
Create02_Period01	0	0	0	0	0	0	0	0	0	0
Create02_Period02	0	0	0	0	0	0	0	0	0	0
Create02_Period03	0	0	0	0	0	0	0	0	0	0
Create02_Period04	0	0	0	0	0	0	0	0	0	0
Create02_Period05	0	0	0	0	0	0	0	0	0	0
Create02_Period06	0	0	0	0	0	0	0	0	0	0
Create02_Period07	28	32	26	11	23	27	20	21	28	32
Create02_Period08	36	50	41	39	33	46	24	37	30	36
Create02_Period09	73	87	70	79	92	74	84	79	76	64
Create02_Period10	60	84	92	82	72	69	85	72	82	87
Create02_Period11	75	82	72	93	64	76	61	79	99	76
Create02_Period12	60	50	62	32	51	54	47	56	51	42
Create02_Period13	30	50	39	35	51	39	43	48	30	39
Create02_Period14	26	31	26	28	29	25	21	17	27	33
Create02_Period15	28	18	19	21	31	23	26	20	24	17
Create02_Period16	16	12	16	14	7	14	15	13	12	11
Create02_Period17	0	0	0	0	0	0	0	0	0	0
Create02_Period18	0	0	0	0	0	0	0	0	0	0
Create02_Period19	0	0	0	0	0	0	0	0	0	0
Create02_Period20	0	0	0	0	0	0	0	0	0	0
Create02_Period21	0	0	0	0	0	0	0	0	0	0
Create02_Period22	0	0	0	0	0	0	0	0	0	0
Create02_Period23	0	0	0	0	0	0	0	0	0	0
Create02_Period24	0	0	0	0	0	0	0	0	0	0
Create03_Period01	4	6	5	4	9	7	5	5	7	3
Create03_Period02	1	3	3	4	2	1	2	1	2	1
Create03_Period03	1	0	2	1	1	1	5	0	1	3
Create03_Period04	4	1	2	3	1	3	3	0	2	2
Create03_Period05	6	2	2	1	3	5	2	0	0	0
Create03_Period06	2	2	2	11	8	4	5	8	7	5
Create03_Period07	22	15	22	19	14	22	17	20	27	28
Create03_Period08	9	11	14	17	7	8	10	6	17	12
Create03_Period09	4	2	5	3	6	6	2	8	5	2
Create03_Period10	12	9	22	15	19	15	10	11	11	6
Create03_Period11	10	12	8	18	19	8	12	19	7	7
Create03_Period12	15	6	8	8	7	10	12	10	8	5

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Create03_Period13	14	9	14	18	7	7	5	10	15	10
Create03_Period14	13	18	8	9	16	13	17	14	12	13
Create03_Period15	14	11	17	21	21	23	18	15	22	23
Create03_Period16	14	16	14	8	10	12	9	10	9	8
Create03_Period17	10	11	16	12	9	8	11	17	13	13
Create03_Period18	9	9	9	4	10	6	10	12	11	9
Create03_Period19	15	10	9	10	6	15	11	10	12	10
Create03_Period20	8	13	11	11	15	7	11	10	11	14
Create03_Period21	3	5	2	8	7	4	7	13	6	9
Create03_Period22	7	7	3	10	10	10	11	4	7	14
Create03_Period23	7	5	6	4	8	3	10	8	8	4
Create03_Period24	4	6	9	5	9	4	5	9	5	6
Create04_Period01	0	0	0	0	0	0	0	0	0	0
Create04_Period02	0	0	0	0	0	0	0	0	0	0
Create04_Period03	2	2	1	0	0	1	0	2	1	0
Create04_Period04	0	0	0	0	0	0	0	0	0	0
Create04_Period05	0	0	0	0	0	0	0	0	0	0
Create04_Period06	1	0	3	1	1	1	0	2	1	1
Create04_Period07	1	3	3	5	4	2	5	4	2	4
Create04_Period08	26	16	14	20	22	19	17	21	12	18
Create04_Period09	10	24	25	28	23	24	24	18	22	22
Create04_Period10	26	28	25	27	34	19	11	26	35	24
Create04_Period11	16	14	17	9	17	26	7	17	11	13
Create04_Period12	15	10	12	18	12	9	10	11	5	7
Create04_Period13	7	14	14	12	12	9	12	7	14	11
Create04_Period14	12	5	6	10	4	6	7	7	6	7
Create04_Period15	9	7	12	10	9	3	10	2	10	6
Create04_Period16	2	7	6	8	1	5	7	1	6	7
Create04_Period17	6	1	2	1	4	5	2	5	1	6
Create04_Period18	3	4	6	7	3	5	6	4	4	2
Create04_Period19	6	3	7	5	8	6	5	2	9	7
Create04_Period20	3	1	2	3	3	2	0	4	3	2
Create04_Period21	1	1	0	0	0	0	0	1	0	2
Create04_Period22	3	4	3	1	0	0	1	2	4	1
Create04_Period23	3	1	2	2	2	1	3	5	0	1
Create04_Period24	1	4	0	0	0	0	1	1	0	1
Create05_Period01	13	4	12	3	8	2	6	5	4	12
Create05_Period02	3	7	4	6	5	8	3	4	5	1
Create05_Period03	9	16	18	8	9	9	15	10	17	9

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Create05_Period04	1	0	0	2	0	2	1	2	0	0
Create05_Period05	0	0	0	0	0	0	0	0	0	0
Create05_Period06	10	11	6	8	9	7	3	12	7	10
Create05_Period07	22	13	13	18	12	19	18	18	16	11
Create05_Period08	19	11	15	17	16	16	17	10	7	9
Create05_Period09	6	5	5	7	8	3	7	2	7	8
Create05_Period10	18	11	13	13	14	15	20	11	20	13
Create05_Period11	15	10	9	11	7	12	10	10	11	9
Create05_Period12	16	13	24	16	7	20	19	14	18	11
Create05_Period13	14	17	15	17	17	20	15	20	19	19
Create05_Period14	12	9	9	8	12	12	9	9	14	9
Create05_Period15	14	12	14	15	8	9	8	11	8	12
Create05_Period16	15	10	25	13	18	17	12	12	20	14
Create05_Period17	35	36	33	34	27	26	35	38	36	35
Create05_Period18	35	44	47	34	54	50	44	42	47	60
Create05_Period19	12	12	15	9	14	9	8	13	14	14
Create05_Period20	13	19	15	21	11	11	24	25	13	14
Create05_Period21	6	7	11	10	7	10	7	7	3	9
Create05_Period22	5	7	2	3	4	4	3	2	5	3
Create05_Period23	10	11	6	2	5	10	6	7	10	5
Create05_Period24	3	3	5	4	3	4	2	7	4	4
Create06_Period01	5	1	2	2	3	4	0	2	10	5
Create06_Period02	1	2	3	1	1	4	1	1	0	1
Create06_Period03	0	0	0	0	0	0	0	0	0	0
Create06_Period04	0	0	0	0	0	0	0	0	0	0
Create06_Period05	2	3	2	1	1	1	3	5	1	1
Create06_Period06	2	0	2	1	2	5	3	1	4	1
Create06_Period07	2	4	4	1	2	3	3	1	3	1
Create06_Period08	1	2	0	3	2	1	2	0	1	0
Create06_Period09	9	8	8	10	7	12	10	13	9	16
Create06_Period10	8	7	15	11	7	5	6	7	6	8
Create06_Period11	8	10	7	11	10	4	10	6	13	6
Create06_Period12	1	4	9	8	5	5	3	4	3	6
Create06_Period13	8	7	5	3	1	7	5	4	1	6
Create06_Period14	12	10	8	8	8	5	13	10	2	7
Create06_Period15	7	2	3	5	8	5	7	3	0	4
Create06_Period16	7	9	8	4	5	11	10	8	9	10
Create06_Period17	9	7	10	6	6	3	2	6	6	6
Create06_Period18	9	12	9	8	7	8	5	7	6	6

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Create06_Period19	0	1	1	0	1	4	4	2	3	2
Create06_Period20	3	8	5	6	2	8	6	3	5	3
Create06_Period21	7	7	9	5	6	4	4	6	9	8
Create06_Period22	3	4	2	4	4	4	2	3	7	1
Create06_Period23	5	0	2	5	4	2	2	5	4	2
Create06_Period24	0	0	0	0	0	0	0	0	0	0
Create07_Period01	2	6	5	3	6	5	2	4	3	2
Create07_Period02	2	1	2	1	3	0	1	0	5	1
Create07_Period03	1	1	0	2	0	1	0	1	0	0
Create07_Period04	1	0	0	0	0	0	2	1	0	1
Create07_Period05	2	5	6	3	4	3	2	1	3	2
Create07_Period06	11	3	8	4	5	9	9	7	9	5
Create07_Period07	7	2	6	5	1	3	6	2	8	4
Create07_Period08	8	6	5	11	6	9	2	7	6	5
Create07_Period09	17	12	9	9	13	9	13	13	11	8
Create07_Period10	7	12	16	14	21	13	11	7	13	10
Create07_Period11	28	13	11	24	14	19	21	17	17	22
Create07_Period12	12	14	18	14	13	17	17	13	8	14
Create07_Period13	10	5	18	7	9	11	16	10	13	11
Create07_Period14	9	4	7	11	10	13	11	11	5	10
Create07_Period15	9	8	8	2	8	9	8	9	7	5
Create07_Period16	1	5	5	6	9	2	8	5	7	3
Create07_Period17	11	13	8	13	13	12	5	11	11	6
Create07_Period18	10	8	7	9	6	9	8	11	9	8
Create07_Period19	6	2	6	5	6	2	3	6	3	2
Create07_Period20	3	1	2	4	4	5	1	2	4	5
Create07_Period21	8	10	8	9	8	14	6	9	11	14
Create07_Period22	5	7	4	8	2	4	5	5	4	4
Create07_Period23	1	2	5	5	4	3	6	5	2	4
Create07_Period24	0	0	0	0	0	0	0	0	0	0
Create08_Period01	14	17	15	11	16	13	10	10	12	16
Create08_Period02	0	3	2	5	6	3	3	3	1	2
Create08_Period03	1	1	1	1	1	1	0	2	3	0
Create08_Period04	0	1	1	2	0	1	0	1	1	2
Create08_Period05	2	4	4	1	1	1	1	1	0	3
Create08_Period06	0	1	1	0	3	2	1	0	1	0
Create08_Period07	4	3	2	9	2	4	4	3	9	3
Create08_Period08	9	4	10	11	8	11	14	11	17	9
Create08_Period09	24	21	32	23	27	32	42	26	27	28

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Create08_Period10	54	46	38	53	53	38	35	43	41	47
Create08_Period11	67	58	48	55	43	62	71	65	63	66
Create08_Period12	63	52	77	48	57	57	61	68	83	61
Create08_Period13	51	62	68	44	39	52	45	56	45	56
Create08_Period14	36	33	29	37	31	29	24	27	41	36
Create08_Period15	35	43	41	48	53	52	43	39	41	64
Create08_Period16	26	40	28	23	30	31	35	28	40	32
Create08_Period17	19	18	21	18	27	19	22	18	15	27
Create08_Period18	23	23	14	17	23	31	28	22	21	25
Create08_Period19	19	25	18	20	23	22	21	21	11	17
Create08_Period20	19	21	4	11	14	10	13	17	6	13
Create08_Period21	5	6	7	4	4	5	8	10	5	6
Create08_Period22	2	2	5	3	12	4	3	6	3	3
Create08_Period23	11	8	14	12	11	6	10	7	14	12
Create08_Period24	2	0	2	0	3	1	0	3	1	1
Create09_Period01	18	16	16	15	23	23	11	19	20	16
Create09_Period02	4	4	6	6	7	6	2	3	3	8
Create09_Period03	0	3	1	2	2	3	6	3	4	4
Create09_Period04	0	1	1	2	2	2	2	2	2	1
Create09_Period05	4	4	4	4	1	6	0	4	0	6
Create09_Period06	1	3	3	1	2	2	2	4	3	0
Create09_Period07	4	5	8	6	4	6	4	6	4	4
Create09_Period08	10	11	10	14	15	4	10	12	10	10
Create09_Period09	24	30	32	39	28	28	36	27	35	28
Create09_Period10	51	45	45	54	55	52	46	44	43	53
Create09_Period11	64	57	80	83	73	56	69	61	66	66
Create09_Period12	51	50	81	42	76	58	62	67	69	83
Create09_Period13	56	63	72	58	56	62	59	47	65	51
Create09_Period14	28	33	36	30	35	40	33	34	34	36
Create09_Period15	42	39	42	48	48	45	57	53	62	38
Create09_Period16	29	28	29	39	31	25	23	35	42	26
Create09_Period17	23	14	19	19	24	18	12	24	22	19
Create09_Period18	21	37	32	25	20	22	20	23	32	19
Create09_Period19	21	22	28	29	19	24	29	19	21	25
Create09_Period20	14	13	7	15	10	14	9	16	14	10
Create09_Period21	10	12	10	6	7	9	8	8	10	12
Create09_Period22	6	4	9	5	5	8	8	3	5	2
Create09_Period23	10	20	14	14	18	18	17	17	16	17
Create09_Period24	0	3	2	1	3	2	0	0	2	2

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Create10_Period01	67	53	67	78	62	82	69	78	64	66
Create10_Period02	11	9	16	10	11	13	14	13	13	21
Create10_Period03	12	8	12	11	7	12	13	11	13	10
Create10_Period04	5	5	5	8	4	9	7	9	6	9
Create10_Period05	10	5	3	9	6	6	5	4	5	3
Create10_Period06	2	2	2	4	4	3	2	4	4	2
Create10_Period07	14	19	15	16	20	14	20	18	12	18
Create10_Period08	16	15	22	16	15	14	14	15	21	13
Create10_Period09	24	22	20	23	20	17	29	21	24	25
Create10_Period10	32	40	36	32	33	34	34	25	25	45
Create10_Period11	32	34	34	30	33	35	32	22	30	42
Create10_Period12	31	23	40	29	52	35	41	38	26	37
Create10_Period13	20	19	24	22	20	25	14	22	18	13
Create10_Period14	23	25	17	30	27	27	31	26	19	31
Create10_Period15	19	25	30	28	25	30	22	19	27	17
Create10_Period16	20	16	11	22	21	20	15	26	16	19
Create10_Period17	26	33	26	30	14	27	27	29	20	16
Create10_Period18	21	27	16	21	27	31	16	26	22	22
Create10_Period19	18	17	18	10	24	29	28	32	14	29
Create10_Period20	19	10	12	17	11	15	18	18	13	15
Create10_Period21	16	23	30	27	15	30	19	20	24	16
Create10_Period22	14	8	16	11	13	17	17	10	13	13
Create10_Period23	27	23	22	21	23	31	19	33	26	34
Create10_Period24	5	9	0	9	4	8	5	8	9	7
Create11_Period01	53	47	56	58	57	51	55	60	49	59
Create11_Period02	3	1	1	1	2	7	3	0	6	3
Create11_Period03	3	7	2	4	3	6	5	6	2	4
Create11_Period04	0	1	0	2	0	4	2	1	1	0
Create11_Period05	2	2	0	1	1	2	0	1	2	4
Create11_Period06	2	0	3	1	3	0	1	0	0	1
Create11_Period07	15	11	19	9	15	6	8	17	8	12
Create11_Period08	22	10	23	17	26	22	13	16	18	27
Create11_Period09	19	17	27	17	19	27	20	23	21	10
Create11_Period10	32	36	34	31	31	32	27	37	32	30
Create11_Period11	35	34	32	36	29	24	23	24	28	31
Create11_Period12	15	19	15	16	14	12	15	16	11	15
Create11_Period13	20	19	17	18	14	16	16	13	15	15
Create11_Period14	27	25	22	28	21	30	28	24	21	28
Create11_Period15	33	32	29	29	18	22	35	27	17	26

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Create11_Period16	24	18	14	23	19	20	13	22	18	15
Create11_Period17	21	22	21	16	16	19	26	24	14	15
Create11_Period18	12	20	18	12	16	18	15	17	13	13
Create11_Period19	13	13	13	13	24	10	16	22	12	17
Create11_Period20	11	9	4	10	6	4	7	7	7	12
Create11_Period21	14	13	13	9	15	9	10	9	20	15
Create11_Period22	13	16	18	15	9	18	11	19	25	12
Create11_Period23	21	13	14	18	22	23	17	23	10	22
Create11_Period24	5	3	7	3	3	7	7	5	5	5
Create12_Period01	2	7	7	4	5	8	3	2	4	10
Create12_Period02	0	0	0	2	1	1	1	1	1	2
Create12_Period03	0	0	0	0	1	1	0	0	0	1
Create12_Period04	0	1	0	2	0	0	0	1	0	0
Create12_Period05	1	1	0	0	0	1	0	0	1	1
Create12_Period06	1	1	1	0	0	0	2	0	2	1
Create12_Period07	4	7	1	2	3	2	6	1	1	3
Create12_Period08	5	4	3	6	4	7	3	10	4	3
Create12_Period09	6	11	7	9	9	10	11	6	9	6
Create12_Period10	10	12	11	9	7	9	16	11	12	6
Create12_Period11	8	14	6	13	11	8	9	7	18	10
Create12_Period12	13	11	10	8	9	9	3	15	10	12
Create12_Period13	8	10	9	5	5	6	5	13	5	5
Create12_Period14	7	6	5	2	1	5	6	9	8	4
Create12_Period15	9	1	5	11	10	9	8	4	6	8
Create12_Period16	4	5	4	2	3	2	4	9	6	6
Create12_Period17	4	4	5	7	3	2	4	3	2	4
Create12_Period18	4	3	8	3	7	2	6	4	4	5
Create12_Period19	3	2	3	2	2	2	5	5	3	4
Create12_Period20	0	1	3	2	4	1	1	2	1	0
Create12_Period21	2	2	3	1	1	1	1	2	2	1
Create12_Period22	2	3	2	2	0	0	0	1	1	1
Create12_Period23	2	3	3	1	3	5	1	0	6	1
Create12_Period24	2	0	0	1	2	0	0	1	1	0
Destination 1	13	13	21	12	13	21	20	12	8	19
Destination 10	21	26	27	31	23	32	31	31	27	30
Destination 11	10	6	10	4	10	6	9	6	11	10
Destination 12	0	0	0	0	0	0	0	0	0	0
Destination 13	2	0	2	1	0	2	2	1	3	0
Destination 14	12	11	13	9	11	5	10	13	5	6

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Destination 15	22	16	17	16	25	21	16	33	24	17
Destination 16	40	56	58	37	54	51	46	37	41	56
Destination 17	7	8	6	9	6	8	2	6	6	5
Destination 18	8	7	6	12	7	2	9	14	6	9
Destination 19	65	40	60	47	46	61	61	47	59	61
Destination 2	10	9	6	6	4	5	8	8	11	7
Destination 20	1	0	2	2	2	2	1	2	1	0
Destination 21	2	0	0	0	3	3	0	2	0	1
Destination 22	10	8	12	11	7	8	7	5	11	10
Destination 23	2	2	0	0	0	2	1	0	3	1
Destination 24	0	0	0	0	0	0	0	0	0	0
Destination 25	2	2	1	2	2	1	1	3	3	1
Destination 26	1	0	1	1	1	1	1	1	0	2
Destination 27	10	4	8	6	3	6	5	7	6	8
Destination 28	13	27	16	12	24	13	19	26	20	23
Destination 29	8	6	8	11	6	8	8	3	7	15
Destination 3	81	77	77	79	87	97	88	83	88	85
Destination 30	8	5	7	8	4	5	7	4	9	16
Destination 31	6	4	8	6	6	7	6	8	9	4
Destination 32	43	37	45	34	29	29	30	47	30	43
Destination 33	0	0	0	0	0	0	0	0	0	0
Destination 34	42	33	30	37	39	42	41	33	31	44
Destination 35	3	1	2	3	3	3	1	0	2	2
Destination 36	68	82	65	82	84	85	73	73	94	83
Destination 37	14	6	3	5	14	10	11	14	14	15
Destination 38	1	1	0	2	2	5	0	2	0	2
Destination 39	2	3	1	1	1	2	1	1	1	2
Destination 4	0	0	0	0	0	0	0	0	0	0
Destination 40	0	3	0	3	0	3	0	2	2	2
Destination 41	10	18	17	9	13	21	23	10	10	21
Destination 42	50	49	68	64	61	78	58	63	63	57
Destination 43	111	116	109	130	106	127	112	113	109	126
Destination 44	57	45	65	52	53	51	57	56	58	50
Destination 45	6	13	9	6	7	10	10	9	11	12
Destination 46	103	116	136	116	118	119	120	116	122	114
Destination 47	52	49	66	57	66	56	57	55	59	59
Destination 48	0	1	1	2	0	0	0	2	4	1
Destination 49	0	3	3	3	1	1	2	2	0	0
Destination 5	73	83	63	63	75	59	61	70	66	81

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Destination 50	65	71	91	83	76	66	83	70	66	80
Destination 51	4	12	7	11	7	4	7	10	4	9
Destination 52	8	5	9	2	13	8	12	14	9	6
Destination 53	124	104	105	123	117	126	103	109	119	114
Destination 54	2	7	6	6	3	4	6	4	2	5
Destination 55	116	107	132	108	100	110	104	122	104	98
Destination 56	35	37	31	32	24	31	34	31	26	32
Destination 57	32	30	27	38	31	23	37	35	31	32
Destination 58	27	18	19	28	16	14	19	26	14	19
Destination 59	29	19	26	19	22	26	22	20	31	16
Destination 6	39	56	31	38	32	38	34	27	54	32
Destination 60	0	1	1	3	1	1	2	2	0	0
Destination 61	36	48	66	50	49	48	61	44	54	65
Destination 62	28	23	13	21	24	24	20	21	20	30
Destination 63	105	112	130	116	125	114	110	121	127	111
Destination 64	6	7	7	6	7	4	6	9	4	9
Destination 65	64	53	59	71	68	74	60	64	60	73
Destination 66	26	48	30	36	35	37	51	52	43	36
Destination 67	45	50	43	41	43	46	35	48	31	41
Destination 68	52	50	47	52	51	48	36	58	43	48
Destination 69	1	0	1	2	2	0	1	2	1	3
Destination 7	0	0	0	0	0	0	0	0	0	0
Destination 70	42	39	42	46	46	45	27	33	28	36
Destination 71	61	47	46	48	49	57	67	63	56	48
Destination 72	50	60	62	41	50	64	52	56	59	43
Destination 73	5	8	6	8	8	9	7	6	8	7
Destination 74	11	10	10	9	8	9	7	9	10	8
Destination 75	30	36	38	38	36	27	31	31	34	28
Destination 76	3	2	1	1	0	0	0	3	2	3
Destination 77	0	0	1	0	0	0	2	1	2	1
Destination 78	14	10	10	14	15	12	16	13	11	9
Destination 79	0	2	1	0	1	1	1	2	1	0
Destination 8	2	1	2	1	1	0	2	5	1	1
Destination 80	1	2	1	2	2	2	0	2	1	3
Destination 81	3	1	1	0	1	1	1	0	3	1
Destination 82	1	2	1	3	3	0	1	3	3	2
Destination 83	0	0	0	0	0	0	0	0	0	0
Destination 84	11	7	12	5	7	9	10	13	4	9
Destination 85	4	3	5	9	9	10	8	5	7	4

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Destination 86	0	0	0	0	0	0	0	0	0	0
Destination 87	0	0	0	0	0	0	0	0	0	0
Destination 88	0	0	0	0	0	0	0	0	0	0
Destination 89	0	0	0	0	0	0	0	0	0	0
Destination 9	11	10	6	9	10	9	9	8	6	11
Destination 90	0	0	0	0	0	0	0	0	0	0
Destination 91	0	0	0	0	0	0	0	0	0	0
Destination 92	0	0	0	0	0	0	0	0	0	0
Destination 93	0	0	0	0	0	0	0	0	0	0
Destination 94	0	0	0	0	0	0	0	0	0	0
Destination 95	0	0	0	0	0	0	0	0	0	0
Destination 96	0	0	0	0	0	0	0	0	0	0
Destination 97	0	0	0	0	0	0	0	0	0	0
Destination 98	0	0	0	0	0	0	0	0	0	0
Destination 99	0	0	0	0	0	0	0	0	0	0
Mix Arrival Fri	0	0	0	0	0	0	0	0	0	0
Mix Arrival Mon	3693	3696	3844	3710	3708	3785	3672	3760	3742	3743
Mix Arrival Sat	0	0	0	0	0	0	0	0	0	0
Mix Arrival Sun	0	0	0	0	0	0	0	0	0	0
Mix Arrival Thu	0	0	0	0	0	0	0	0	0	0
Mix Arrival Tue	0	0	0	0	0	0	0	0	0	0
Mix Arrival Wed	0	0	0	0	0	0	0	0	0	0
MixPeriod_ 01	178	157	185	178	189	195	161	185	173	189
MixPeriod_ 02	25	30	37	36	38	43	30	26	36	40
MixPeriod_ 03	29	38	37	29	24	35	44	35	41	31
MixPeriod_ 04	11	10	9	21	7	21	17	17	12	15
MixPeriod_ 05	29	26	21	20	17	25	13	16	12	20
MixPeriod_ 06	32	23	31	31	37	33	28	38	38	26
MixPeriod_ 07	141	132	135	121	118	123	127	127	134	135
MixPeriod_ 08	205	165	194	215	193	180	165	174	172	173
MixPeriod_ 09	257	288	298	296	303	301	335	280	298	265
MixPeriod_ 10	356	402	408	400	406	352	362	362	373	406
MixPeriod_ 11	413	400	387	432	360	389	377	386	418	406
MixPeriod_ 12	327	291	386	277	340	330	340	351	332	332
MixPeriod_ 13	278	302	330	261	260	299	271	280	276	267
MixPeriod_ 14	238	236	202	225	224	232	221	224	219	236
MixPeriod_ 15	241	212	232	249	247	254	254	213	243	236
MixPeriod_ 16	165	173	172	172	166	169	161	183	190	161
MixPeriod_ 17	164	159	161	156	143	139	146	175	140	147

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
MixPeriod_ 18	147	187	166	140	173	182	158	168	169	169
MixPeriod_ 19	113	107	118	103	127	123	130	132	102	127
MixPeriod_ 20	93	96	65	100	80	77	90	104	77	88
MixPeriod_ 21	72	86	93	79	70	86	70	85	90	92
MixPeriod_ 22	60	62	64	62	59	69	61	55	74	54
MixPeriod_ 23	97	86	88	84	100	102	91	110	96	102
MixPeriod_ 24	22	28	25	23	27	26	20	34	27	26
RecordAllCount	3693	3696	3844	3709	3708	3785	3672	3759	3742	3743
Source 1	0	0	0	0	0	2	1	0	0	2
Source 10	12	13	12	7	13	17	10	15	14	6
Source 11	36	58	47	27	36	33	32	42	36	37
Source 12	2	3	3	1	2	3	4	1	2	1
Source 13	46	52	64	56	62	56	53	62	44	47
Source 14	10	15	9	11	9	12	10	9	8	13
Source 15	25	31	33	29	35	32	22	25	26	38
Source 16	14	19	17	13	13	18	16	21	20	24
Source 17	34	46	26	33	35	34	25	39	36	30
Source 18	6	3	10	9	6	3	11	5	7	6
Source 19	57	59	60	59	43	54	56	61	59	66
Source 2	1	1	1	2	1	1	2	3	3	3
Source 20	4	3	0	1	1	1	0	1	2	3
Source 21	22	22	23	22	22	23	22	18	33	25
Source 22	56	58	44	45	44	65	56	45	52	59
Source 23	22	25	21	12	21	15	22	20	24	26
Source 24	12	15	16	15	9	10	10	7	7	11
Source 25	4	1	3	1	2	0	1	0	2	1
Source 26	35	32	34	38	34	35	35	32	41	34
Source 27	6	6	12	14	7	11	13	11	8	9
Source 28	16	10	11	8	10	9	12	6	10	8
Source 29	158	154	160	160	171	157	162	165	162	159
Source 3	45	41	35	35	46	41	46	41	38	28
Source 30	9	14	16	11	9	9	15	8	11	10
Source 31	17	33	23	21	19	30	28	19	23	25
Source 32	23	17	18	16	18	14	8	10	14	12
Source 33	6	6	8	12	7	8	9	4	8	4
Source 34	26	42	37	46	33	32	24	34	40	38
Source 35	12	11	10	13	16	11	11	15	19	13
Source 36	35	23	31	31	28	28	34	35	30	21
Source 37	4	4	8	5	4	6	1	5	11	5

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Source 38	5	6	10	7	10	6	4	8	7	6
Source 39	30	37	32	30	30	27	37	31	37	22
Source 4	131	115	127	128	125	117	106	107	114	107
Source 40	161	154	163	150	146	162	156	148	147	161
Source 41	5	4	5	2	2	7	6	5	6	7
Source 42	43	33	40	39	46	45	40	25	37	37
Source 43	42	44	49	43	46	51	41	44	43	47
Source 44	23	22	13	24	23	28	27	30	22	18
Source 45	7	13	9	15	13	11	9	15	11	7
Source 46	29	21	33	19	21	23	23	23	29	24
Source 47	0	1	1	0	1	2	2	2	0	1
Source 48	12	14	14	18	10	15	10	15	8	15
Source 49	9	12	15	12	9	13	18	16	14	10
Source 5	4	3	2	5	10	6	9	9	3	3
Source 50	18	20	15	8	8	11	12	13	10	13
Source 51	10	10	11	10	5	8	13	11	10	10
Source 52	3	4	2	0	1	0	0	0	3	1
Source 53	7	6	4	4	4	7	5	7	6	4
Source 54	19	12	13	15	17	19	17	12	9	15
Source 55	12	16	19	16	9	21	15	25	16	19
Source 56	34	19	39	36	38	37	34	23	26	32
Source 57	14	18	9	17	16	5	21	18	15	8
Source 58	7	6	8	12	7	8	7	8	7	6
Source 59	5	11	5	2	6	5	2	5	2	7
Source 6	10	10	14	8	10	13	9	5	15	6
Source 60	0	0	0	0	0	0	0	0	0	0
Source 61	7	6	5	3	9	3	7	9	9	4
Source 62	17	23	20	9	15	14	20	20	24	14
Source 63	20	18	20	18	18	21	16	27	21	23
Source 64	27	38	30	36	37	47	27	40	34	45
Source 65	26	11	27	30	20	25	18	22	21	26
Source 66	15	12	20	15	16	12	15	20	23	11
Source 67	27	18	20	22	22	16	15	20	16	14
Source 68	11	16	15	14	20	16	20	13	21	15
Source 69	12	6	17	15	10	7	3	5	9	9
Source 7	1	1	1	0	0	1	0	2	1	2
Source 70	28	20	20	25	13	20	25	26	24	24
Source 71	18	21	15	13	18	17	18	18	15	7
Source 72	18	19	24	32	22	25	27	22	26	36

Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
Source 73	11	8	9	10	16	6	7	9	11	12
Source 74	5	5	5	5	7	5	9	12	10	7
Source 75	17	10	13	13	17	11	14	11	16	8
Source 76	0	1	1	1	1	1	1	2	0	0
Source 77	2	0	2	1	0	1	1	1	0	0
Source 78	0	0	1	0	0	1	0	1	2	1
Source 79	1	1	0	1	3	2	2	1	2	0
Source 8	0	0	0	0	0	0	0	0	0	0
Source 80	0	2	0	3	0	0	2	3	2	4
Source 81	10	9	8	9	7	2	6	9	7	5
Source 82	2	6	5	9	4	2	5	3	6	5
Source 83	5	2	6	3	4	4	3	3	3	5
Source 84	0	0	0	0	0	0	0	0	0	0
Source 85	23	36	28	27	34	24	27	29	37	31
Source 86	9	3	7	5	7	5	6	10	8	5
Source 87	0	0	0	0	0	0	0	0	0	0
Source 88	0	0	0	0	0	0	0	0	0	0
Source 89	0	0	0	0	0	0	0	0	0	0
Source 9	1	1	2	1	2	2	0	3	1	1
Source 90	0	0	0	0	0	0	0	0	0	0
Source 91	0	0	0	0	0	0	0	0	0	0
Source 92	0	0	0	0	0	0	0	0	0	0
Source 93	0	0	0	0	0	0	0	0	0	0
Source 94	0	0	0	0	0	0	0	0	0	0
Source 95	0	0	0	0	0	0	0	0	0	0
Source 96	0	0	0	0	0	0	0	0	0	0
Source 97	0	0	0	0	0	0	0	0	0	0
Source 98	0	0	0	0	0	0	0	0	0	0
Source 99	0	0	0	0	0	0	0	0	0	0
Entity Create.Number In	3693	3696	3844	3710	3708	3785	3672	3760	3742	3743
Entity Create.Number Out	3693	3696	3844	3709	3708	3785	3672	3759	3742	3743
Entity Other.Number In	0	0	0	0	0	0	0	0	0	0
Entity Other.Number Out	0	0	0	0	0	0	0	0	0	0
Entity OutScope.Number In	0	0	0	0	0	0	0	0	0	0
Entity OutScope.Number Out	0	0	0	0	0	0	0	0	0	0
Output_Complete Job	3693	3696	3844	3709	3708	3785	3672	3759	3742	3743
Output_Errorcase	0	0	0	0	0	0	0	0	0	0
Output_Job Building DIPD	80.57	80.87	81.93	81.35	81.85	82.27	81.08	81.62	82.64	79.00
Output_Job Building DOPD	95.66	96.15	95.57	95.52	95.75	96.41	95.38	95.45	96.32	95.45

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Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
QSet_D1SentLR_1.NumberInQueue	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
QSet_D1SentLR_1.WaitingTime	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02
QSet_D1SentLR_2.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_D1SentLR_2.WaitingTime	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01
QSet_D2SentLR_1.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_D2SentLR_1.WaitingTime	0.04	0.03	0.04	0.04	0.03	0.04	0.03	0.04	0.03	0.04
QSet_D2SentLR_2.NumberInQueue	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
QSet_D2SentLR_2.WaitingTime	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
QSet_D3SentLR_1.NumberInQueue	0.04	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.03
QSet_D3SentLR_2.NumberInQueue	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
QSet_Hub1BlowerZone03_1.NumberInQueue	0.05	0.05	0.05	0.05	0.04	0.05	0.05	0.05	0.05	0.06
QSet_Hub1BlowerZone03_1.WaitingTime	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
QSet_Hub1BlowerZone04_2.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub1BlowerZone04_2.WaitingTime	0	0	0	0	0	0	0	0	0	0
QSet_Hub1BlowerZone05_3.NumberInQueue	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
QSet_Hub1BlowerZone05_3.WaitingTime	0.08	0.08	0.08	0.08	0.07	0.08	0.07	0.08	0.07	0.08
QSet_Hub1BlowerZone06_4.NumberInQueue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QSet_Hub1BlowerZone07_5.NumberInQueue	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.02
QSet_Hub1BlowerZone07_5.WaitingTime	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
QSet_Hub1BlowerZone08_6.NumberInQueue	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03
QSet_Hub1BlowerZone08_6.WaitingTime	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02
QSet_Hub1Roller_1.NumberInQueue	0.07	0.07	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07
QSet_Hub1Roller_1.WaitingTime	0.10	0.10	0.10	0.10	0.10	0.11	0.10	0.11	0.10	0.10
QSet_Hub2BlowerZone09_1.NumberInQueue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QSet_Hub2BlowerZone09_1.WaitingTime	0	0	0	0	0	0	0	0	0	0
QSet_Hub2BlowerZone10_2.NumberInQueue	0.04	0.04	0.04	0.03	0.03	0.04	0.03	0.04	0.04	0.04
QSet_Hub2BlowerZone10_2.WaitingTime	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.03
QSet_Hub2BlowerZone11_3.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub2BlowerZone11_3.WaitingTime	0.11	0.11	0.11	0.11	0.10	0.11	0.11	0.11	0.10	0.11
QSet_Hub2BlowerZone12_4.NumberInQueue	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.05
QSet_Hub2BlowerZone14_5.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub2BlowerZone14_5.WaitingTime	0.10	0.10	0.11	0.09	0.10	0.10	0.10	0.11	0.11	0.10
QSet_Hub2BlowerZone15_6.NumberInQueue	0.08	0.09	0.10	0.09	0.10	0.09	0.09	0.09	0.10	0.10
QSet_Hub2Roller_2.NumberInQueue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QSet_Hub2Roller_2.WaitingTime	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
QSet_PathD1H1_4.NumberInQueue	0.12	0.14	0.14	0.14	0.14	0.13	0.14	0.14	0.15	0.14
QSet_PathD1H1_4.WaitingTime	0.09	0.10	0.10	0.10	0.09	0.10	0.10	0.10	0.09	0.10
QSet_PathD2H2_6.NumberInQueue	0.04	0.04	0.05	0.04	0.04	0.05	0.04	0.04	0.04	0.05
QSet_PathD2H2_6.WaitingTime	0	0	0	0	0	0	0	0	0	0

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Statistic Name	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
ResPathZone10.NumberBusy	148	172	158	151	135	149	142	162	160	174
ResPathZone10.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathZone10.Utilization	1814	1758	1824	1792	1773	1869	1776	1837	1745	1848
ResPathZone11.NumberBusy	208	214	227	170	182	196	196	227	232	205
ResPathZone11.NumberScheduled	173	169	178	177	171	185	160	155	161	167
ResPathZone11.Utilization	153	125	135	123	137	158	138	146	133	145
ResPathZone12.NumberBusy	489	472	483	469	457	481	453	494	436	477
ResPathZone12.NumberScheduled	181	187	187	189	169	182	188	182	177	202
ResPathZone12.Utilization	800	790	806	852	829	882	818	833	797	852
ResPathZone13.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone13.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathZone13.Utilization	713	750	751	732	727	726	735	722	736	757
ResPathZone14.NumberBusy	660	641	656	657	631	667	629	680	609	651
ResPathZone14.NumberScheduled	16	13	12	11	6	8	14	18	18	14
ResPathZone14.Utilization	208	189	213	224	224	202	210	220	225	207
ResPathZone15.NumberBusy	280	248	278	272	257	277	264	254	261	246
ResPathZone15.NumberScheduled	274	264	279	278	274	285	264	286	267	244
ResPathZone15.Utilization	309	280	297	304	289	274	249	274	269	284
ResPathZone16.NumberBusy	568	571	549	516	574	571	571	565	579	584
ResPathZone16.NumberScheduled	856	823	864	884	861	929	862	899	833	862
ResPathZone16.Utilization	2	2	3	4	2	1	4	7	1	1
ResPathZone17.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone17.NumberScheduled	302	316	321	285	293	304	295	323	309	337
ResPathZone17.Utilization	306	288	316	279	275	295	292	291	305	291
ResPathZone18.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone18.NumberScheduled	499	514	518	499	482	518	495	489	473	510
ResPathZone18.Utilization	569	579	605	564	545	592	575	562	534	595
ResPathZone19.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone19.NumberScheduled	660	674	722	647	686	690	675	699	747	702
ResPathZone19.Utilization	586	628	697	640	649	630	625	657	691	642
ResPathZone20.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone20.NumberScheduled	3693	3696	3844	3709	3708	3785	3672	3759	3742	3743
ResPathZone20.Utilization	4.98	4.60	9.45	8.66	0.88	6.44	3.99	1.80	6.39	0.86
ResPathZone21.NumberBusy	1.35	2.67	2.42	1.00	1.09	1.08	0.54	1.50	2.24	0.00
ResPathZone21.NumberScheduled	35.53	34.97	34.92	35.23	34.77	35.60	35.22	35.54	34.74	35.70
ResPathZone21.Utilization	36.87	36.23	36.39	36.73	36.14	36.77	36.75	36.77	36.58	37.24
ResPathZone22.NumberBusy	1.28	1.18	1.36	1.48	1.34	1.10	1.49	1.21	1.76	1.48
ResPathZone22.NumberScheduled	1.87	1.94	2.44	1.87	1.74	1.86	2.06	1.44	2.50	2.31
ResPathZone22.Utilization	1.18	1.56	1.57	0.84	1.59	1.63	1.25	1.54	2.17	1.63

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Count_CreateType01	341	308	327	349	359	330	313	336	340	335
Count_CreateType02	445	458	409	470	451	469	432	472	442	495
Count_CreateType03	216	193	194	204	221	220	188	209	211	220
Count_CreateType04	136	137	157	137	149	129	162	130	129	162
Count_CreateType05	314	316	272	289	266	278	302	284	289	271
Count_CreateType06	106	99	97	106	108	94	99	89	104	89
Count_CreateType07	168	171	178	138	161	174	179	180	185	176
Count_CreateType08	477	493	459	477	508	495	428	493	490	520
Count_CreateType09	531	557	513	519	560	506	545	558	548	542
Count_CreateType10	476	528	504	514	501	544	488	497	503	482
Count_CreateType11	406	385	405	395	407	399	399	363	379	384
Count_CreateType12	115	92	116	91	113	94	89	93	95	96
Counter_BuildddingDestination1	168	171	178	138	161	174	179	180	185	176
Counter_BuildddingDestination2	223	233	209	188	214	225	224	221	206	226
Counter_BuildddingDestination3	475	457	447	481	505	446	462	471	479	454
Counter_BuildddingDestination4	45	29	41	36	43	47	35	47	43	45
Counter_BuildddingDestination5	467	414	441	491	494	457	432	453	461	454
Counter_BuildddingDestination6	1219	1259	1219	1251	1267	1244	1204	1260	1213	1324
Counter_BuildddingDestination7	597	656	617	593	624	627	585	569	611	592
Counter_BuildddingDestination8	537	518	479	511	496	512	501	503	516	501
Counter_BuildddingSource1	106	99	97	106	108	94	99	89	104	89
Counter_BuildddingSource2	601	621	588	594	630	581	611	628	628	620
Counter_BuildddingSource3	140	144	131	119	136	141	130	130	136	147
Counter_BuildddingSource4	215	169	190	196	194	202	192	181	197	174
Counter_BuildddingSource5	288	298	304	304	332	275	278	301	299	289
Counter_BuildddingSource6	1186	1217	1145	1193	1218	1204	1151	1207	1174	1276
Counter_BuildddingSource7	1188	1186	1173	1172	1183	1233	1157	1164	1175	1174
Counter_BuildddingSource8	7	3	3	5	3	2	4	4	1	3
Counter_ByOrder01	925	944	890	930	971	917	920	964	905	997
Counter_ByOrder02	668	649	608	606	661	662	635	661	677	676
Counter_ByOrder03	935	1011	980	956	948	978	924	930	940	951
Counter_ByOrder04	493	475	471	497	524	463	471	494	509	470
Counter_ByOrder05	300	305	288	293	289	291	283	280	300	290
Counter_ByOrder06	62	39	45	46	49	52	53	57	42	57
Counter_ByOrder07	66	64	81	61	71	70	75	68	68	67
Counter_ByOrder08	270	231	249	291	275	285	247	243	255	249
Counter_ByOrder09	12	19	19	9	16	14	14	7	18	15
Counter_ByRoute01	925	944	890	930	971	917	920	964	905	997
Counter_ByRoute02	285	279	264	256	306	298	271	279	292	298

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Counter_ByRoute03	383	370	344	350	355	364	364	382	385	378
Counter_ByRoute04	312	317	329	300	315	295	316	280	290	290
Counter_ByRoute05	623	694	651	656	633	683	608	650	650	661
Counter_ByRoute06	351	359	342	356	383	324	350	362	372	342
Counter_ByRoute07	142	116	129	141	141	139	121	132	137	128
Counter_ByRoute08	0	0	0	0	0	0	0	0	0	0
Counter_ByRoute09	123	130	110	108	118	128	116	125	125	135
Counter_ByRoute10	64	53	63	69	63	68	57	59	69	67
Counter_ByRoute11	45	39	40	41	35	34	50	30	40	31
Counter_ByRoute12	68	83	75	75	73	61	60	66	66	57
Counter_ByRoute13	30	11	13	15	13	20	25	19	17	19
Counter_ByRoute14	5	12	9	6	13	10	8	7	4	8
Counter_ByRoute15	13	5	8	9	13	15	13	18	14	16
Counter_ByRoute16	14	11	15	16	10	7	7	13	7	14
Counter_ByRoute17	5	6	9	5	9	1	6	3	1	6
Counter_ByRoute18	2	1	2	2	3	2	3	4	7	5
Counter_ByRoute19	24	13	22	15	16	28	18	19	16	11
Counter_ByRoute20	35	44	48	39	43	39	48	42	44	45
Counter_ByRoute21	30	19	24	26	26	26	21	25	23	26
Counter_ByRoute22	124	105	115	141	127	131	122	114	122	117
Counter_ByRoute23	90	87	84	107	102	102	85	90	87	90
Counter_ByRoute24	26	20	26	17	20	26	19	14	23	16
Counter_ByRoute25	2	3	5	0	2	3	0	0	3	2
Counter_ByRoute26	3	5	3	3	4	5	7	1	6	3
Counter_ByRoute27	0	2	2	0	0	0	0	1	0	0
Counter_ByRoute28	1	7	5	4	3	4	5	4	4	6
Counter_ByRoute29	1	0	1	0	3	2	1	1	0	2
Counter_ByRoute30	3	1	0	0	1	0	1	0	3	1
Counter_ByRoute31	2	0	3	2	1	0	0	0	2	0
Counter_ByRoute32	0	1	0	0	2	0	0	0	0	1
CounterP_ByOrder01	925	944	890	930	971	917	920	964	905	997
CounterP_ByOrder02	668	649	608	606	661	662	637	661	678	676
CounterP_ByOrder03	935	1011	980	956	948	978	924	930	940	951
CounterP_ByOrder04	493	475	471	497	524	463	471	494	509	470
CounterP_ByOrder05	300	305	288	293	289	291	283	280	300	290
CounterP_ByOrder06	62	39	45	46	49	52	53	57	42	57
CounterP_ByOrder07	66	64	81	61	71	70	75	68	68	67
CounterP_ByOrder08	270	231	249	291	275	285	247	243	255	249
CounterP_ByOrder09	12	19	19	9	16	14	14	7	18	15

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
CounterP_ByRoute01	925	944	890	930	971	917	920	964	905	997
CounterP_ByRoute02	285	279	264	256	306	298	272	279	292	298
CounterP_ByRoute03	383	370	344	350	355	364	365	382	386	378
CounterP_ByRoute04	312	317	329	300	315	295	316	280	290	290
CounterP_ByRoute05	623	694	651	656	633	683	608	650	650	661
CounterP_ByRoute06	351	359	342	356	383	324	350	362	372	342
CounterP_ByRoute07	142	116	129	141	141	139	121	132	137	128
CounterP_ByRoute08	0	0	0	0	0	0	0	0	0	0
CounterP_ByRoute09	123	130	110	108	118	128	116	125	125	135
CounterP_ByRoute10	64	53	63	69	63	68	57	59	69	67
CounterP_ByRoute11	45	39	40	41	35	34	50	30	40	31
CounterP_ByRoute12	68	83	75	75	73	61	60	66	66	57
CounterP_ByRoute13	30	11	13	15	13	20	25	19	17	19
CounterP_ByRoute14	5	12	9	6	13	10	8	7	4	8
CounterP_ByRoute15	13	5	8	9	13	15	13	18	14	16
CounterP_ByRoute16	14	11	15	16	10	7	7	13	7	14
CounterP_ByRoute17	5	6	9	5	9	1	6	3	1	6
CounterP_ByRoute18	2	1	2	2	3	2	3	4	7	5
CounterP_ByRoute19	24	13	22	15	16	28	18	19	16	11
CounterP_ByRoute20	35	44	48	39	43	39	48	42	44	45
CounterP_ByRoute21	30	19	24	26	26	26	21	25	23	26
CounterP_ByRoute22	124	105	115	141	127	131	122	114	122	117
CounterP_ByRoute23	90	87	84	107	102	102	85	90	87	90
CounterP_ByRoute24	26	20	26	17	20	26	19	14	23	16
CounterP_ByRoute25	2	3	5	0	2	3	0	0	3	2
CounterP_ByRoute26	3	5	3	3	4	5	7	1	6	3
CounterP_ByRoute27	0	2	2	0	0	0	0	1	0	0
CounterP_ByRoute28	1	7	5	4	3	4	5	4	4	6
CounterP_ByRoute29	1	0	1	0	3	2	1	1	0	2
CounterP_ByRoute30	3	1	0	0	1	0	1	0	3	1
CounterP_ByRoute31	2	0	3	2	1	0	0	0	2	0
CounterP_ByRoute32	0	1	0	0	2	0	0	0	0	1
CounterP_ByRouteError	0	0	0	0	0	0	0	0	0	0
CountLTT_BuildD1_E	128	140	139	111	127	141	138	150	146	140
CountLTT_BuildD2_R	193	208	183	170	189	197	203	207	179	208
CountLTT_BuildD3_H	388	368	361	368	384	338	383	369	399	372
CountLTT_BuildD4_I	18	8	16	15	21	19	15	22	22	21
CountLTT_BuildD5_W	328	295	309	331	351	309	289	331	326	322
CountLTT_BuildD6_DOPD	1155	1190	1150	1184	1201	1172	1144	1188	1149	1244

[illegible]

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Create02_Period06	0	0	0	0	0	0	0	0	0	0
Create02_Period07	22	23	27	28	21	21	18	18	13	25
Create02_Period08	38	34	38	39	38	31	39	34	38	41
Create02_Period09	61	71	75	84	79	85	75	80	83	95
Create02_Period10	96	91	73	81	81	85	89	86	92	100
Create02_Period11	73	79	61	79	73	95	72	92	67	82
Create02_Period12	50	44	45	49	57	47	48	53	50	53
Create02_Period13	43	38	31	33	35	42	36	44	39	44
Create02_Period14	22	35	22	31	27	26	23	32	25	17
Create02_Period15	30	26	22	30	24	27	22	22	21	26
Create02_Period16	10	17	15	16	16	10	10	11	14	12
Create02_Period17	0	0	0	0	0	0	0	0	0	0
Create02_Period18	0	0	0	0	0	0	0	0	0	0
Create02_Period19	0	0	0	0	0	0	0	0	0	0
Create02_Period20	0	0	0	0	0	0	0	0	0	0
Create02_Period21	0	0	0	0	0	0	0	0	0	0
Create02_Period22	0	0	0	0	0	0	0	0	0	0
Create02_Period23	0	0	0	0	0	0	0	0	0	0
Create02_Period24	0	0	0	0	0	0	0	0	0	0
Create03_Period01	11	12	6	9	7	8	8	5	7	11
Create03_Period02	0	5	1	3	4	5	3	2	0	1
Create03_Period03	1	0	2	1	1	2	2	2	2	2
Create03_Period04	2	0	2	1	4	3	0	4	1	1
Create03_Period05	1	1	1	2	3	1	1	2	2	4
Create03_Period06	8	5	6	9	4	6	5	6	2	5
Create03_Period07	30	19	18	15	23	25	22	28	32	25
Create03_Period08	5	9	8	10	14	15	13	11	7	13
Create03_Period09	6	7	6	4	8	4	5	9	7	7
Create03_Period10	13	15	12	7	16	7	12	4	9	15
Create03_Period11	9	7	11	8	13	14	8	12	13	7
Create03_Period12	10	8	7	8	8	7	6	10	9	14
Create03_Period13	11	7	16	8	14	14	12	6	12	8
Create03_Period14	12	9	11	11	11	19	11	11	9	16
Create03_Period15	24	20	23	26	25	19	12	23	17	14
Create03_Period16	8	12	9	6	8	13	8	12	7	9
Create03_Period17	13	12	10	22	10	15	11	9	10	13
Create03_Period18	7	7	9	7	5	4	7	10	11	6
Create03_Period19	10	10	12	10	13	10	9	11	18	13
Create03_Period20	11	7	4	11	11	13	4	11	10	14

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Create03_Period21	8	6	3	6	5	1	7	4	11	3
Create03_Period22	7	5	7	6	8	6	9	8	3	2
Create03_Period23	6	3	6	9	1	4	8	5	6	11
Create03_Period24	3	7	4	5	5	5	5	4	6	6
Create04_Period01	0	0	0	0	0	0	0	0	0	0
Create04_Period02	0	0	0	0	0	0	0	0	0	0
Create04_Period03	0	0	2	1	3	1	0	0	1	4
Create04_Period04	0	0	0	0	0	0	0	0	0	0
Create04_Period05	0	0	0	0	0	0	0	0	0	0
Create04_Period06	1	0	1	2	0	1	2	1	2	0
Create04_Period07	0	3	3	3	2	4	0	0	5	2
Create04_Period08	17	16	16	18	15	11	19	16	19	19
Create04_Period09	20	22	25	20	33	25	23	28	28	27
Create04_Period10	15	17	26	23	23	19	31	21	18	23
Create04_Period11	8	17	20	13	12	9	16	14	11	13
Create04_Period12	15	11	14	9	10	13	7	12	10	9
Create04_Period13	8	14	8	13	10	13	11	7	6	13
Create04_Period14	10	6	6	6	7	3	13	10	1	11
Create04_Period15	8	4	8	3	7	4	13	6	9	7
Create04_Period16	2	7	6	5	5	7	4	2	1	5
Create04_Period17	5	0	3	1	4	3	2	4	5	3
Create04_Period18	3	4	7	5	3	2	5	3	5	5
Create04_Period19	13	8	5	5	5	8	8	4	4	8
Create04_Period20	6	1	2	3	2	1	1	0	1	4
Create04_Period21	0	1	2	1	3	1	2	0	1	0
Create04_Period22	1	1	2	3	3	1	2	1	0	5
Create04_Period23	3	1	1	3	2	3	3	1	1	1
Create04_Period24	1	4	0	0	0	0	0	0	1	3
Create05_Period01	7	8	6	2	4	2	3	8	6	4
Create05_Period02	6	4	4	6	3	6	5	5	6	2
Create05_Period03	14	13	12	5	7	14	12	7	8	17
Create05_Period04	0	1	0	1	1	0	1	0	0	1
Create05_Period05	0	0	0	0	0	0	0	0	0	0
Create05_Period06	4	8	13	6	9	6	6	7	10	5
Create05_Period07	23	13	13	17	18	14	13	8	15	21
Create05_Period08	18	11	16	13	13	15	10	13	13	14
Create05_Period09	4	8	5	6	3	1	6	8	9	6
Create05_Period10	17	20	12	13	18	14	11	12	11	8
Create05_Period11	9	5	6	8	10	12	14	10	7	10

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Create05_Period12	18	20	14	16	14	24	13	9	13	20
Create05_Period13	21	25	19	25	22	21	17	19	15	15
Create05_Period14	13	13	11	9	8	5	14	13	13	12
Create05_Period15	9	18	11	10	9	14	22	10	19	11
Create05_Period16	23	15	12	25	5	18	17	16	15	7
Create05_Period17	31	26	20	34	30	21	39	38	37	30
Create05_Period18	45	39	48	47	39	50	50	47	39	38
Create05_Period19	12	18	10	7	14	7	17	10	10	8
Create05_Period20	16	27	10	10	12	10	10	18	13	19
Create05_Period21	9	9	13	6	4	9	4	4	8	7
Create05_Period22	2	4	5	11	9	7	3	7	8	3
Create05_Period23	7	9	7	10	10	5	7	12	9	11
Create05_Period24	6	2	5	2	4	3	8	3	5	2
Create06_Period01	5	2	8	4	4	5	6	1	2	4
Create06_Period02	6	1	2	4	4	1	3	1	1	3
Create06_Period03	0	0	0	0	0	0	0	0	0	0
Create06_Period04	0	0	0	0	0	0	0	0	0	0
Create06_Period05	0	6	1	2	3	1	0	3	0	0
Create06_Period06	3	2	3	3	1	3	1	4	2	2
Create06_Period07	2	0	1	2	1	0	2	3	2	2
Create06_Period08	2	1	0	2	1	1	1	1	1	0
Create06_Period09	9	9	11	10	11	6	14	5	8	5
Create06_Period10	11	3	8	9	8	8	6	5	10	3
Create06_Period11	10	10	6	7	6	9	5	6	6	9
Create06_Period12	4	5	6	3	8	3	7	4	5	2
Create06_Period13	5	3	5	6	6	10	6	7	11	7
Create06_Period14	6	9	6	10	13	7	6	4	7	12
Create06_Period15	4	4	2	3	3	4	5	4	7	5
Create06_Period16	7	9	3	8	12	11	7	7	6	8
Create06_Period17	6	6	3	2	10	2	9	6	7	7
Create06_Period18	7	11	5	10	6	8	3	9	13	6
Create06_Period19	0	0	0	1	0	3	0	0	0	0
Create06_Period20	6	7	6	8	2	3	10	4	6	9
Create06_Period21	6	6	8	7	5	2	4	5	5	2
Create06_Period22	3	2	4	3	1	5	2	7	1	1
Create06_Period23	4	3	9	2	3	2	2	3	4	2
Create06_Period24	0	0	0	0	0	0	0	0	0	0
Create07_Period01	4	2	2	1	5	1	1	2	4	6
Create07_Period02	0	2	2	1	4	0	4	4	5	1

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Create07_Period03	3	3	2	2	1	1	2	1	1	0
Create07_Period04	0	1	1	1	0	0	3	0	0	0
Create07_Period05	4	4	4	2	3	3	1	2	2	3
Create07_Period06	10	10	5	8	11	7	7	13	7	8
Create07_Period07	3	1	3	9	4	6	8	3	3	3
Create07_Period08	6	7	4	0	3	4	3	5	8	8
Create07_Period09	9	11	16	12	12	18	14	7	15	9
Create07_Period10	13	8	20	13	11	11	14	20	17	21
Create07_Period11	20	18	14	13	18	21	12	19	15	15
Create07_Period12	13	22	17	11	10	21	21	14	14	12
Create07_Period13	13	15	12	7	17	12	18	19	18	8
Create07_Period14	10	7	5	6	7	12	11	14	11	10
Create07_Period15	8	4	6	6	7	9	7	16	9	7
Create07_Period16	5	7	10	5	9	6	5	4	2	9
Create07_Period17	7	9	7	11	11	9	16	11	11	10
Create07_Period18	10	16	16	5	7	10	9	7	13	11
Create07_Period19	4	3	3	8	2	3	0	4	5	7
Create07_Period20	9	4	10	6	4	3	4	2	8	4
Create07_Period21	8	9	11	8	7	9	14	9	17	17
Create07_Period22	6	6	6	2	2	6	4	0	0	5
Create07_Period23	3	2	2	1	6	2	1	4	0	2
Create07_Period24	0	0	0	0	0	0	0	0	0	0
Create08_Period01	9	14	12	19	11	11	12	16	17	19
Create08_Period02	3	3	5	3	2	5	2	2	4	2
Create08_Period03	0	0	0	1	0	0	1	2	0	2
Create08_Period04	1	1	1	1	1	0	1	1	1	0
Create08_Period05	1	0	0	2	1	1	1	0	2	3
Create08_Period06	0	2	0	1	0	1	1	0	0	2
Create08_Period07	4	1	4	1	3	6	4	2	4	4
Create08_Period08	13	11	12	9	12	11	5	8	3	13
Create08_Period09	34	28	24	31	33	31	28	19	34	33
Create08_Period10	31	56	43	45	46	56	39	50	34	43
Create08_Period11	62	77	52	49	63	69	48	71	62	76
Create08_Period12	61	50	66	42	73	81	53	59	56	61
Create08_Period13	52	53	44	59	61	41	50	55	69	46
Create08_Period14	28	36	36	28	28	25	30	31	31	31
Create08_Period15	50	47	40	62	39	36	40	51	40	51
Create08_Period16	27	27	29	22	37	27	32	31	36	28
Create08_Period17	17	16	19	26	21	12	15	17	26	24

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Create08_Period18	25	22	20	18	25	22	17	17	19	31
Create08_Period19	18	16	27	19	20	19	16	23	26	19
Create08_Period20	14	9	13	16	7	12	9	8	8	13
Create08_Period21	14	10	5	4	11	8	9	9	7	6
Create08_Period22	6	2	0	5	5	6	3	2	3	9
Create08_Period23	5	11	7	13	9	14	12	19	7	4
Create08_Period24	2	1	0	1	0	1	0	0	1	0
Create09_Period01	14	15	16	14	16	16	20	13	13	16
Create09_Period02	5	7	7	4	4	3	7	3	5	4
Create09_Period03	7	4	2	3	2	0	3	3	3	0
Create09_Period04	3	4	1	2	2	3	4	0	2	3
Create09_Period05	3	2	5	5	1	4	4	3	4	5
Create09_Period06	0	3	0	1	4	2	0	3	6	2
Create09_Period07	5	9	3	8	6	4	5	6	4	5
Create09_Period08	18	9	14	11	11	13	10	12	15	14
Create09_Period09	21	32	28	27	44	31	38	37	24	32
Create09_Period10	47	55	40	47	45	33	42	54	48	49
Create09_Period11	70	70	56	56	71	55	74	79	58	70
Create09_Period12	64	69	59	64	65	80	56	62	68	53
Create09_Period13	60	59	45	47	66	40	56	56	55	56
Create09_Period14	31	36	38	34	25	34	28	33	35	42
Create09_Period15	49	43	46	56	53	47	44	58	39	48
Create09_Period16	24	39	33	34	35	33	31	38	37	37
Create09_Period17	27	28	24	18	24	26	19	20	25	22
Create09_Period18	21	20	22	26	27	18	28	19	45	23
Create09_Period19	17	20	23	14	19	25	25	17	14	22
Create09_Period20	13	10	16	16	19	11	14	10	15	9
Create09_Period21	6	4	12	7	5	8	18	6	12	10
Create09_Period22	5	4	7	9	3	6	3	7	7	8
Create09_Period23	17	13	16	16	10	10	15	16	10	11
Create09_Period24	4	2	0	0	3	4	1	3	4	1
Create10_Period01	65	85	83	74	70	75	61	63	55	76
Create10_Period02	16	16	13	11	15	19	10	7	16	10
Create10_Period03	5	15	5	13	11	7	7	6	13	6
Create10_Period04	8	9	6	3	7	9	7	5	11	6
Create10_Period05	4	4	3	1	2	4	2	4	6	3
Create10_Period06	3	5	2	2	5	2	4	5	6	2
Create10_Period07	14	19	10	21	13	15	18	14	16	16
Create10_Period08	16	15	18	19	13	12	13	20	19	16

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Create10_Period09	27	23	22	24	24	32	21	19	16	23
Create10_Period10	28	32	34	31	22	47	28	45	39	29
Create10_Period11	37	33	36	32	38	22	35	36	32	35
Create10_Period12	37	37	33	36	31	40	46	39	31	41
Create10_Period13	17	17	15	21	16	27	24	23	22	16
Create10_Period14	33	21	31	24	25	33	24	20	20	14
Create10_Period15	22	19	25	21	26	26	22	34	29	23
Create10_Period16	11	25	19	13	13	16	16	15	18	13
Create10_Period17	31	21	19	32	31	31	33	27	32	22
Create10_Period18	27	24	23	24	19	31	19	20	24	35
Create10_Period19	15	23	20	32	19	23	20	19	22	27
Create10_Period20	12	17	17	18	18	13	14	12	17	12
Create10_Period21	18	19	20	16	27	21	20	24	19	18
Create10_Period22	8	19	15	11	14	11	9	15	9	8
Create10_Period23	20	19	28	25	34	24	29	21	25	21
Create10_Period24	2	11	7	10	8	4	6	4	6	10
Create11_Period01	55	47	62	52	60	55	48	47	46	51
Create11_Period02	2	4	5	3	3	6	2	2	2	1
Create11_Period03	1	7	2	5	7	2	2	6	6	4
Create11_Period04	1	2	2	1	1	1	1	0	0	0
Create11_Period05	2	0	1	0	4	1	3	1	1	1
Create11_Period06	1	0	0	3	0	0	3	0	2	0
Create11_Period07	11	11	15	11	16	8	10	17	14	13
Create11_Period08	21	13	19	11	24	20	30	13	14	14
Create11_Period09	19	15	27	18	22	23	19	17	25	20
Create11_Period10	33	28	33	39	33	25	38	27	33	38
Create11_Period11	40	25	22	35	28	27	34	23	35	29
Create11_Period12	21	18	17	16	21	18	16	16	11	18
Create11_Period13	10	18	7	17	9	11	14	19	11	12
Create11_Period14	24	35	24	24	26	30	28	20	26	28
Create11_Period15	45	34	25	36	28	31	28	19	21	25
Create11_Period16	24	18	21	13	16	17	21	23	24	19
Create11_Period17	18	14	25	17	16	21	12	24	15	21
Create11_Period18	10	14	12	17	7	14	16	19	17	15
Create11_Period19	12	17	20	18	12	13	17	19	9	9
Create11_Period20	6	9	7	7	9	11	6	7	9	7
Create11_Period21	11	15	22	15	25	18	15	15	14	17
Create11_Period22	13	14	12	13	10	16	20	10	20	18
Create11_Period23	18	21	19	17	25	22	13	13	21	18

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Create11_Period24	8	6	6	7	5	9	3	6	3	6
Create12_Period01	7	5	4	3	9	3	5	5	4	6
Create12_Period02	0	1	1	0	2	0	1	1	1	1
Create12_Period03	1	1	1	1	2	1	1	3	2	0
Create12_Period04	1	1	1	0	1	1	0	0	1	0
Create12_Period05	0	0	0	1	0	0	0	0	0	0
Create12_Period06	0	0	1	0	0	1	0	1	1	1
Create12_Period07	4	5	4	6	3	3	1	2	0	4
Create12_Period08	5	1	7	4	2	0	2	4	6	8
Create12_Period09	4	11	13	8	15	7	5	13	6	5
Create12_Period10	12	9	16	11	13	19	7	8	13	7
Create12_Period11	16	12	15	14	8	13	16	8	14	13
Create12_Period12	10	4	6	5	7	8	8	11	6	10
Create12_Period13	8	12	9	4	6	5	10	6	7	9
Create12_Period14	10	5	8	3	2	6	7	4	8	3
Create12_Period15	9	5	6	8	11	6	5	5	6	8
Create12_Period16	5	1	1	3	4	1	1	3	4	6
Create12_Period17	5	5	5	3	5	5	4	4	3	6
Create12_Period18	4	5	6	4	4	3	4	1	4	2
Create12_Period19	2	3	3	4	7	3	4	4	3	0
Create12_Period20	5	2	5	3	2	1	4	2	2	2
Create12_Period21	0	1	0	4	3	0	3	3	2	3
Create12_Period22	2	0	2	0	5	2	1	2	1	1
Create12_Period23	4	2	2	2	2	6	0	3	1	1
Create12_Period24	1	1	0	0	0	0	0	0	0	0
Destination 1	16	12	22	17	19	13	25	16	14	20
Destination 10	24	25	30	23	28	17	20	22	21	24
Destination 11	5	10	9	6	12	3	6	8	10	9
Destination 12	0	0	0	0	0	0	0	0	0	0
Destination 13	0	1	0	0	2	3	0	2	0	3
Destination 14	6	6	11	5	9	7	7	2	6	5
Destination 15	20	23	27	14	22	12	13	28	23	22
Destination 16	46	43	41	59	44	55	60	47	49	48
Destination 17	13	4	11	9	5	10	6	7	9	11
Destination 18	6	9	8	9	9	9	10	8	10	10
Destination 19	43	52	58	47	70	47	42	64	52	49
Destination 2	5	6	6	9	6	8	6	6	9	8
Destination 20	2	1	3	1	1	0	0	2	0	1
Destination 21	4	1	1	4	0	0	1	2	0	1

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Destination 22	12	2	10	7	7	14	9	13	12	10
Destination 23	1	2	0	2	4	1	2	0	0	1
Destination 24	0	0	0	0	0	0	0	0	0	0
Destination 25	4	1	0	1	4	1	0	2	1	1
Destination 26	0	0	3	1	2	1	0	3	1	1
Destination 27	6	8	7	8	7	5	7	5	2	8
Destination 28	18	11	19	17	24	17	18	20	17	19
Destination 29	7	6	8	4	7	9	6	8	10	11
Destination 3	80	91	74	80	80	97	77	85	85	78
Destination 30	10	16	12	4	4	9	2	5	8	11
Destination 31	7	10	4	10	3	5	7	6	8	12
Destination 32	39	35	38	34	42	37	30	37	40	32
Destination 33	0	0	0	0	0	0	0	0	0	0
Destination 34	36	40	37	44	29	44	42	46	21	37
Destination 35	3	2	2	1	1	1	2	0	0	3
Destination 36	79	80	77	79	82	71	86	72	74	66
Destination 37	16	20	12	13	11	9	5	10	15	13
Destination 38	1	1	3	2	1	0	0	1	1	1
Destination 39	0	2	0	1	2	1	0	1	2	5
Destination 4	0	0	0	0	0	0	0	0	0	0
Destination 40	0	2	0	1	3	1	0	2	0	1
Destination 41	22	16	16	20	13	18	20	12	18	20
Destination 42	55	60	57	36	71	68	54	50	68	71
Destination 43	93	134	119	126	115	146	100	124	109	104
Destination 44	71	55	51	54	55	49	47	57	50	45
Destination 45	6	8	6	14	11	7	2	15	11	10
Destination 46	125	113	123	134	141	107	112	129	126	122
Destination 47	79	48	43	66	48	57	63	59	74	49
Destination 48	3	2	1	0	3	2	2	0	1	1
Destination 49	1	2	2	1	0	4	0	1	2	1
Destination 5	70	67	60	71	75	80	61	74	68	74
Destination 50	80	57	62	94	90	79	77	82	78	80
Destination 51	8	9	6	10	9	7	7	5	15	7
Destination 52	13	8	7	1	10	3	10	7	8	15
Destination 53	106	113	128	109	142	127	122	118	121	121
Destination 54	2	1	4	2	3	5	3	2	5	5
Destination 55	115	110	118	100	94	117	105	101	109	104
Destination 56	33	39	38	34	30	37	31	26	35	29
Destination 57	38	39	34	30	39	35	26	33	31	32

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Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Destination 93	0	0	0	0	0	0	0	0	0	0
Destination 94	0	0	0	0	0	0	0	0	0	0
Destination 95	0	0	0	0	0	0	0	0	0	0
Destination 96	0	0	0	0	0	0	0	0	0	0
Destination 97	0	0	0	0	0	0	0	0	0	0
Destination 98	0	0	0	0	0	0	0	0	0	0
Destination 99	0	0	0	0	0	0	0	0	0	0
Mix Arrival Fri	0	0	0	0	0	0	0	0	0	0
Mix Arrival Mon	3731	3737	3631	3689	3804	3732	3624	3704	3715	3772
Mix Arrival Sat	0	0	0	0	0	0	0	0	0	0
Mix Arrival Sun	0	0	0	0	0	0	0	0	0	0
Mix Arrival Thu	0	0	0	0	0	0	0	0	0	0
Mix Arrival Tue	0	0	0	0	0	0	0	0	0	0
Mix Arrival Wed	0	0	0	0	0	0	0	0	0	0
MixPeriod_ 01	177	190	199	178	186	176	164	160	154	193
MixPeriod_ 02	38	43	40	35	41	45	37	27	40	25
MixPeriod_ 03	32	43	28	32	34	28	30	30	36	35
MixPeriod_ 04	16	19	14	10	17	17	17	10	16	11
MixPeriod_ 05	15	17	15	15	17	15	12	15	17	19
MixPeriod_ 06	30	35	31	35	34	29	29	40	38	27
MixPeriod_ 07	137	120	110	135	123	120	123	113	129	131
MixPeriod_ 08	192	155	183	165	179	151	165	169	173	201
MixPeriod_ 09	258	289	301	296	355	315	305	303	311	324
MixPeriod_ 10	373	384	375	382	378	386	375	392	390	386
MixPeriod_ 11	411	399	361	368	392	399	373	420	370	407
MixPeriod_ 12	341	324	315	307	342	389	317	329	300	328
MixPeriod_ 13	278	290	250	270	303	267	274	299	299	265
MixPeriod_ 14	227	239	224	209	203	225	226	210	217	219
MixPeriod_ 15	279	239	227	284	248	241	241	267	234	248
MixPeriod_ 16	160	186	167	163	169	169	161	168	172	164
MixPeriod_ 17	160	137	135	166	162	145	160	160	171	158
MixPeriod_ 18	159	162	168	163	142	162	158	152	190	172
MixPeriod_ 19	103	118	123	118	111	114	116	111	111	113
MixPeriod_ 20	98	93	90	98	86	78	76	74	89	93
MixPeriod_ 21	80	80	96	74	95	77	96	79	96	83
MixPeriod_ 22	53	57	60	63	60	66	56	59	52	60
MixPeriod_ 23	87	84	97	98	102	92	90	97	84	82
MixPeriod_ 24	27	34	22	25	25	26	23	20	26	28
RecordAllCount	3731	3737	3631	3689	3804	3732	3622	3704	3714	3772

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
Source 1	3	0	2	1	1	2	3	1	2	0
Source 10	14	10	11	12	8	9	10	13	9	10
Source 11	50	42	38	39	37	45	40	47	33	47
Source 12	2	1	2	1	1	1	0	2	1	1
Source 13	54	34	47	50	51	50	45	31	46	51
Source 14	6	12	17	9	9	13	11	18	9	16
Source 15	27	38	29	24	34	26	27	24	33	38
Source 16	20	16	18	15	14	20	14	17	19	14
Source 17	30	51	31	37	21	41	41	39	30	37
Source 18	4	5	7	2	8	3	4	6	6	8
Source 19	67	52	62	54	50	65	64	49	51	58
Source 2	1	0	1	0	0	1	2	1	1	1
Source 20	2	1	4	2	4	0	0	1	1	0
Source 21	17	27	18	18	26	25	20	14	27	22
Source 22	54	45	45	63	48	49	47	59	55	47
Source 23	24	14	22	23	26	21	24	15	12	24
Source 24	10	11	18	8	20	15	11	11	10	7
Source 25	1	1	3	1	1	2	0	1	2	1
Source 26	29	34	43	34	48	23	33	42	36	33
Source 27	10	5	10	14	11	9	6	15	8	15
Source 28	5	9	17	8	12	7	6	12	7	12
Source 29	162	161	141	181	172	156	159	167	154	176
Source 3	43	46	29	39	38	39	39	36	44	26
Source 30	16	6	11	7	15	14	19	21	15	15
Source 31	26	25	15	34	22	26	26	21	24	23
Source 32	17	14	17	16	16	13	11	18	16	26
Source 33	8	6	7	7	3	6	7	8	12	5
Source 34	35	37	41	34	40	39	38	32	39	28
Source 35	6	14	10	16	17	11	12	12	14	10
Source 36	33	36	27	22	30	30	31	29	35	32
Source 37	5	2	5	4	6	5	4	7	5	4
Source 38	12	4	9	8	4	9	12	5	12	4
Source 39	35	30	35	27	35	29	26	31	33	19
Source 4	106	107	119	103	108	102	124	103	94	133
Source 40	168	160	158	168	184	162	148	164	151	170
Source 41	6	5	5	5	2	4	6	4	7	6
Source 42	35	33	40	35	30	37	30	49	32	51
Source 43	58	42	48	38	43	56	57	50	48	38
Source 44	20	34	18	22	33	21	25	21	30	29

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Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
QSet_D3SentLR_1.NumberInQueue	0.04	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.03
QSet_D3SentLR_2.NumberInQueue	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
QSet_Hub1BlowerZone03_1.NumberInQueue	0.05	0.04	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05
QSet_Hub1BlowerZone03_1.WaitingTime	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
QSet_Hub1BlowerZone04_2.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub1BlowerZone04_2.WaitingTime	0	0	0	0	0	0	0	0	0	0
QSet_Hub1BlowerZone05_3.NumberInQueue	0.09	0.09	0.08	0.09	0.09	0.09	0.09	0.09	0.08	0.10
QSet_Hub1BlowerZone05_3.WaitingTime	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07
QSet_Hub1BlowerZone06_4.NumberInQueue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QSet_Hub1BlowerZone07_5.NumberInQueue	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03
QSet_Hub1BlowerZone07_5.WaitingTime	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
QSet_Hub1BlowerZone08_6.NumberInQueue	0.03	0.04	0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.04
QSet_Hub1BlowerZone08_6.WaitingTime	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
QSet_Hub1Roller_1.NumberInQueue	0.07	0.07	0.06	0.06	0.07	0.07	0.06	0.07	0.07	0.07
QSet_Hub1Roller_1.WaitingTime	0.10	0.11	0.10	0.10	0.10	0.11	0.10	0.10	0.10	0.10
QSet_Hub2BlowerZone09_1.NumberInQueue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QSet_Hub2BlowerZone09_1.WaitingTime	0	0	0	0	0	0	0	0	0	0
QSet_Hub2BlowerZone10_2.NumberInQueue	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.04	0.04
QSet_Hub2BlowerZone10_2.WaitingTime	0.04	0.04	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03
QSet_Hub2BlowerZone11_3.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub2BlowerZone11_3.WaitingTime	0.11	0.10	0.11	0.11	0.11	0.11	0.10	0.10	0.11	0.10
QSet_Hub2BlowerZone12_4.NumberInQueue	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
QSet_Hub2BlowerZone14_5.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub2BlowerZone14_5.WaitingTime	0.11	0.10	0.10	0.10	0.11	0.11	0.10	0.10	0.10	0.10
QSet_Hub2BlowerZone15_6.NumberInQueue	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.10	0.10	0.09
QSet_Hub2Roller_2.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub2Roller_2.WaitingTime	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
QSet_PathD1H1_4.NumberInQueue	0.14	0.14	0.14	0.14	0.15	0.13	0.14	0.14	0.15	0.14
QSet_PathD1H1_4.WaitingTime	0.10	0.08	0.09	0.11	0.10	0.10	0.09	0.09	0.09	0.09
QSet_PathD2H2_6.NumberInQueue	0.04	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
QSet_PathD2H2_6.WaitingTime	0	0	0	0	0	0	0	0	0	0
QSet_PathH1D1_3.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_PathH1D1_3.WaitingTime	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03
QSet_PathH1H2_1.NumberInQueue	0.13	0.12	0.13	0.12	0.13	0.13	0.13	0.12	0.12	0.12
QSet_PathH1H2_1.WaitingTime	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QSet_PathH2D2_5.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_PathH2D2_5.WaitingTime	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.02
QSet_PathH2H1_2.NumberInQueue	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03
QSet_PathH2H1_2.WaitingTime	0.47	0.47	0.46	0.46	0.47	0.49	0.45	0.45	0.46	0.47

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Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
ResHub1BlowerZone08.Utilization	1	1	1	1	1	1	1	1	1	1
ResHub1Roller_1.NumberBusy	1	1	1	1	1	1	1	1	1	1
ResHub1Roller_1.NumberScheduled	1	1	1	1	1	1	1	1	1	1
ResHub1Roller_1.Utilization	1	1	1	1	1	1	1	1	1	1
ResHub2BlowerZone09.NumberBusy	1	1	1	1	1	1	1	1	1	1
ResHub2BlowerZone09.NumberScheduled	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ResHub2BlowerZone09.Utilization	0.14	0.14	0.14	0.14	0.15	0.13	0.14	0.14	0.15	0.14
ResHub2BlowerZone10.NumberBusy	0.10	0.08	0.09	0.11	0.10	0.10	0.09	0.09	0.09	0.09
ResHub2BlowerZone10.NumberScheduled	0.04	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
ResHub2BlowerZone10.Utilization	0	0	0	0	0	0	0	0	0	0
ResHub2BlowerZone11.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResHub2BlowerZone11.NumberScheduled	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone11.Utilization	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
ResHub2BlowerZone12.NumberBusy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone12.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResHub2BlowerZone12.Utilization	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone14.NumberBusy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone14.NumberScheduled	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
ResHub2BlowerZone14.Utilization	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone15.NumberBusy	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ResHub2BlowerZone15.NumberScheduled	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02
ResHub2BlowerZone15.Utilization	0	0	0	0	0	0	0	0	0	0
ResHub2Roller_2.NumberBusy	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01
ResHub2Roller_2.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResHub2Roller_2.Utilization	0.04	0.04	0.04	0.04	0.03	0.04	0.03	0.03	0.03	0.03
ResPathD1H1_4.NumberBusy	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ResPathD1H1_4.NumberScheduled	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ResPathD1H1_4.Utilization	0.04	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.03
ResPathD2H2_6.NumberBusy	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
ResPathD2H2_6.NumberScheduled	0.05	0.04	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05
ResPathD2H2_6.Utilization	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
ResPathH1D1_3.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathH1D1_3.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathH1D1_3.Utilization	0.09	0.09	0.08	0.09	0.09	0.09	0.09	0.09	0.08	0.10
ResPathH1H2_1.NumberBusy	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07
ResPathH1H2_1.NumberScheduled	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResPathH1H2_1.Utilization	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03
ResPathH2D2_5.NumberBusy	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
ResPathH2D2_5.NumberScheduled	0.03	0.04	0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.04

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
ResPathH2D2_5.Utilization	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
ResPathH2H1_2.NumberBusy	0.07	0.07	0.06	0.06	0.07	0.07	0.06	0.07	0.07	0.07
ResPathH2H1_2.NumberScheduled	0.10	0.11	0.10	0.10	0.10	0.11	0.10	0.10	0.10	0.10
ResPathH2H1_2.Utilization	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResPathZone01.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone01.NumberScheduled	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.04	0.04
ResPathZone01.Utilization	0.04	0.04	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03
ResPathZone02.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone02.NumberScheduled	0.11	0.10	0.11	0.11	0.11	0.11	0.10	0.10	0.11	0.10
ResPathZone02.Utilization	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ResPathZone03.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone03.NumberScheduled	0.11	0.10	0.10	0.10	0.11	0.11	0.10	0.10	0.10	0.10
ResPathZone03.Utilization	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.10	0.10	0.09
ResPathZone04.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone04.NumberScheduled	25	27	24	17	27	26	20	16	20	18
ResPathZone04.Utilization	427	429	425	437	461	408	423	435	462	428
ResPathZone05.NumberBusy	284	244	265	304	283	284	262	262	275	268
ResPathZone05.NumberScheduled	105	128	128	117	121	102	108	110	113	103
ResPathZone05.Utilization	0	0	0	0	0	0	0	0	0	0
ResPathZone06.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone06.NumberScheduled	99	98	89	101	108	109	99	98	88	102
ResPathZone06.Utilization	496	469	487	460	497	485	489	447	467	460
ResPathZone07.NumberBusy	7	3	3	5	3	2	4	4	1	3
ResPathZone07.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathZone07.Utilization	106	99	97	106	108	94	99	89	104	89
ResPathZone08.NumberBusy	78	74	78	72	84	90	73	86	88	104
ResPathZone08.NumberScheduled	1790	1810	1788	1771	1823	1871	1738	1737	1788	1809
ResPathZone08.Utilization	36	46	36	40	41	44	32	46	46	40
ResPathZone09.NumberBusy	348	336	329	337	358	329	314	344	355	363
ResPathZone09.NumberScheduled	612	640	608	640	601	658	594	631	620	610
ResPathZone09.Utilization	0	0	0	0	0	0	0	0	0	0
ResPathZone10.NumberBusy	153	165	155	138	133	166	157	146	146	162
ResPathZone10.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathZone10.Utilization	1806	1833	1811	1808	1796	1828	1755	1757	1794	1778
ResPathZone11.NumberBusy	200	207	199	191	202	211	194	197	215	224
ResPathZone11.NumberScheduled	178	181	189	172	174	164	178	158	171	148
ResPathZone11.Utilization	157	132	136	147	155	160	139	131	136	137
ResPathZone12.NumberBusy	479	465	494	481	489	467	480	432	456	455
ResPathZone12.NumberScheduled	187	157	177	199	185	191	175	176	179	184

Statistic Name	Rep 11	Rep 12	Rep 13	Rep 14	Rep 15	Rep 16	Rep 17	Rep 18	Rep 19	Rep 20
ResPathZone12.Utilization	804	860	835	836	821	880	780	816	825	827
ResPathZone13.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone13.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathZone13.Utilization	733	759	708	764	753	758	723	747	720	806
ResPathZone14.NumberBusy	666	666	663	654	678	687	638	643	637	619
ResPathZone14.NumberScheduled	13	11	12	19	12	14	14	14	14	11
ResPathZone14.Utilization	216	193	194	204	221	220	187	209	211	220
ResPathZone15.NumberBusy	274	270	275	244	269	268	278	269	289	265
ResPathZone15.NumberScheduled	248	264	252	238	265	278	252	243	283	296
ResPathZone15.Utilization	266	270	284	268	277	266	281	269	255	291
ResPathZone16.NumberBusy	554	562	523	548	575	559	497	566	561	570
ResPathZone16.NumberScheduled	869	909	875	873	863	895	851	847	866	851
ResPathZone16.Utilization	1	1	4	4	0	2	3	0	4	2
ResPathZone17.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone17.NumberScheduled	302	313	313	287	302	309	305	312	312	324
ResPathZone17.Utilization	314	316	272	289	266	278	301	284	289	271
ResPathZone18.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone18.NumberScheduled	507	454	495	512	500	495	475	467	489	461
ResPathZone18.Utilization	572	542	569	608	615	559	540	563	574	557
ResPathZone19.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone19.NumberScheduled	712	698	681	696	743	696	684	690	724	704
ResPathZone19.Utilization	638	655	623	618	666	620	639	650	658	646
ResPathZone20.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone20.NumberScheduled	3731	3737	3631	3689	3804	3732	3622	3704	3714	3772
ResPathZone20.Utilization	0	4.71	10.34	0	0	0.591	1.985	6.834	10.93	4.416
ResPathZone21.NumberBusy	2.278	0.307	0.593	0.903	2.121	1.717	0.274	1.736	0.173	0
ResPathZone21.NumberScheduled	35.48	35.55	36.06	35.71	35.08	36.04	35.27	34.7	35.35	34.89
ResPathZone21.Utilization	36.98	36.97	37.47	37.33	36.62	37.64	36.59	36.32	36.56	36.12
ResPathZone22.NumberBusy	1.48	1.359	1.312	1.553	1.529	1.523	1.28	1.577	1.173	1.221
ResPathZone22.NumberScheduled	1.583	1.913	2.366	2.279	1.589	2.4	1.761	2.076	1.365	1.448
ResPathZone22.Utilization	1.799	1.924	1.155	1.947	2.072	1.914	1.419	1.404	1.793	0.485

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Count_CreateType01	356	337	327	348	347	368	376	315	324	320
Count_CreateType02	424	483	465	490	457	451	449	443	494	435
Count_CreateType03	193	220	189	178	202	214	177	186	234	210
Count_CreateType04	150	142	147	138	169	129	140	136	156	156
Count_CreateType05	267	301	326	307	284	293	286	264	294	284
Count_CreateType06	78	90	85	91	112	98	87	101	92	121
Count_CreateType07	160	184	175	146	176	167	143	143	180	162
Count_CreateType08	484	492	485	471	504	487	515	445	480	498
Count_CreateType09	522	543	540	503	539	559	536	511	530	490
Count_CreateType10	527	485	520	453	527	503	521	534	501	510
Count_CreateType11	414	366	375	403	390	427	390	353	394	362
Count_CreateType12	101	111	96	94	104	91	89	91	115	103
Counter_BuilddingDestination1	160	184	175	146	176	167	143	143	180	162
Counter_BuilddingDestination2	228	200	218	213	254	204	202	201	201	230
Counter_BuilddingDestination3	439	465	475	417	427	478	490	449	456	406
Counter_BuilddingDestination4	52	41	39	38	47	43	40	38	47	49
Counter_BuilddingDestination5	480	459	427	475	463	498	481	430	447	431
Counter_BuilddingDestination6	1250	1273	1266	1247	1292	1242	1277	1199	1323	1251
Counter_BuilddingDestination7	597	595	603	586	650	638	600	595	602	610
Counter_BuilddingDestination8	470	537	527	499	502	516	476	467	537	512
Counter_BuilddingSource1	78	90	85	91	112	98	87	101	92	121
Counter_BuilddingSource2	586	621	619	569	615	638	600	585	617	558
Counter_BuilddingSource3	147	129	128	140	150	147	103	137	168	153
Counter_BuilddingSource4	191	201	181	215	221	201	221	171	184	207
Counter_BuilddingSource5	316	295	302	300	292	313	297	268	286	256
Counter_BuilddingSource6	1180	1271	1235	1187	1214	1146	1217	1120	1251	1211
Counter_BuilddingSource7	1173	1146	1176	1116	1202	1240	1184	1138	1191	1143
Counter_BuilddingSource8	5	1	4	3	5	3	0	2	4	2
Counter_ByOrder01	981	933	955	918	995	889	971	898	950	921
Counter_ByOrder02	592	687	640	621	634	688	611	580	669	650
Counter_ByOrder03	945	951	968	933	1000	982	978	942	971	963
Counter_ByOrder04	462	515	478	475	468	532	521	454	490	439
Counter_ByOrder05	301	287	296	301	314	322	253	286	324	303
Counter_ByOrder06	41	48	56	33	44	44	50	56	44	55
Counter_ByOrder07	58	76	74	68	80	57	58	56	75	54
Counter_ByOrder08	277	234	243	255	263	259	253	243	251	244
Counter_ByOrder09	19	23	20	17	13	13	14	7	19	22
Counter_ByRoute01	981	933	955	918	995	889	971	898	950	921
Counter_ByRoute02	247	306	250	259	273	299	249	237	289	274

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Counter_ByRoute03	345	381	390	362	361	389	362	343	380	376
Counter_ByRoute04	312	272	291	310	317	317	306	281	297	299
Counter_ByRoute05	633	679	677	623	683	665	672	661	674	664
Counter_ByRoute06	322	375	359	316	318	379	362	339	358	301
Counter_ByRoute07	140	140	119	159	150	153	159	115	132	138
Counter_ByRoute08	0	0	0	0	0	0	0	0	0	0
Counter_ByRoute09	133	113	112	122	135	134	92	126	147	131
Counter_ByRoute10	55	62	69	60	71	74	55	71	76	57
Counter_ByRoute11	31	41	38	36	40	34	44	29	29	51
Counter_ByRoute12	82	71	77	83	68	80	62	60	72	64
Counter_ByRoute13	12	20	18	10	18	18	27	22	21	17
Counter_ByRoute14	0	4	9	4	8	9	3	2	4	10
Counter_ByRoute15	14	8	9	10	8	8	12	10	9	15
Counter_ByRoute16	15	16	20	9	10	9	8	22	10	13
Counter_ByRoute17	4	4	4	6	7	3	4	3	5	7
Counter_ByRoute18	4	4	2	0	1	1	1	1	5	3
Counter_ByRoute19	13	18	22	16	27	15	17	21	20	17
Counter_ByRoute20	37	50	46	46	45	38	36	31	45	27
Counter_ByRoute21	32	28	27	23	34	32	26	23	33	25
Counter_ByRoute22	120	117	100	124	118	132	110	112	125	109
Counter_ByRoute23	100	69	98	88	90	82	97	84	77	89
Counter_ByRoute24	25	20	18	20	21	13	20	24	16	21
Counter_ByRoute25	1	2	2	1	1	2	0	1	3	6
Counter_ByRoute26	7	6	8	8	6	7	3	4	10	6
Counter_ByRoute27	0	3	1	2	1	0	1	0	1	2
Counter_ByRoute28	5	8	4	4	2	4	6	0	2	4
Counter_ByRoute29	3	2	0	2	2	0	0	1	2	1
Counter_ByRoute30	1	0	2	0	1	0	0	1	0	1
Counter_ByRoute31	2	1	2	0	0	0	4	0	1	1
Counter_ByRoute32	0	1	1	0	0	0	0	0	0	1
CounterP_ByOrder01	981	933	955	918	995	889	971	898	950	921
CounterP_ByOrder02	592	687	640	621	634	688	611	580	669	650
CounterP_ByOrder03	945	951	968	933	1000	982	978	942	972	963
CounterP_ByOrder04	462	515	478	475	468	532	521	454	490	439
CounterP_ByOrder05	301	287	296	302	314	322	253	286	324	303
CounterP_ByOrder06	41	48	56	33	44	44	50	56	44	55
CounterP_ByOrder07	58	76	74	68	80	57	58	56	75	54
CounterP_ByOrder08	277	234	243	255	263	260	253	243	251	244
CounterP_ByOrder09	19	23	20	17	13	13	14	7	19	22

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
CounterP_ByRoute01	981	933	955	918	995	889	971	898	950	921
CounterP_ByRoute02	247	306	250	259	273	299	249	237	289	274
CounterP_ByRoute03	345	381	390	362	361	389	362	343	380	376
CounterP_ByRoute04	312	272	291	310	317	317	306	281	298	299
CounterP_ByRoute05	633	679	677	623	683	665	672	661	674	664
CounterP_ByRoute06	322	375	359	316	318	379	362	339	358	301
CounterP_ByRoute07	140	140	119	159	150	153	159	115	132	138
CounterP_ByRoute08	0	0	0	0	0	0	0	0	0	0
CounterP_ByRoute09	133	113	112	122	135	134	92	126	147	131
CounterP_ByRoute10	55	62	69	60	71	74	55	71	76	57
CounterP_ByRoute11	31	41	38	36	40	34	44	29	29	51
CounterP_ByRoute12	82	71	77	84	68	80	62	60	72	64
CounterP_ByRoute13	12	20	18	10	18	18	27	22	21	17
CounterP_ByRoute14	0	4	9	4	8	9	3	2	4	10
CounterP_ByRoute15	14	8	9	10	8	8	12	10	9	15
CounterP_ByRoute16	15	16	20	9	10	9	8	22	10	13
CounterP_ByRoute17	4	4	4	6	7	3	4	3	5	7
CounterP_ByRoute18	4	4	2	0	1	1	1	1	5	3
CounterP_ByRoute19	13	18	22	16	27	15	17	21	20	17
CounterP_ByRoute20	37	50	46	46	45	38	36	31	45	27
CounterP_ByRoute21	32	28	27	23	34	32	26	23	33	25
CounterP_ByRoute22	120	117	100	124	118	133	110	112	125	109
CounterP_ByRoute23	100	69	98	88	90	82	97	84	77	89
CounterP_ByRoute24	25	20	18	20	21	13	20	24	16	21
CounterP_ByRoute25	1	2	2	1	1	2	0	1	3	6
CounterP_ByRoute26	7	6	8	8	6	7	3	4	10	6
CounterP_ByRoute27	0	3	1	2	1	0	1	0	1	2
CounterP_ByRoute28	5	8	4	4	2	4	6	0	2	4
CounterP_ByRoute29	3	2	0	2	2	0	0	1	2	1
CounterP_ByRoute30	1	0	2	0	1	0	0	1	0	1
CounterP_ByRoute31	2	1	2	0	0	0	4	0	1	1
CounterP_ByRoute32	0	1	1	0	0	0	0	0	0	1
CounterP_ByRouteError	0	0	0	0	0	0	0	0	0	0
CountLTT_BuildD1_E	139	154	142	115	142	147	121	114	144	138
CountLTT_BuildD2_R	202	179	196	192	229	191	182	176	184	206
CountLTT_BuildD3_H	338	378	367	328	333	388	395	368	373	316
CountLTT_BuildD4_I	25	12	14	17	17	14	18	19	15	19
CountLTT_BuildD5_W	334	313	310	329	322	338	354	300	304	307
CountLTT_BuildD6_DOPD	1178	1183	1189	1175	1207	1156	1200	1131	1236	1195

[illegible]

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Create02_Period06	0	0	0	0	0	0	0	0	0	0
Create02_Period07	18	16	26	23	26	15	27	17	21	26
Create02_Period08	42	44	34	46	37	48	41	50	44	33
Create02_Period09	61	78	78	94	94	89	69	72	63	75
Create02_Period10	81	102	82	99	81	66	77	88	85	89
Create02_Period11	87	92	83	82	80	72	84	81	90	70
Create02_Period12	39	55	65	48	47	64	53	50	59	41
Create02_Period13	27	41	35	32	34	27	38	31	52	36
Create02_Period14	36	25	30	30	23	31	20	23	39	31
Create02_Period15	27	17	20	19	30	29	22	22	20	20
Create02_Period16	6	13	12	17	5	10	18	9	21	14
Create02_Period17	0	0	0	0	0	0	0	0	0	0
Create02_Period18	0	0	0	0	0	0	0	0	0	0
Create02_Period19	0	0	0	0	0	0	0	0	0	0
Create02_Period20	0	0	0	0	0	0	0	0	0	0
Create02_Period21	0	0	0	0	0	0	0	0	0	0
Create02_Period22	0	0	0	0	0	0	0	0	0	0
Create02_Period23	0	0	0	0	0	0	0	0	0	0
Create02_Period24	0	0	0	0	0	0	0	0	0	0
Create03_Period01	5	4	6	3	8	5	8	12	4	6
Create03_Period02	2	3	3	1	0	2	2	0	5	3
Create03_Period03	0	0	1	0	0	2	1	0	1	1
Create03_Period04	4	0	3	1	1	2	0	0	4	2
Create03_Period05	2	3	4	3	1	1	2	1	1	2
Create03_Period06	5	6	5	5	2	9	11	8	2	4
Create03_Period07	25	27	23	15	20	20	23	20	29	21
Create03_Period08	12	16	6	11	12	7	6	11	6	12
Create03_Period09	5	7	2	2	8	11	5	5	7	7
Create03_Period10	8	13	12	13	11	18	9	8	10	3
Create03_Period11	13	11	7	14	15	16	6	14	17	18
Create03_Period12	10	8	10	3	13	12	7	7	11	12
Create03_Period13	12	12	13	10	10	11	4	10	12	15
Create03_Period14	11	4	13	6	18	14	7	11	13	10
Create03_Period15	17	27	12	18	22	18	19	13	20	20
Create03_Period16	7	9	9	6	5	9	11	9	15	6
Create03_Period17	13	10	10	11	8	12	11	11	17	11
Create03_Period18	7	13	8	9	7	6	3	8	8	9
Create03_Period19	4	12	7	10	11	7	8	8	12	11
Create03_Period20	10	9	9	12	10	11	5	10	7	10

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Create03_Period21	6	6	4	5	2	4	4	7	6	3
Create03_Period22	5	5	8	6	6	7	10	6	7	11
Create03_Period23	6	10	11	4	7	3	12	3	11	8
Create03_Period24	4	5	3	10	5	7	3	4	9	5
Create04_Period01	0	0	0	0	0	0	0	0	0	0
Create04_Period02	0	0	0	0	0	0	0	0	0	0
Create04_Period03	0	1	1	2	2	2	1	0	2	3
Create04_Period04	0	0	0	0	0	0	0	0	0	0
Create04_Period05	0	0	0	0	0	0	0	0	0	0
Create04_Period06	2	0	2	1	2	2	1	1	1	1
Create04_Period07	0	3	4	3	2	1	4	2	4	5
Create04_Period08	19	26	22	26	22	14	16	11	22	27
Create04_Period09	27	25	22	22	29	22	30	27	27	24
Create04_Period10	20	22	27	19	26	19	23	27	24	25
Create04_Period11	15	13	13	9	18	18	14	14	11	10
Create04_Period12	14	9	8	8	13	11	13	14	10	10
Create04_Period13	17	9	8	12	6	7	8	9	10	15
Create04_Period14	3	2	8	7	9	7	6	3	12	11
Create04_Period15	6	10	5	6	5	8	7	14	8	4
Create04_Period16	4	7	5	3	12	2	3	2	2	2
Create04_Period17	6	2	1	4	5	3	5	3	3	2
Create04_Period18	4	1	4	4	5	1	0	3	3	6
Create04_Period19	4	6	3	7	5	4	3	1	4	7
Create04_Period20	2	1	4	0	2	4	1	2	1	3
Create04_Period21	0	0	1	0	1	1	2	1	1	0
Create04_Period22	4	1	5	1	2	2	1	1	5	1
Create04_Period23	1	4	3	3	3	1	1	0	4	0
Create04_Period24	2	0	1	1	0	0	1	1	2	0
Create05_Period01	5	5	5	2	5	11	6	7	8	9
Create05_Period02	8	4	5	0	2	4	3	1	2	8
Create05_Period03	4	14	15	13	13	16	11	8	10	12
Create05_Period04	1	1	0	0	1	1	2	0	0	0
Create05_Period05	0	0	0	0	0	0	0	0	0	0
Create05_Period06	5	7	7	5	4	1	7	4	3	6
Create05_Period07	20	18	20	17	19	15	20	13	22	10
Create05_Period08	15	12	14	15	12	16	9	14	15	18
Create05_Period09	7	7	3	5	9	10	7	6	11	1
Create05_Period10	11	14	16	20	12	10	15	16	13	12
Create05_Period11	7	10	14	8	9	12	8	11	10	8

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Create05_Period12	13	17	19	19	13	15	20	11	14	12
Create05_Period13	15	17	14	25	20	20	13	20	15	14
Create05_Period14	12	9	16	15	6	9	10	12	11	11
Create05_Period15	9	20	8	11	14	6	10	10	8	8
Create05_Period16	14	13	27	17	16	15	22	11	13	24
Create05_Period17	28	30	33	41	25	30	37	27	36	28
Create05_Period18	44	46	60	37	51	48	35	41	46	53
Create05_Period19	6	12	12	12	13	6	8	12	14	13
Create05_Period20	22	21	17	12	15	21	15	20	20	15
Create05_Period21	5	8	4	6	9	9	13	5	5	9
Create05_Period22	3	5	0	9	6	4	10	7	3	3
Create05_Period23	9	4	10	11	6	3	2	8	10	4
Create05_Period24	4	7	7	7	4	11	3	0	5	6
Create06_Period01	3	3	7	2	7	0	5	5	7	4
Create06_Period02	2	2	2	1	5	3	3	1	1	1
Create06_Period03	0	0	0	0	0	0	0	0	0	0
Create06_Period04	0	0	0	0	0	0	0	0	0	0
Create06_Period05	2	5	0	2	2	5	0	2	2	5
Create06_Period06	0	1	1	5	2	3	3	2	0	2
Create06_Period07	1	3	2	2	1	0	2	1	0	6
Create06_Period08	1	2	3	0	2	1	1	0	0	3
Create06_Period09	9	8	9	8	5	3	10	10	8	5
Create06_Period10	6	4	4	4	10	5	4	10	7	8
Create06_Period11	4	4	7	10	7	6	7	9	15	7
Create06_Period12	2	5	7	2	2	6	6	6	2	6
Create06_Period13	3	10	4	6	10	5	7	4	5	10
Create06_Period14	10	7	9	9	11	11	7	8	13	9
Create06_Period15	5	3	3	2	6	3	4	2	3	3
Create06_Period16	6	4	7	6	6	11	8	9	2	10
Create06_Period17	3	6	4	6	13	4	3	11	4	6
Create06_Period18	8	7	6	5	5	6	8	10	8	11
Create06_Period19	0	3	0	2	3	0	0	0	0	1
Create06_Period20	4	4	1	7	2	6	2	4	2	7
Create06_Period21	5	3	5	7	6	12	2	5	3	10
Create06_Period22	2	2	3	1	4	8	3	2	5	4
Create06_Period23	2	4	1	4	3	0	2	0	5	3
Create06_Period24	0	0	0	0	0	0	0	0	0	0
Create07_Period01	6	8	3	4	1	4	3	6	0	4
Create07_Period02	1	1	4	1	4	2	0	1	2	0

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Create07_Period03	1	1	0	1	1	0	1	2	2	0
Create07_Period04	0	0	1	4	2	2	0	0	0	1
Create07_Period05	5	5	7	0	4	5	3	3	3	3
Create07_Period06	11	6	4	10	16	11	8	6	7	9
Create07_Period07	4	4	6	6	6	6	2	3	6	6
Create07_Period08	1	4	4	6	7	6	7	5	6	5
Create07_Period09	18	16	12	9	10	13	12	14	15	14
Create07_Period10	12	10	14	14	19	9	10	11	17	11
Create07_Period11	18	23	12	15	21	18	17	15	22	15
Create07_Period12	6	15	18	15	17	15	10	14	14	17
Create07_Period13	11	20	20	12	9	14	11	18	7	11
Create07_Period14	5	8	10	7	8	8	6	8	11	6
Create07_Period15	7	7	3	3	10	11	6	5	7	7
Create07_Period16	7	5	8	9	3	3	4	6	7	5
Create07_Period17	10	10	10	6	6	9	10	7	13	11
Create07_Period18	10	10	5	6	5	9	10	5	15	12
Create07_Period19	3	6	7	2	3	3	2	3	3	3
Create07_Period20	6	1	3	5	3	2	3	1	3	9
Create07_Period21	5	14	18	6	10	8	15	5	10	7
Create07_Period22	6	5	5	5	9	7	2	3	5	2
Create07_Period23	7	5	1	0	2	2	1	2	5	4
Create07_Period24	0	0	0	0	0	0	0	0	0	0
Create08_Period01	12	9	10	11	18	8	18	14	12	20
Create08_Period02	5	1	4	3	2	2	2	2	5	2
Create08_Period03	1	1	1	1	1	1	0	1	1	0
Create08_Period04	2	1	1	1	0	0	0	1	1	0
Create08_Period05	1	2	2	3	3	5	3	1	5	2
Create08_Period06	1	3	2	0	1	2	0	2	3	0
Create08_Period07	3	5	4	3	5	3	4	7	6	3
Create08_Period08	11	2	10	10	11	6	16	12	13	6
Create08_Period09	35	25	35	27	34	23	37	33	22	23
Create08_Period10	41	53	37	52	42	52	46	36	37	48
Create08_Period11	71	47	50	51	67	75	61	52	60	65
Create08_Period12	62	75	52	56	69	53	73	45	45	54
Create08_Period13	53	63	52	43	61	46	56	40	55	50
Create08_Period14	25	25	42	29	43	37	32	41	33	35
Create08_Period15	40	52	46	50	35	52	47	54	55	43
Create08_Period16	27	35	25	28	33	27	30	26	33	29
Create08_Period17	17	20	22	23	13	19	23	23	16	22

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Create08_Period18	27	29	26	27	16	15	21	20	22	35
Create08_Period19	18	18	22	19	12	21	18	12	17	20
Create08_Period20	6	12	13	11	13	14	8	10	16	12
Create08_Period21	8	9	11	6	14	4	7	6	10	11
Create08_Period22	9	1	7	4	2	7	2	4	3	4
Create08_Period23	8	4	10	10	8	15	10	3	9	12
Create08_Period24	1	0	1	3	1	0	1	0	1	2
Create09_Period01	11	18	16	13	15	20	18	15	16	18
Create09_Period02	4	4	1	6	6	7	6	9	2	2
Create09_Period03	1	1	1	2	1	3	1	4	1	0
Create09_Period04	0	1	2	4	1	3	3	2	1	2
Create09_Period05	2	1	3	7	5	3	3	1	1	2
Create09_Period06	1	0	4	1	4	2	4	4	2	6
Create09_Period07	6	5	5	3	2	4	4	7	7	6
Create09_Period08	3	17	12	15	13	10	16	12	19	13
Create09_Period09	29	28	44	26	46	39	41	32	21	33
Create09_Period10	48	31	49	48	47	47	42	46	47	37
Create09_Period11	70	79	70	71	85	55	66	67	75	59
Create09_Period12	75	72	57	71	51	71	65	61	58	58
Create09_Period13	64	47	60	53	54	50	57	53	40	47
Create09_Period14	25	34	32	20	33	24	30	19	33	33
Create09_Period15	51	52	35	41	40	64	44	45	49	43
Create09_Period16	23	44	29	33	32	40	36	36	41	27
Create09_Period17	24	26	26	18	19	21	20	22	17	29
Create09_Period18	27	18	27	17	18	25	22	23	29	19
Create09_Period19	21	24	17	20	24	25	24	23	27	16
Create09_Period20	13	9	9	8	11	17	10	8	10	14
Create09_Period21	9	11	14	4	6	6	8	10	17	7
Create09_Period22	2	4	7	3	4	8	1	3	4	6
Create09_Period23	11	16	17	16	19	13	14	8	12	10
Create09_Period24	2	1	3	3	3	2	1	1	1	3
Create10_Period01	78	68	64	55	72	60	68	78	64	66
Create10_Period02	10	14	9	7	10	15	12	9	10	12
Create10_Period03	8	4	12	7	9	12	10	9	8	15
Create10_Period04	11	1	7	6	11	7	10	5	8	3
Create10_Period05	12	4	4	4	3	5	3	7	7	4
Create10_Period06	2	6	2	4	6	6	1	3	1	2
Create10_Period07	17	13	18	22	22	15	18	19	21	19
Create10_Period08	14	16	26	7	16	9	17	25	20	10

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Create10_Period09	26	27	24	22	23	25	27	23	36	24
Create10_Period10	31	35	40	37	41	33	25	31	35	34
Create10_Period11	38	34	35	35	37	29	32	34	32	36
Create10_Period12	28	43	35	37	46	47	49	42	47	39
Create10_Period13	14	20	25	23	18	20	36	22	24	26
Create10_Period14	33	30	22	23	26	32	28	37	17	23
Create10_Period15	19	14	18	20	35	22	29	19	26	18
Create10_Period16	17	15	14	11	14	18	12	17	15	14
Create10_Period17	30	15	28	23	23	26	25	25	22	22
Create10_Period18	22	25	26	16	29	24	26	26	19	26
Create10_Period19	32	27	27	19	23	27	21	27	23	25
Create10_Period20	16	12	14	19	13	10	16	11	13	21
Create10_Period21	20	20	19	18	16	26	15	18	22	26
Create10_Period22	10	9	14	7	11	8	7	18	6	13
Create10_Period23	31	24	31	26	19	22	22	23	18	27
Create10_Period24	8	9	6	5	4	5	12	6	7	5
Create11_Period01	57	40	45	42	47	55	52	52	57	51
Create11_Period02	1	2	3	3	4	2	3	1	1	3
Create11_Period03	2	5	4	6	3	3	3	5	7	3
Create11_Period04	0	2	4	1	1	2	1	0	1	0
Create11_Period05	0	1	0	1	2	3	1	1	0	2
Create11_Period06	1	1	2	1	2	2	3	0	1	1
Create11_Period07	14	11	10	11	12	16	16	9	10	11
Create11_Period08	17	27	15	24	23	23	22	20	17	20
Create11_Period09	18	13	16	19	19	15	16	23	20	14
Create11_Period10	48	33	33	33	43	46	26	33	39	23
Create11_Period11	29	30	37	27	42	34	41	21	44	23
Create11_Period12	19	17	19	18	16	12	14	13	12	17
Create11_Period13	18	19	15	17	9	15	20	11	16	12
Create11_Period14	33	22	21	38	25	29	22	26	23	16
Create11_Period15	30	21	32	35	24	30	32	24	26	31
Create11_Period16	17	21	20	18	18	17	17	14	13	18
Create11_Period17	18	19	18	20	14	21	15	13	17	17
Create11_Period18	10	16	9	17	17	13	15	11	10	13
Create11_Period19	11	16	11	11	14	20	11	18	9	16
Create11_Period20	10	2	11	10	5	8	6	11	7	8
Create11_Period21	19	10	19	12	6	19	11	12	29	27
Create11_Period22	17	16	12	11	14	16	14	8	17	15
Create11_Period23	20	18	16	23	28	18	18	18	16	20

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Create11_Period24	5	4	3	5	2	8	11	9	2	1
Create12_Period01	5	5	2	3	7	2	4	6	3	3
Create12_Period02	0	0	1	0	1	0	2	1	0	1
Create12_Period03	0	0	0	1	1	0	1	0	0	0
Create12_Period04	0	1	2	0	0	0	0	0	0	0
Create12_Period05	1	1	2	1	0	1	0	0	2	1
Create12_Period06	1	2	2	1	1	0	2	1	0	2
Create12_Period07	4	3	3	5	3	2	2	2	8	5
Create12_Period08	4	4	5	5	5	6	4	3	5	6
Create12_Period09	7	10	3	10	10	5	5	9	10	4
Create12_Period10	11	12	11	5	14	11	11	7	13	7
Create12_Period11	11	12	8	8	8	8	15	8	12	18
Create12_Period12	5	14	7	4	10	5	13	6	11	12
Create12_Period13	6	4	10	7	8	9	6	10	7	7
Create12_Period14	9	9	7	7	10	3	2	6	9	6
Create12_Period15	6	4	7	10	5	9	8	8	7	1
Create12_Period16	6	0	6	5	4	6	3	4	6	10
Create12_Period17	4	7	4	3	4	3	1	3	3	7
Create12_Period18	6	7	9	5	6	3	3	5	5	3
Create12_Period19	3	2	2	6	1	2	2	3	5	2
Create12_Period20	1	2	0	3	1	6	0	2	0	3
Create12_Period21	3	3	2	2	1	3	1	1	3	1
Create12_Period22	2	3	1	1	1	2	2	3	1	1
Create12_Period23	4	6	1	0	2	5	1	3	4	1
Create12_Period24	2	0	1	2	1	0	1	0	1	2
Destination 1	17	20	17	18	18	19	19	16	24	13
Destination 10	17	23	25	24	24	32	21	18	31	27
Destination 11	4	7	10	12	9	10	7	7	6	5
Destination 12	0	0	0	0	0	0	0	0	0	0
Destination 13	1	1	1	0	4	2	1	0	0	2
Destination 14	10	5	6	8	10	9	8	9	10	16
Destination 15	13	19	22	24	23	31	17	18	22	26
Destination 16	56	40	49	39	50	53	52	40	48	48
Destination 17	12	12	6	8	1	14	5	7	8	12
Destination 18	7	9	3	8	18	8	6	7	8	11
Destination 19	58	64	42	49	60	46	49	49	57	60
Destination 2	4	10	5	10	6	1	7	8	3	11
Destination 20	1	0	0	1	1	0	0	1	0	0
Destination 21	1	3	1	0	1	2	2	0	1	2

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Destination 22	13	5	7	6	5	7	12	9	8	12
Destination 23	1	0	1	0	2	1	0	2	2	3
Destination 24	0	0	0	0	0	0	0	0	0	0
Destination 25	1	3	3	1	2	1	1	2	4	2
Destination 26	2	1	1	2	4	0	0	2	4	0
Destination 27	6	4	6	4	9	6	10	10	3	9
Destination 28	20	17	18	27	15	14	19	21	19	11
Destination 29	7	11	4	8	12	13	3	11	3	12
Destination 3	88	76	81	83	82	74	87	61	78	74
Destination 30	5	12	6	8	9	13	12	6	15	9
Destination 31	7	8	12	8	6	10	13	6	9	7
Destination 32	42	28	41	40	29	39	37	40	37	32
Destination 33	0	0	0	0	0	0	0	0	0	0
Destination 34	39	40	41	35	42	38	41	39	42	39
Destination 35	0	3	1	2	2	0	1	1	0	1
Destination 36	77	89	82	71	83	69	99	71	67	76
Destination 37	8	12	8	11	11	14	14	10	13	16
Destination 38	1	2	0	0	1	2	0	0	2	3
Destination 39	2	1	1	1	1	0	0	1	0	3
Destination 4	0	0	0	0	0	0	0	0	0	0
Destination 40	1	0	2	2	1	1	2	0	1	2
Destination 41	9	21	11	13	16	14	23	17	24	19
Destination 42	57	62	80	57	51	61	50	63	54	59
Destination 43	110	123	116	120	150	128	115	113	118	123
Destination 44	48	50	53	39	42	57	65	63	48	50
Destination 45	8	11	5	4	8	8	7	13	16	7
Destination 46	113	113	120	107	107	139	118	104	112	96
Destination 47	52	68	55	57	51	47	61	55	59	52
Destination 48	4	2	1	2	0	1	0	2	0	1
Destination 49	0	1	1	0	2	0	2	0	0	1
Destination 5	70	77	78	56	73	76	74	78	73	68
Destination 50	80	75	73	83	79	95	71	69	82	64
Destination 51	5	6	13	3	9	8	11	8	6	7
Destination 52	10	5	5	9	5	15	11	7	5	9
Destination 53	105	108	120	102	102	130	120	127	121	94
Destination 54	3	1	5	5	5	1	2	6	5	4
Destination 55	109	107	115	105	128	115	94	82	100	119
Destination 56	36	39	18	33	24	28	28	35	28	37
Destination 57	32	37	33	27	34	22	37	32	31	30

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Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Destination 93	0	0	0	0	0	0	0	0	0	0
Destination 94	0	0	0	0	0	0	0	0	0	0
Destination 95	0	0	0	0	0	0	0	0	0	0
Destination 96	0	0	0	0	0	0	0	0	0	0
Destination 97	0	0	0	0	0	0	0	0	0	0
Destination 98	0	0	0	0	0	0	0	0	0	0
Destination 99	0	0	0	0	0	0	0	0	0	0
Mix Arrival Fri	0	0	0	0	0	0	0	0	0	0
Mix Arrival Mon	3676	3754	3730	3622	3811	3787	3709	3522	3794	3651
Mix Arrival Sat	0	0	0	0	0	0	0	0	0	0
Mix Arrival Sun	0	0	0	0	0	0	0	0	0	0
Mix Arrival Thu	0	0	0	0	0	0	0	0	0	0
Mix Arrival Tue	0	0	0	0	0	0	0	0	0	0
Mix Arrival Wed	0	0	0	0	0	0	0	0	0	0
MixPeriod_ 01	182	160	158	135	180	165	182	195	171	181
MixPeriod_ 02	33	31	32	22	34	37	33	25	28	32
MixPeriod_ 03	17	27	35	33	31	39	29	29	32	34
MixPeriod_ 04	18	7	20	17	17	17	16	8	15	8
MixPeriod_ 05	25	22	22	21	20	28	15	16	21	21
MixPeriod_ 06	29	32	31	33	40	38	40	31	20	33
MixPeriod_ 07	129	127	149	130	140	116	139	115	151	132
MixPeriod_ 08	166	209	186	192	191	186	189	199	203	178
MixPeriod_ 09	307	294	294	296	350	316	323	300	292	284
MixPeriod_ 10	381	390	381	409	403	369	347	365	380	358
MixPeriod_ 11	406	403	379	386	448	410	413	377	436	375
MixPeriod_ 12	321	363	334	324	338	350	374	295	311	316
MixPeriod_ 13	276	291	279	272	266	255	287	257	279	267
MixPeriod_ 14	231	202	238	211	239	234	198	220	233	209
MixPeriod_ 15	237	251	207	231	241	270	245	238	252	219
MixPeriod_ 16	141	173	175	170	153	169	177	155	180	172
MixPeriod_ 17	153	145	156	155	130	148	150	145	148	155
MixPeriod_ 18	165	172	180	143	159	150	143	152	165	187
MixPeriod_ 19	102	126	108	108	109	115	97	107	114	114
MixPeriod_ 20	90	73	81	87	75	99	66	79	79	102
MixPeriod_ 21	80	84	97	66	71	92	78	70	106	101
MixPeriod_ 22	60	51	62	48	59	69	52	55	56	60
MixPeriod_ 23	99	95	101	97	97	82	83	68	94	89
MixPeriod_ 24	28	26	25	36	20	33	33	21	28	24
RecordAllCount	3676	3754	3730	3621	3811	3786	3709	3522	3793	3651

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
Source 1	1	1	1	0	1	2	0	1	2	3
Source 10	12	9	5	10	6	11	8	6	12	14
Source 11	49	39	29	43	49	46	31	43	46	41
Source 12	0	2	1	3	0	0	2	2	3	3
Source 13	45	52	42	50	60	52	55	42	54	58
Source 14	8	16	11	11	8	12	12	6	15	8
Source 15	24	31	25	31	28	29	25	35	31	32
Source 16	12	20	15	19	19	12	15	20	16	12
Source 17	34	39	43	35	33	48	29	33	47	39
Source 18	6	5	4	4	6	10	8	5	6	7
Source 19	55	52	78	58	44	58	54	57	70	49
Source 2	2	0	2	1	0	2	0	0	0	1
Source 20	3	0	3	0	0	0	0	1	2	2
Source 21	13	21	19	23	25	22	15	20	30	26
Source 22	49	52	36	64	51	63	61	43	49	58
Source 23	13	20	22	24	16	23	15	22	32	14
Source 24	12	12	12	8	7	13	13	11	11	9
Source 25	1	2	1	2	0	2	1	1	3	2
Source 26	44	33	26	38	22	42	31	43	35	35
Source 27	13	14	9	9	9	11	5	13	8	10
Source 28	12	17	6	22	15	9	10	13	10	10
Source 29	173	189	169	161	169	140	175	169	182	164
Source 3	31	32	46	36	40	40	32	48	37	39
Source 30	5	12	12	17	5	7	14	6	9	12
Source 31	24	23	26	21	29	13	31	24	32	24
Source 32	15	24	20	18	19	12	15	13	12	20
Source 33	3	6	11	3	4	7	7	2	7	9
Source 34	37	25	41	37	31	37	17	27	46	33
Source 35	9	17	22	14	11	6	12	9	16	9
Source 36	30	33	42	33	30	34	24	28	41	34
Source 37	11	5	1	8	5	5	7	10	4	6
Source 38	8	7	10	9	14	11	15	2	8	8
Source 39	38	31	33	38	39	27	31	25	27	26
Source 4	117	116	99	111	132	96	126	108	114	130
Source 40	165	162	162	153	172	176	181	140	150	151
Source 41	7	7	7	6	7	6	6	6	4	5
Source 42	34	38	25	23	34	40	39	32	47	48
Source 43	33	52	46	46	44	47	47	40	48	30
Source 44	26	27	18	26	23	35	23	19	22	31

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[illegible]

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
QSet_D3SentLR_1.NumberInQueue	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.03
QSet_D3SentLR_2.NumberInQueue	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02
QSet_Hub1BlowerZone03_1.NumberInQueue	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.05	0.05	0.05
QSet_Hub1BlowerZone03_1.WaitingTime	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
QSet_Hub1BlowerZone04_2.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub1BlowerZone04_2.WaitingTime	0	0	0	0	0	0	0	0	0	0
QSet_Hub1BlowerZone05_3.NumberInQueue	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.09	0.09
QSet_Hub1BlowerZone05_3.WaitingTime	0.08	0.08	0.07	0.08	0.08	0.08	0.08	0.07	0.08	0.07
QSet_Hub1BlowerZone06_4.NumberInQueue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QSet_Hub1BlowerZone07_5.NumberInQueue	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.02
QSet_Hub1BlowerZone07_5.WaitingTime	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
QSet_Hub1BlowerZone08_6.NumberInQueue	0.03	0.04	0.04	0.03	0.04	0.04	0.03	0.04	0.04	0.04
QSet_Hub1BlowerZone08_6.WaitingTime	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
QSet_Hub1Roller_1.NumberInQueue	0.06	0.07	0.07	0.06	0.07	0.07	0.07	0.06	0.06	0.07
QSet_Hub1Roller_1.WaitingTime	0.10	0.10	0.10	0.10	0.11	0.10	0.10	0.10	0.10	0.10
QSet_Hub2BlowerZone09_1.NumberInQueue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QSet_Hub2BlowerZone09_1.WaitingTime	0	0	0	0	0	0	0	0	0	0
QSet_Hub2BlowerZone10_2.NumberInQueue	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.04
QSet_Hub2BlowerZone10_2.WaitingTime	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03
QSet_Hub2BlowerZone11_3.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub2BlowerZone11_3.WaitingTime	0.11	0.11	0.10	0.11	0.11	0.11	0.11	0.10	0.11	0.11
QSet_Hub2BlowerZone12_4.NumberInQueue	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.05	0.04
QSet_Hub2BlowerZone14_5.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub2BlowerZone14_5.WaitingTime	0.10	0.10	0.10	0.09	0.10	0.10	0.10	0.10	0.11	0.10
QSet_Hub2BlowerZone15_6.NumberInQueue	0.09	0.10	0.10	0.09	0.09	0.10	0.10	0.09	0.10	0.08
QSet_Hub2Roller_2.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_Hub2Roller_2.WaitingTime	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
QSet_PathD1H1_4.NumberInQueue	0.13	0.15	0.14	0.13	0.13	0.15	0.14	0.14	0.15	0.12
QSet_PathD1H1_4.WaitingTime	0.10	0.10	0.09	0.10	0.10	0.10	0.10	0.09	0.10	0.09
QSet_PathD2H2_6.NumberInQueue	0.05	0.05	0.05	0.05	0.04	0.05	0.04	0.03	0.04	0.04
QSet_PathD2H2_6.WaitingTime	0	0	0	0	0	0	0	0	0	0
QSet_PathH1D1_3.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_PathH1D1_3.WaitingTime	0.03	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02
QSet_PathH1H2_1.NumberInQueue	0.13	0.12	0.12	0.13	0.12	0.14	0.12	0.11	0.13	0.11
QSet_PathH1H2_1.WaitingTime	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QSet_PathH2D2_5.NumberInQueue	0	0	0	0	0	0	0	0	0	0
QSet_PathH2D2_5.WaitingTime	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.03
QSet_PathH2H1_2.NumberInQueue	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.02
QSet_PathH2H1_2.WaitingTime	0.45	0.46	0.46	0.45	0.48	0.48	0.45	0.44	0.48	0.46

[illegible]

[illegible]

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
ResHub1BlowerZone08.Utilization	1	1	1	1	1	1	1	1	1	1
ResHub1Roller_1.NumberBusy	1	1	1	1	1	1	1	1	1	1
ResHub1Roller_1.NumberScheduled	1	1	1	1	1	1	1	1	1	1
ResHub1Roller_1.Utilization	1	1	1	1	1	1	1	1	1	1
ResHub2BlowerZone09.NumberBusy	1	1	1	1	1	1	1	1	1	1
ResHub2BlowerZone09.NumberScheduled	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ResHub2BlowerZone09.Utilization	0.13	0.15	0.14	0.13	0.13	0.15	0.14	0.14	0.15	0.12
ResHub2BlowerZone10.NumberBusy	0.10	0.10	0.09	0.10	0.10	0.10	0.10	0.09	0.10	0.09
ResHub2BlowerZone10.NumberScheduled	0.05	0.05	0.05	0.05	0.04	0.05	0.04	0.03	0.04	0.04
ResHub2BlowerZone10.Utilization	0	0	0	0	0	0	0	0	0	0
ResHub2BlowerZone11.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResHub2BlowerZone11.NumberScheduled	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone11.Utilization	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
ResHub2BlowerZone12.NumberBusy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone12.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResHub2BlowerZone12.Utilization	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone14.NumberBusy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone14.NumberScheduled	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
ResHub2BlowerZone14.Utilization	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResHub2BlowerZone15.NumberBusy	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ResHub2BlowerZone15.NumberScheduled	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02
ResHub2BlowerZone15.Utilization	0	0	0	0	0	0	0	0	0	0
ResHub2Roller_2.NumberBusy	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ResHub2Roller_2.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResHub2Roller_2.Utilization	0.03	0.04	0.04	0.03	0.04	0.04	0.03	0.03	0.04	0.03
ResPathD1H1_4.NumberBusy	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ResPathD1H1_4.NumberScheduled	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ResPathD1H1_4.Utilization	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.03
ResPathD2H2_6.NumberBusy	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02
ResPathD2H2_6.NumberScheduled	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.05	0.05	0.05
ResPathD2H2_6.Utilization	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
ResPathH1D1_3.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathH1D1_3.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathH1D1_3.Utilization	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.09	0.09
ResPathH1H2_1.NumberBusy	0.08	0.08	0.07	0.08	0.08	0.08	0.08	0.07	0.08	0.07
ResPathH1H2_1.NumberScheduled	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResPathH1H2_1.Utilization	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.02
ResPathH2D2_5.NumberBusy	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
ResPathH2D2_5.NumberScheduled	0.03	0.04	0.04	0.03	0.04	0.04	0.03	0.04	0.04	0.04

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
ResPathH2D2_5.Utilization	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
ResPathH2H1_2.NumberBusy	0.06	0.07	0.07	0.06	0.07	0.07	0.07	0.06	0.06	0.07
ResPathH2H1_2.NumberScheduled	0.10	0.10	0.10	0.10	0.11	0.10	0.10	0.10	0.10	0.10
ResPathH2H1_2.Utilization	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ResPathZone01.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone01.NumberScheduled	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.04
ResPathZone01.Utilization	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03
ResPathZone02.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone02.NumberScheduled	0.11	0.11	0.10	0.11	0.11	0.11	0.11	0.10	0.11	0.11
ResPathZone02.Utilization	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.05	0.04
ResPathZone03.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone03.NumberScheduled	0.10	0.10	0.10	0.09	0.10	0.10	0.10	0.10	0.11	0.10
ResPathZone03.Utilization	0.09	0.10	0.10	0.09	0.09	0.10	0.10	0.09	0.10	0.08
ResPathZone04.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone04.NumberScheduled	16	19	26	16	22	18	17	16	16	26
ResPathZone04.Utilization	396	458	439	390	401	462	431	422	446	374
ResPathZone05.NumberBusy	286	287	251	304	285	305	286	253	279	269
ResPathZone05.NumberScheduled	122	123	126	130	114	119	102	91	118	94
ResPathZone05.Utilization	0	0	0	0	0	0	0	0	0	0
ResPathZone06.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone06.NumberScheduled	95	120	91	88	100	86	89	76	97	91
ResPathZone06.Utilization	482	452	443	482	472	521	467	423	480	433
ResPathZone07.NumberBusy	4	1	4	3	5	3	0	2	4	2
ResPathZone07.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathZone07.Utilization	78	90	85	91	112	98	87	101	92	121
ResPathZone08.NumberBusy	64	84	72	66	79	100	78	75	97	87
ResPathZone08.NumberScheduled	1746	1789	1763	1728	1861	1846	1729	1706	1854	1772
ResPathZone08.Utilization	32	48	49	48	31	30	39	27	42	46
ResPathZone09.NumberBusy	334	350	335	337	353	350	351	326	332	366
ResPathZone09.NumberScheduled	624	609	655	567	649	618	639	639	611	621
ResPathZone09.Utilization	0	0	0	0	0	0	0	0	0	0
ResPathZone10.NumberBusy	142	166	173	160	140	168	142	152	181	145
ResPathZone10.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathZone10.Utilization	1786	1801	1839	1774	1843	1832	1791	1712	1817	1802
ResPathZone11.NumberBusy	209	202	202	203	224	225	162	206	249	216
ResPathZone11.NumberScheduled	169	184	188	184	183	167	163	143	169	163
ResPathZone11.Utilization	143	117	148	124	140	122	151	134	121	141
ResPathZone12.NumberBusy	485	444	439	478	487	499	457	425	482	461
ResPathZone12.NumberScheduled	194	188	171	181	180	195	166	172	193	180

Statistic Name	Rep 21	Rep 22	Rep 23	Rep 24	Rep 25	Rep 26	Rep 27	Rep 28	Rep 29	Rep 30
ResPathZone12.Utilization	814	840	866	795	869	813	846	823	835	822
ResPathZone13.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone13.NumberScheduled	0	0	0	0	0	0	0	0	0	0
ResPathZone13.Utilization	726	803	744	764	752	727	761	718	797	724
ResPathZone14.NumberBusy	648	636	617	645	672	714	654	612	662	613
ResPathZone14.NumberScheduled	11	15	12	17	14	9	10	11	9	16
ResPathZone14.Utilization	193	220	189	178	202	214	177	186	234	210
ResPathZone15.NumberBusy	238	274	260	237	288	265	230	244	272	283
ResPathZone15.NumberScheduled	247	272	267	233	280	284	248	268	281	269
ResPathZone15.Utilization	280	274	296	277	286	247	274	259	293	291
ResPathZone16.NumberBusy	544	559	561	539	572	559	570	515	550	566
ResPathZone16.NumberScheduled	872	832	889	823	898	879	882	852	848	869
ResPathZone16.Utilization	3	2	4	1	7	3	3	8	4	4
ResPathZone17.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone17.NumberScheduled	303	321	313	300	306	343	293	288	335	318
ResPathZone17.Utilization	267	301	326	307	284	293	286	264	294	284
ResPathZone18.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone18.NumberScheduled	507	512	478	526	515	515	489	434	495	481
ResPathZone18.Utilization	602	582	553	605	577	617	583	521	565	525
ResPathZone19.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone19.NumberScheduled	675	695	709	645	682	726	677	682	728	658
ResPathZone19.Utilization	613	649	651	594	646	661	625	612	640	594
ResPathZone20.NumberBusy	0	0	0	0	0	0	0	0	0	0
ResPathZone20.NumberScheduled	3676	3754	3730	3621	3811	3786	3709	3522	3793	3651
ResPathZone20.Utilization	0	10.79	4.679	7.822	8.099	5.678	1.254	4.337	2.172	
ResPathZone21.NumberBusy	2.29	1.279	2.68	0	3.014	1.915	0	0.449	3.47	1.437
ResPathZone21.NumberScheduled	35.19	35.51	35.52	35.58	35.35	35.9	34.97	35.41	35.65	35.35
ResPathZone21.Utilization	36.61	37.48	37.08	37.02	37	37.7	36.43	36.73	37.08	36.69
ResPathZone22.NumberBusy	1.437	1.842	1.501	1.337	1.601	1.73	1.395	1.318	1.346	1.291
ResPathZone22.NumberScheduled	1.327	2.979	2.114	2.259	2.167	2.452	1.565	1.378	2.149	1.604
ResPathZone22.Utilization	1.31	2.058	1.171	2.351	1.188	1.734	4.629	1.029	1.614	2.729

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