LABORATORY MANUAL

MAXIMO *Release 6.0*

IE 434 – MAINTENANCE ENGINEERING

Version 6

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PART 1
Concept and Theory

Chapter 1: Introduction

MAXIMO is Strategic Asset Management (SAM) software that manages all strategic asset to increase utilization and reduce operation cost so that the profit of the company is increased as well.

1. Strategic Asset:

Strategic assets are those assets that are directly or closely associated with revenue generation or that are critical to the mission of the organization. They include the following types of assets:

- Tangible
- Fixed
- Physical
- Capital

For example, manufacturing companies depend on assets' uptime to meet production goals; for them, plant floor machinery is clearly strategic. Hotels hospitals, and airports require trouble-free facilities to deliver the quality of' service their customers and users expect. Public transit and over-the-road transport companies depend on the reliability of their fleets to move people or goods. Financial services companies rely heavily on computer systems to manage transactions and maintain positive customer relationships that drive their business. All of these are strategic assets.

2. What Is SAM?

- Manages and optimizes the business processes related to fixed, physical, or capital assets that have a direct and significant impact on achieving corporate objectives.
- Takes an enterprise-wide view of asset performance and the tools required to drive maximum return on asset investment.
- Drives corporate performance by extracting greater lifetime value from asset investment.

3. Four SAM Categories:

SAM is focused on four broad categories of fixed, physical, and capital assets: Production, Facilities, Fleet, and IT.

Asset Categories:

Asset Category	Description
Production	Production assets are generally understood to be those involved in discrete or process manufacturing. This includes, for example, robots on the assembly line at an automobile plant, or the steppers used in computer chip manufacturing. However, the definition of production assets is considerably broader. In the utility industry, for example, production assets are turbines and compressors used for power generation; they also include the transmission and distribution assets that deliver output to end users. In the telecommunications industry, the antennas and microwave towers involved in producing and delivering output to customers are also production assets.
Facilities	Facilities assets include types of buildings, from corporate headquarters, casinos (e.g., MGM Grand), and museums (e.g., the Louvre), to stadiums, shipyards, and passenger terminals (e.g., Zurich Airport). Maintaining these facilities can involve mechanical, HVAC, and electrical systems, as well as landscaping and parking lots. There are also many specialized facilities, such as clean rooms, surgical theaters, laboratories, and satellite ground stations.
Fleet	Fleet assets are often over-the-road vehicles such as cars and trucks; however, this category also includes airborne fleets (aircraft), rolling stock (rail cars), and marine assets (passenger boats and ships). Companies might have mission- critical fleet assets around which the core of their business is built; for example, a commercial shipping company depends on its trucks and aircraft. Vehicles for a public transit organization like Long Island Railroad also fall into this first category. Additionally, companies might have enterprise fleet assets that are important to the overall function of an operation but do not directly generate revenue, such as employee shuttle buses, repair trucks, or forklifts.
IT	The operations of most companies today are critically dependent on the organization's IT infrastructure. On the hardware side this includes servers, desktops, laptops, cell phones, PDAs, hubs/routers, and telecom assets. Software is equally important in day-to-day operations, and ensuring software license compliance is an important part of IT asset management.

4. Why SAM?

With pressure mounting to improve financial performance in the face of a difficult economic climate, companies are looking in all directions to increase revenue, reduce costs, and mitigate risks. SAM is a more sophisticated and comprehensive approach to extracting greater lifetime value from asset investment; it is one relatively unexplored avenue that offers an opportunity for significant gains.

5. Objectives of Strategic Asset Management

There are five main objectives of asset management:

- Investment—Minimize funds invested to achieve business objectives.
- Ownership cost—Minimize cost to ensure a required level of performance.
- Commercial return—Maximize the value that the assets add to the business.
- Strategic value—Optimize the market value and flexibility of the asset base.

SAM and Maintenance, and Asset Performance

- Risk—Manage commercial, health, and environmental risks.

6. Some key performance indicators (KPIs) of SAM are:

- Return on asset (ROA)
- Overall equipment effectiveness (OEE)
- Expenditure/capital replacement value
- Maintenance cost per unit of output
- Mean time between failures (MTBF)
- Mean time to repair (MTTR)
- Mean time between work orders (MTBWO)
- Maintenance cost/estimated replacement cost (ERV)

8. World-Class Benchmarks:

Some world-class benchmarks and performance goals are: .

- Maintenance costs

Total maintenance costs/total manufacturing costs <~10%

- Planned maintenance

Planned maintenance/total maintenance >90%

- Maintenance overtime

Maintenance overtime/total maintenance time <5%

- Maintenance rework

Work orders reworked/total work orders 0%

- Inventory turns

Turns ratio of spare parts > 3

- Training

Maintenance workers receiving > 40 hours/year > 90%

- Safety

Injuries per 200,000 maintenance hours < 2

9. KPIs Do Not Give Answers

While KPIs do not deliver magic answers, they will tell you what is happening in your organization. The excerpt below, written in response to an article on asset breakdowns, illustrates this point.

"A better picture would give, not simply the number of breakdowns, but the consequences of those breakdowns, such as:

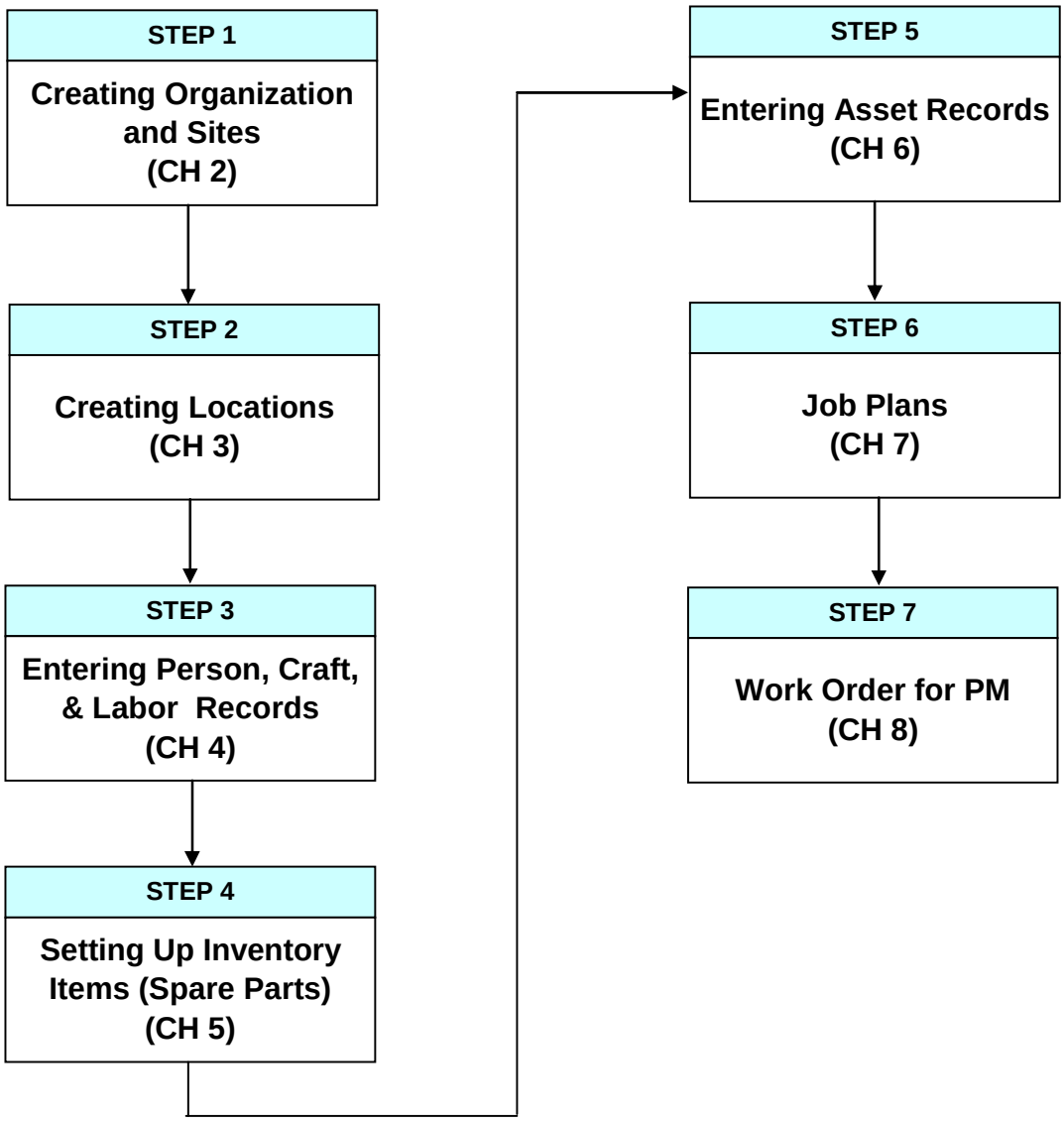
- The financial value lost due to breakdowns (whether by lost production, lost customers, or other means)
- The number of injuries, labor-hours lost, and fatalities, caused by breakdowns
- The number of environmental infractions caused by breakdowns

I can illustrate the importance of this by giving a catastrophic example. If you only had two breakdowns in the last three years, but if—because of these breakdowns—your plant is on the verge of being closed—then you should be examining your PM program, even though you "only had two breakdowns in three years."

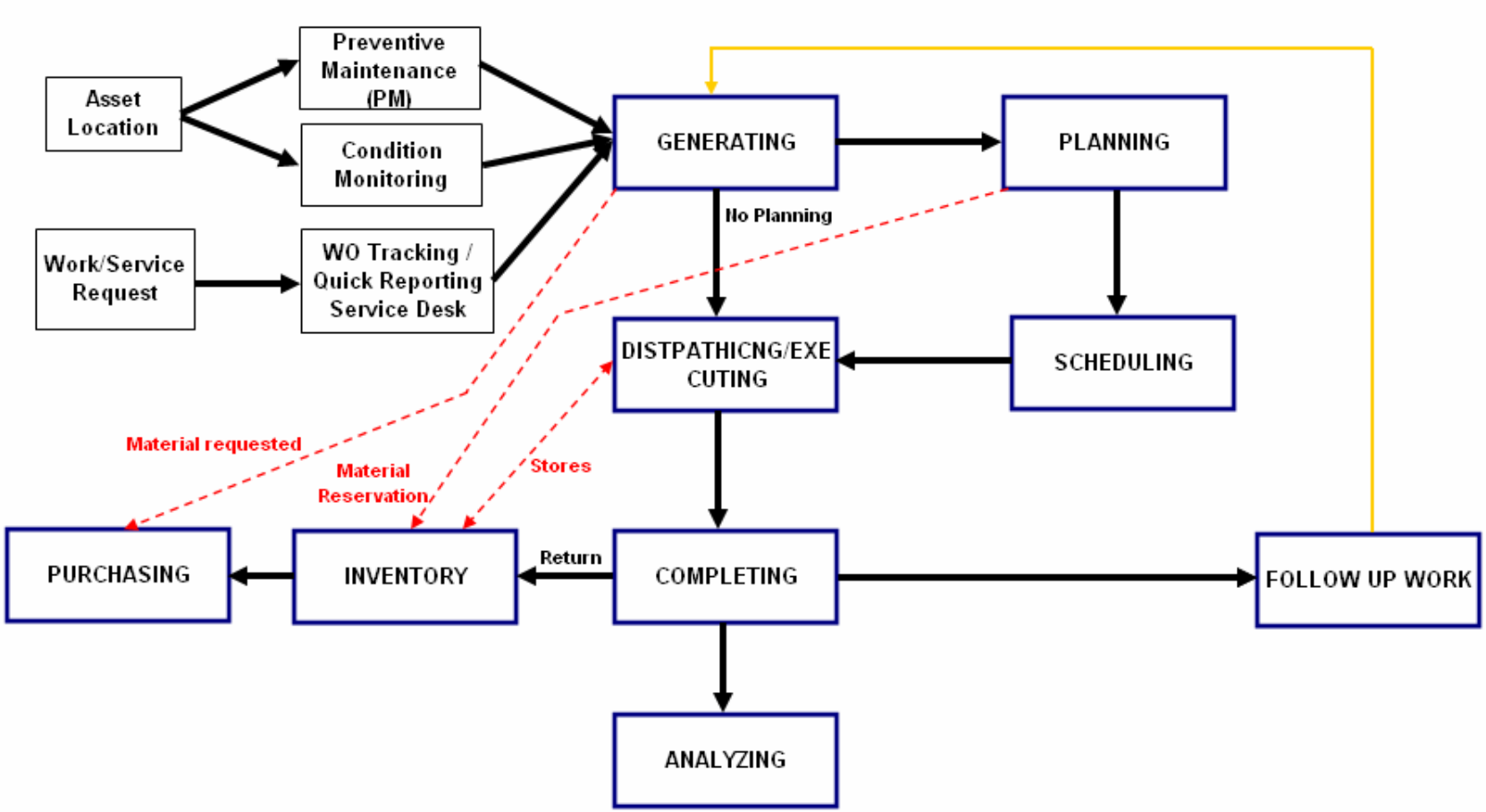
Simply noting that the breakdowns are taking place is not likely to provide the information needed to prevent them. However, noting both the breakdowns and their consequences might provide the information you need to decide whether you need to conduct a more detailed review."

Dana Netheron, Jan. 2003 - Plant Maintenance Web site

10. General Steps for MAXIMO:



11. All Modules (applications) in MAXIMO are working together (Maintenance Activity):

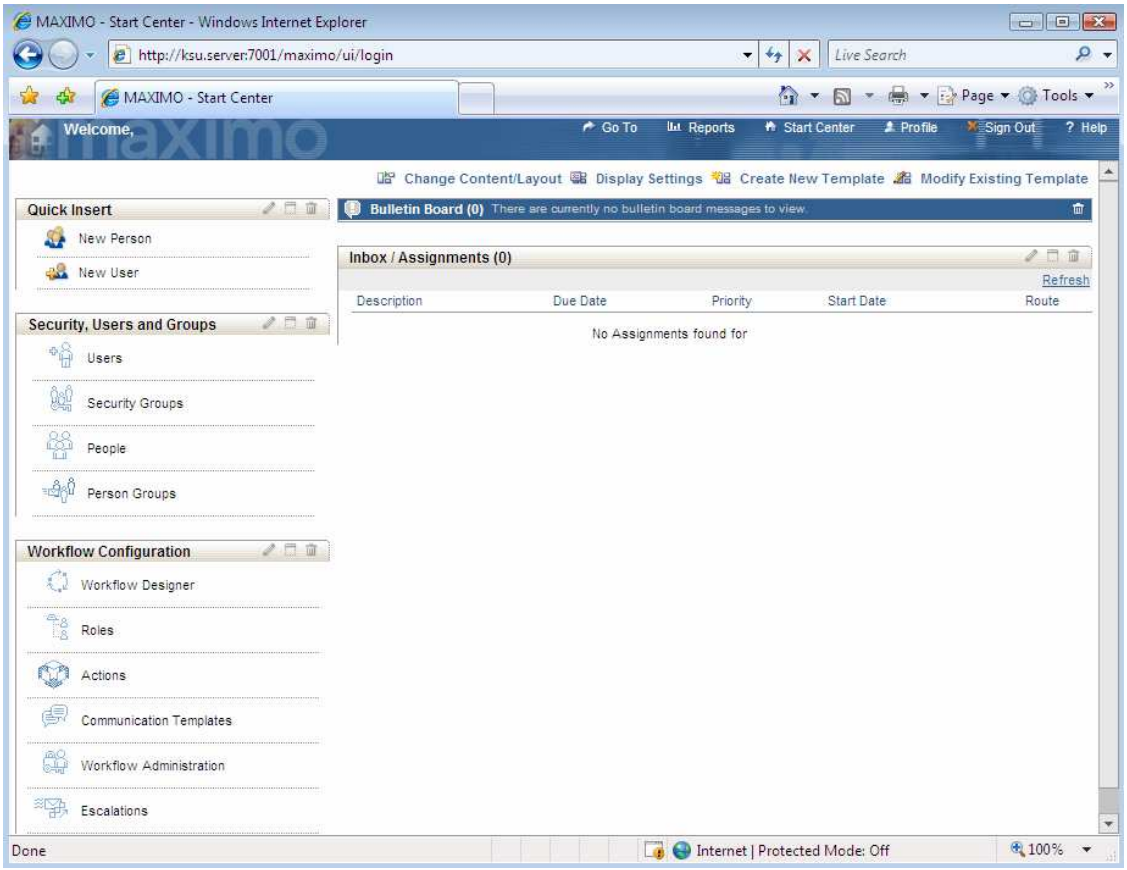


MAXIMO (version 6 above): is a web based application in which the application is installed in a server and client can access the MAXIMO application via web browser (IE 7 below for MAXIMO ver. 6).

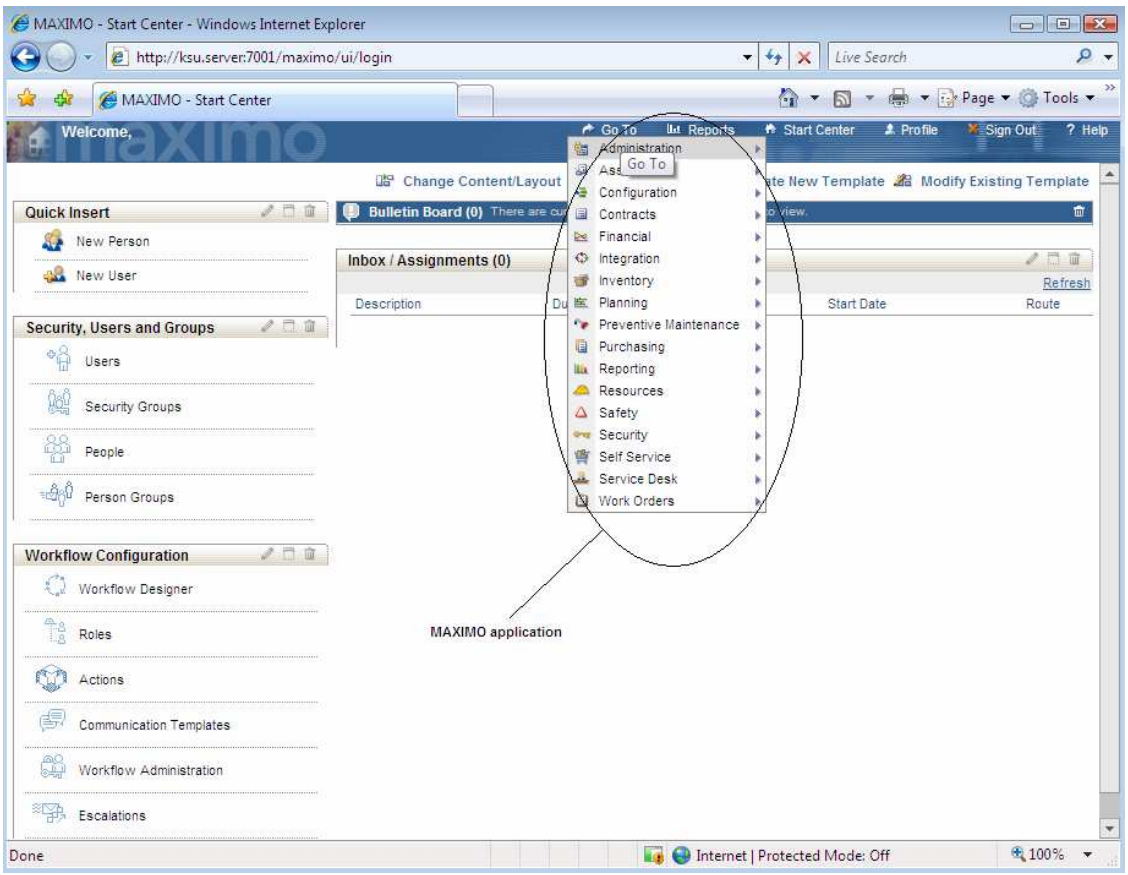
12. MAXIMO Screen Shoot:

a. Maximo Login Screen:

b. Maximo Main Screen and Application:



c. Maximo Applications:

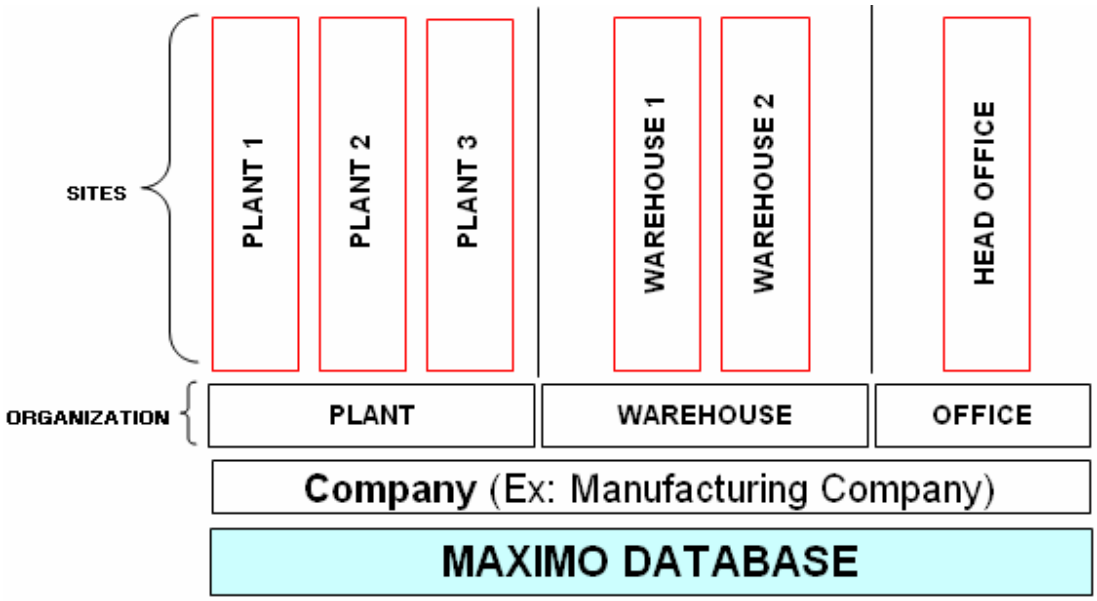


Chapter 2: Organization and Sites

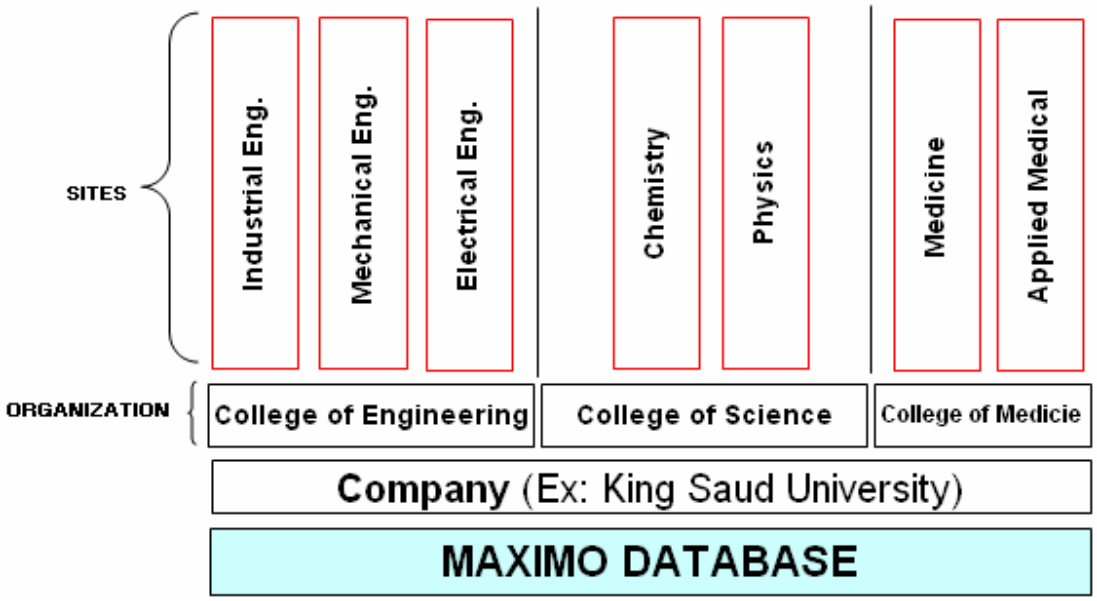
Organization is a group of sites that have similar business process.

Schematic view of Organization and sites:

Example 1:



Example 2:



Chapter 3: Locations

1. Introduction

One of the principal benefits to using Maximo is the ability to track maintenance costs against your various assets and operating locations. To track and monitor work and costs by location, you first need to create the location where the asset is to be located and based. A location is used to define where an asset physically is and what it is doing. Work orders can be written against a location only where the asset operates.

2. Learning Objectives

When you have completed this chapter, you should be able to:

- Describe a location and location hierarchy;
- Describe a system and system hierarchy;
- Describe the advantages of implementing a system hierarchy;
- Navigate the Locations application;
- Create a location and a location hierarchy; and
- Associate locations with systems to create a system hierarchy

3. Implementation

• Identify high-priority operating locations and enter them first. Low- ^ priority locations can be phased in later.

- Creating and using location hierarchies lets you track work and costs individually, as well as rolling up costs hierarchically.

Implementation Questions to Consider

Chapter Overview continued

- Creating location hierarchies and systems will enable users to easily find locations, as well as any associated assets.
- Have a predefined formatting and identification procedure in place. The documentation should be graphically laid out well for your location hierarchy. This documentation can act as a map as you identify and enter locations and systems into Maximo.

Chapter 3: Locations

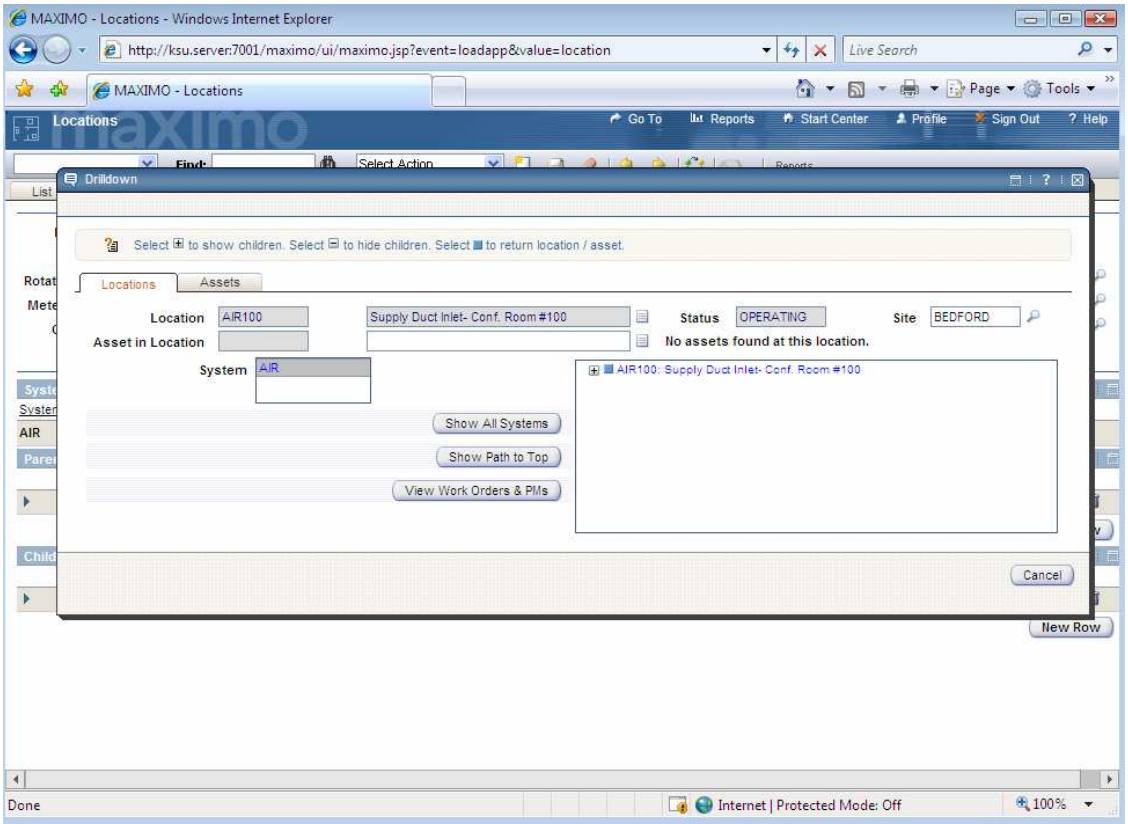
Location and system hierarchies should be an integral piece of a site implementation; they are the backbone of the system. A well-thought-out hierarchical design makes it easier to track assets and costs as related to locations.

In addition, the time and thought you invest in planning the locations and systems creates a more strategic approach in navigating the Assets/Locations

continued on next page

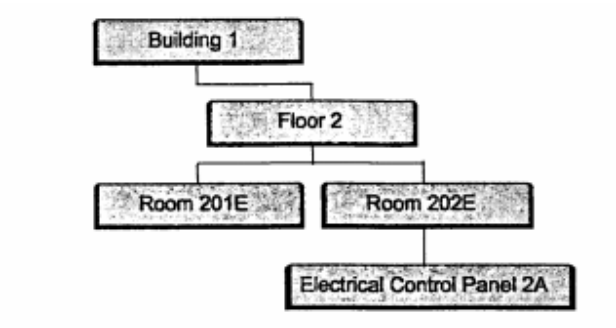
menus.

Locations are like addresses; for example, if you live at 5 Green Way Plaza, you may start out in a tent, then a trailer, then a building. So, even though the structure you are in changes, the address remains 5 Green Way Plaza. If you apply the same logic to locations and assets, locations normally do not change; however, the assets that reside at the location might change.

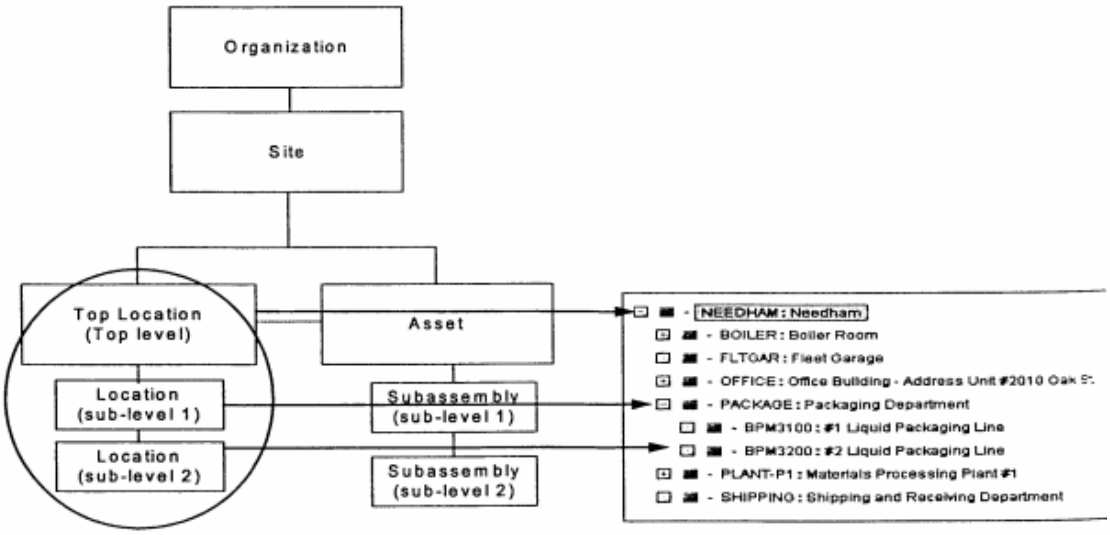


Location hierarchies let you group assets and locations into areas of responsibilities. A location hierarchy can be designed to include all location. in your plant against which work orders are written, and can track the movement of assets into and out of locations. Maximo identifies location hierarchies as systems.

4. Location hierarchies as a system:



5. Location and Asset relation (parent-child design):



SystemIn Maximo, a system is an identifier or reference consisting of locations Definition associated with a particular focus or responsibility. In most cases, a system functions to identify location hierarchies or location networks.

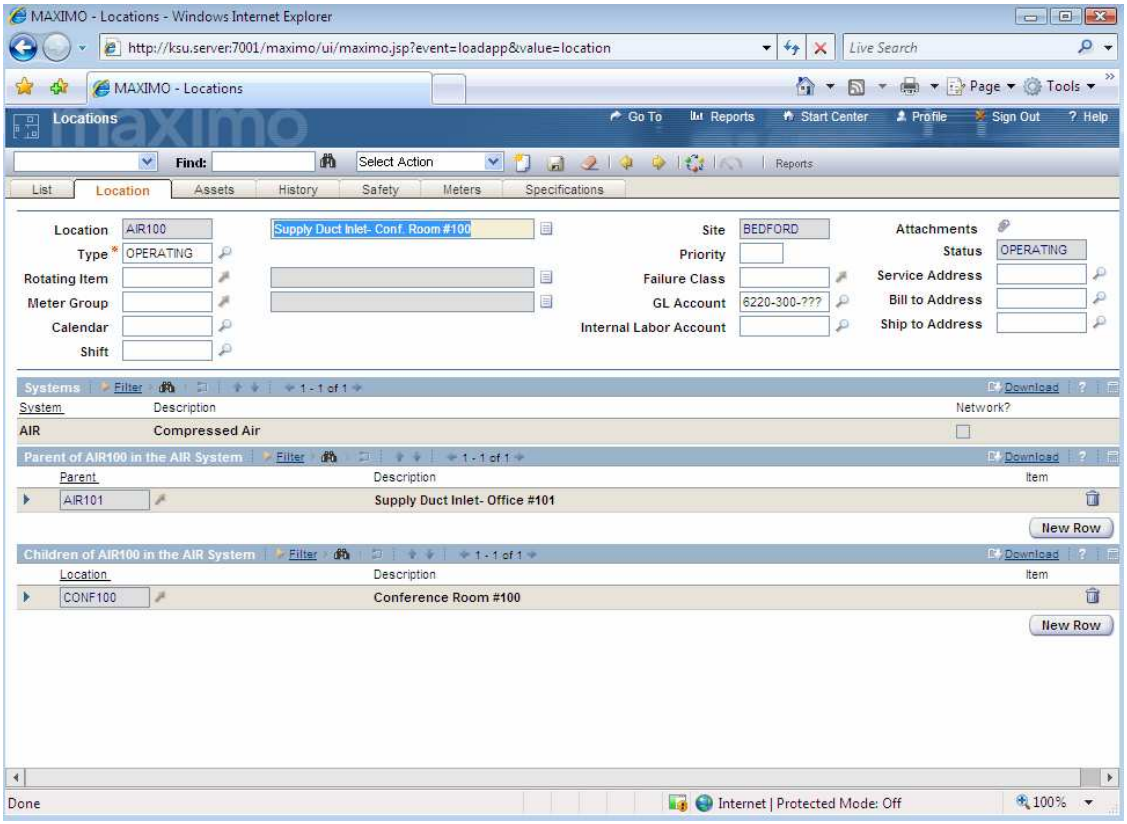
- Location hierarchies have a parent-child branching relationship.

  Implementation Tip
- Location networks can have multiple parents and have no defined branching relationships.

Chapter 3: Locations

The Locations application lets you enter and maintain operating location w assets and organize these locations into a logical hierarchy. The Location application screen contains multiple pages designated by tabs, and is access^ from the Assets module in the Start Center.

Menu	Function
List	Enter and save searches.
Location	Enter or view detailed information specific to a location. The only required fields on this page are Location and Type.
Assets	Display the assets, if any, at the selected location.
History	Display the history of the asset's movement transactions into and out of the location.
Safety	View, add, or delete safety records associated with the selected location.
Meters	View, add, or modify meter records associated with a location.
Specifications	Enter or view specifications for the location as recorded in the Classifications application.

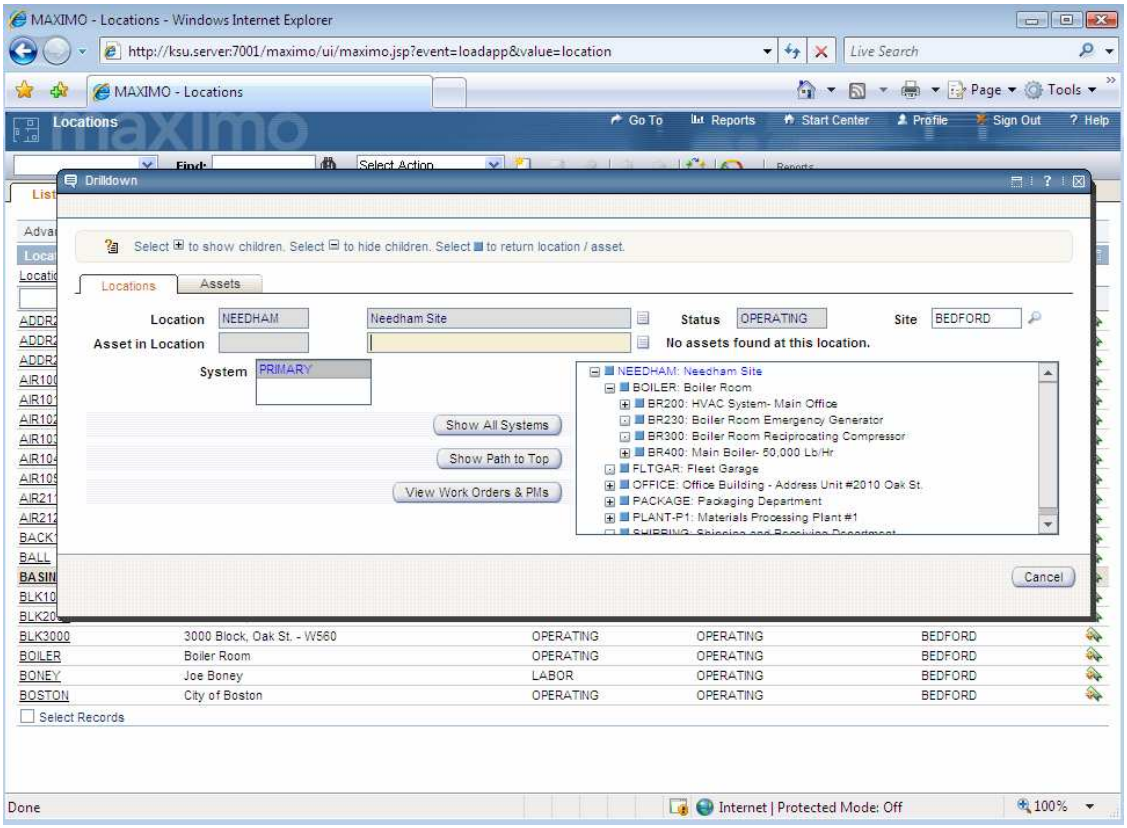


6. Location Type:

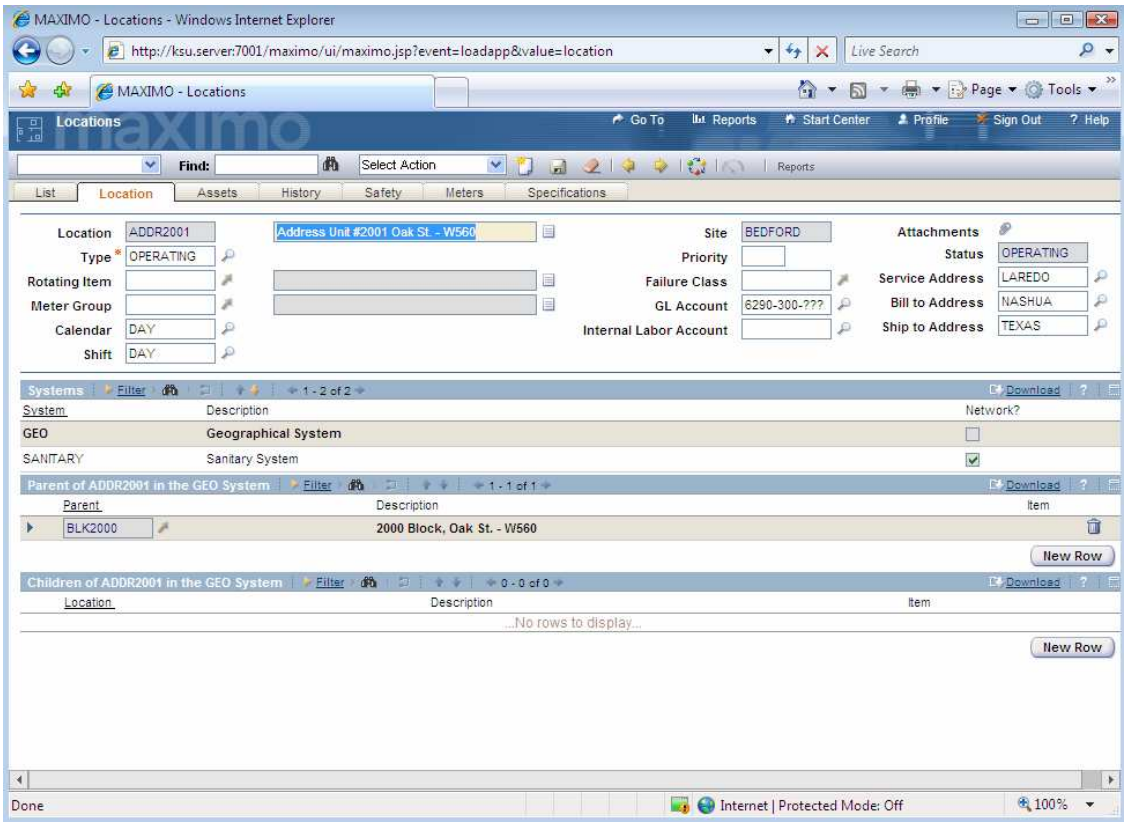
Location Type	Description
Courier	Used to track assets that a courier is holding until they are received into another location.
Holding	Generally used to identify areas where assets are temporarily stored prior to tracking procedures such as serialization and inspection.
Labor	*Associated* as location records so that you can track assets and inventory issued to specific individuals, such as: • Expensive tools • Safety gear
Operating	Generally used to identify the physical spaces where your assets operate.
Repair	Used to track assets when they have been removed from an operating location for repair.
Salvage	Used to track assets as they move to a salvage location.
Vendor	Used to track assets as they move to a vendor location.

7. Drill Down Menu from "Select Action":

The function of drill down menu is to show the hierarchy tree of the available locations.



8. Location Module main screen:



Chapter 4: Person, Craft, and Labor

1. Introduction

Maximo helps you manage person records in your organization with the People, Crafts and Labor.

In this module, the main goals are:

1. to enter person record (data)
2. to enter labor
3. to enter Craft (the skill level of the labor, ex: trainee, apprentice, experts, etc)

2. Definitions

The following terms are used in Maximo to manage person records:

• People - In Maximo, you use the People application to contain person records of all people associated with Maximo as users or labor or groups who might be involved in other ways, such as part of a work or owner group.

• Labor - Labor in Maximo is any employee or contractor specified on records and transactions in any of the work-related Maximo applications, such as work orders. Labor is identified by labor codes.

• Person groups - These consist of two or more persons who can be designated as a single entity on work orders as a work group or owner group, or on tickets as an owner group. The individuals in the group might or might not be users or labor.

Labor and Users Are Persons

• Users - A Maximo user is anyone who signs in to Maximo. Some people might only view information in Maximo, but they are still users. Users are identified by user names.

Note: All labor and Maximo users must be associated with a person record.

Person records are maintained using the People application in the Resources module.

Chapter 4: Person, Craft, and Labor

Eveiy person who has a relationship with Maximo is entered as a person record using the People application. These relationships include:

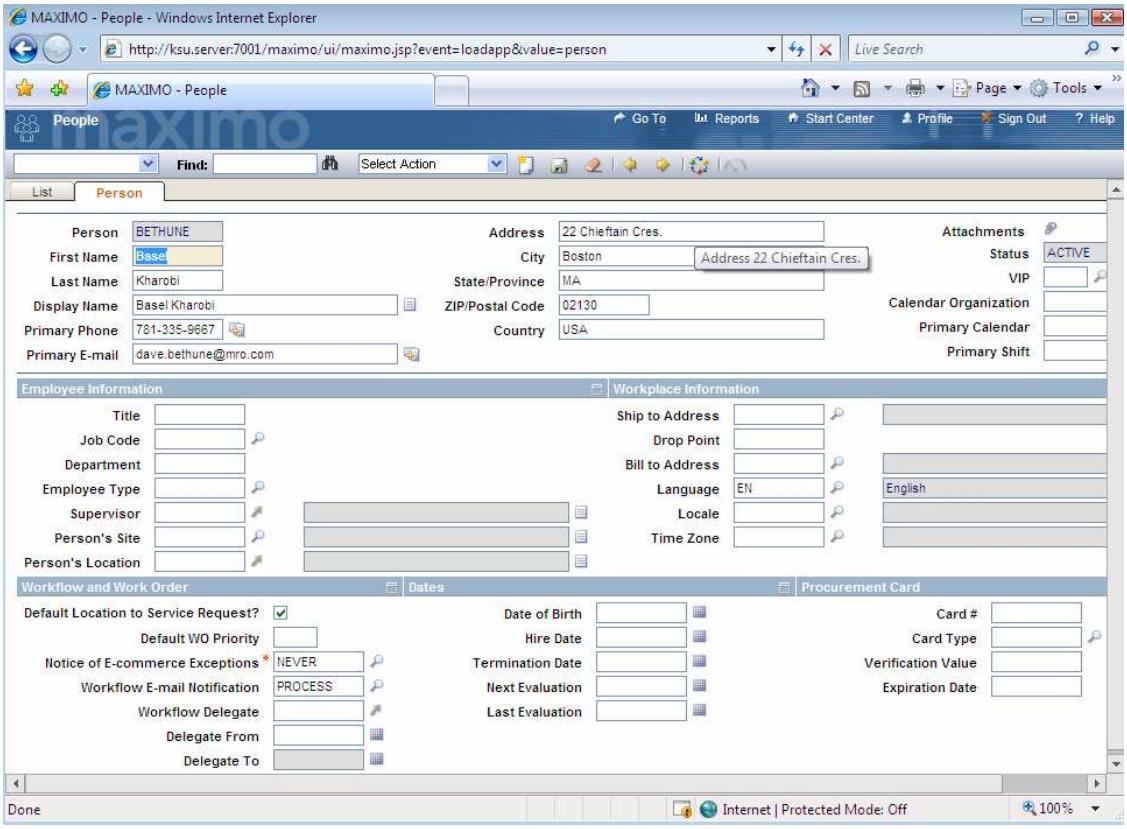
- Labor personnel
- Users of Maximo
- Primary owners of assets
- Custodians of assets
- Users of assets (as opposed to Maximo users)
- Vendor contacts

3. Performance metric for Labor and Craft (KPI):

Metric Title	Metric Description
% Overtime of total hours worked	What percentage of all hours worked is overtime
Ratio of supervisors to craft persons	Number of supervisors divided by the number craft persons
Ratio of planners to craft persons	Number of planners divided by the number of craft persons
Ratio of hourly maintenance personnel to overhead personnel	Number of hourly maintenance personnel divided by the number of overhead personnel
% Labor Cost Captured on Work Orders	What percentage of labor cost is captured on work orders
% Self Performed and Contract Maintenance Labor for: • Total Asset Management Costs • Total Operational Labor Costs • Plant or Maintenance Engineering costs	What is the percentage of internal and contract against different cost areas: Maintenance, Operational, Plant Engineering
Straight time and Overtime Labor costs per: • Asset criticality classification • Specific Asset • Specific department or location . Work type (PdM, PM, CM, Standing Work Order, etc)	What are the labor costs for straight time and overtime against critical assets, critical locations, and work types

Self Performed versus Contract Labor Cost per: • Asset criticality classification • Specific Asset • Specific department or location • Work type (PdM, PM, CM, Standing Work Order, etc)	What are the labor costs for self-performed versus Contract Labor against critical assets, critical locations, and work types

4. Screen of people application:



5. The Crafts and Labor Applications

a. Introduction

The Crafts and Labor applications are useful not only for labor tracking and analysis, but also for recovering labor costs associated with assets or parts under warranty.

Crafts are used to identify the skill levels, standard rates, and premium pay codes for crafts for forecasting budget requirements. With crafts in place, you can create job plans and identify the skill type required for each task. This will help you in planning, scheduling, and assigning work.

Maximo allows a more granular approach to using crafts. You can define levels, and these levels can be applied to crafts.

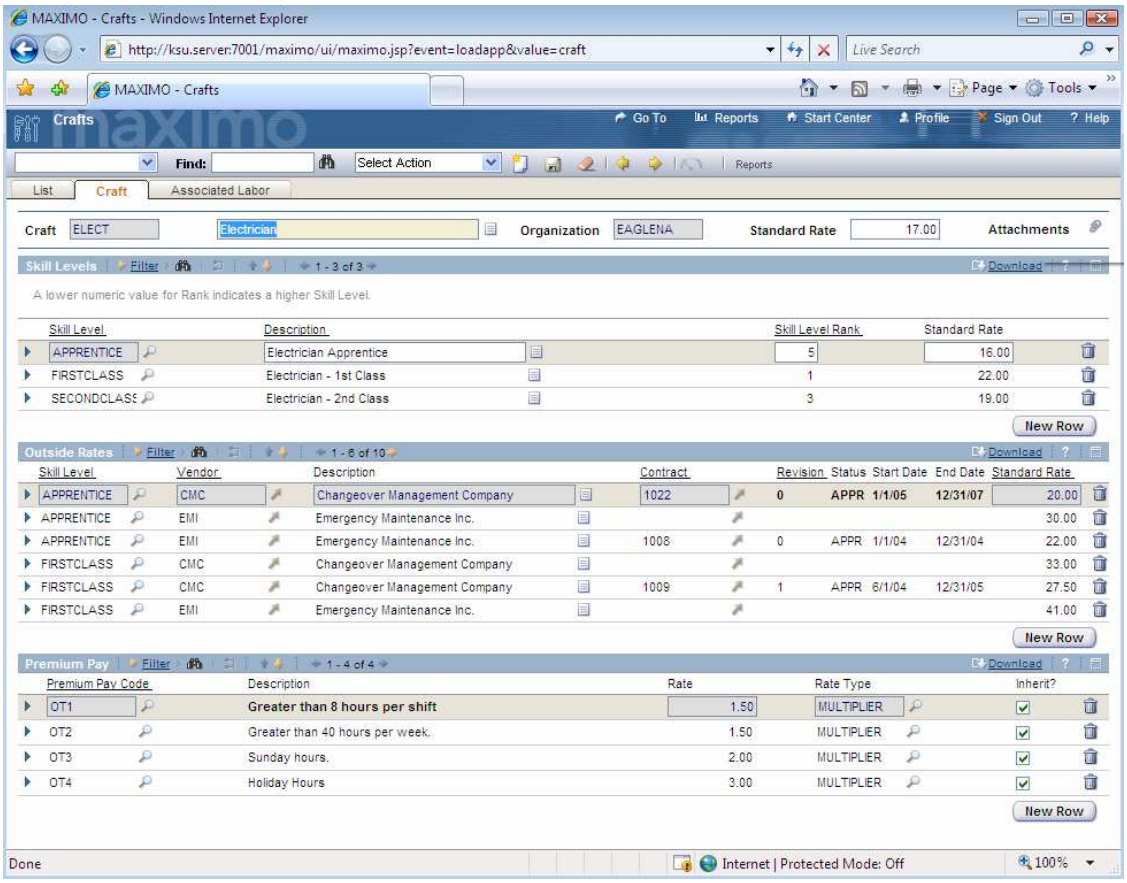
Example: You need an electrician for a work order, but you don't need the top person—you just want a "newbie" to do some basic work. So, you look for an apprentice.

b. The benefits of this approach are as follows:

- This functionality allows work orders and other types of records to call for more specific skills.
- It allows Maximo to track the various costs of crafts at different levels.
- With an accurately designed implementation, there would be no need to adjust rates when recording actuals.
- The right craft could be requested for the job, and the appropriate pay rate would automatically be in the cost structure.
- With the ability to ask for specific levels of crafts, you can avoid having the master electrician show up to do a simple job, thus more accurately controlling costs.

Craft Tab Sections	Description
Skill Levels	Defines the skill levels available for this craft, along with associated costs. Note: The **Skill Level Rank** field is especially important because it allows the Assignment Manager application to choose skill levels at the desired rank and higher when finding labor for work.
Outside Rates	Describes the outside vendors who might also provide labor for this craft. It shows the vendors, craft levels, and contract numbers, where applicable.
Premium Pay	Shows the premium pay categories available for this craft. Existing premium categories can be added by clicking **New Row.** New categories can be added by choosing **Manage Premium Pay Codes** from the Select Action menu, then adding the new code to the craft record.

c. Labor and Craft screen:



Chapter 5: Inventory Items (Spare Parts)

Tracking inventory use and stocking levels can help your organization reduce costs. Inventory items entered in Maximo can be tracked as they are received in the storeroom and as they are issued. Items can be automatically reordered, reducing "stock outs" for the storeroom. All inventory items are recorded for later usage detail. This should lead to improved purchase planning, allowing organizations to see reductions in wasted inventory levels.

When you have completed this chapter, you should be able to:

- discuss key performance indicator (KPI) inventory management,
- enter parts and inventory records,
- add alternate vendors,
- set up rotating items,
- describe the item kits and condition codes functions of the inventory applications
- discuss the relationship between the Inventory and Assets applications.

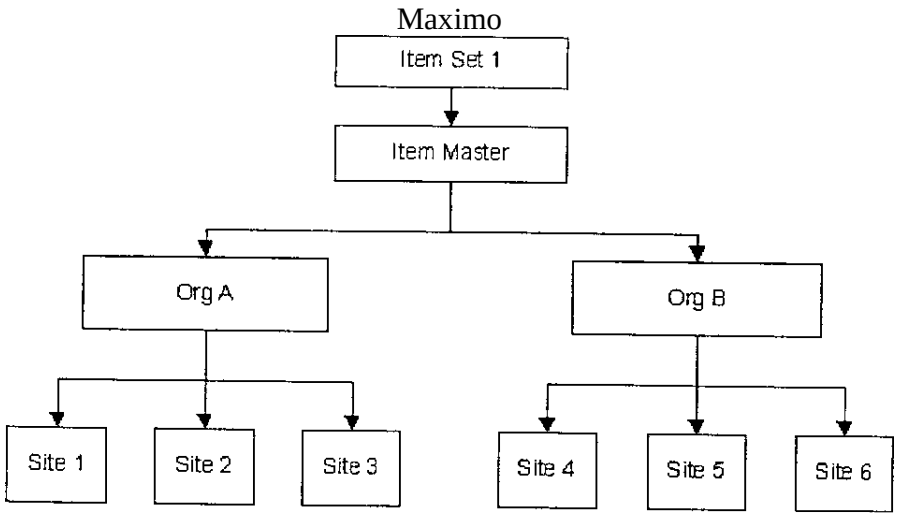
1. Key definitions in this module:

Key Term	Definition
Item	The basic non-serialized unit for things/parts that are kept in inventory.
Item record	A record for an inventory item that does not include the location.
Item/location record	A record for an item at a storeroom location.
Rotating item	An inventory item, with a generic item number and a current balance (which can be greater than one), multiple instances of which can be used in multiple locations.
Rotating assets	An individual instance of a rotating item, identified by an individual asset number.
Alternate items	Items/parts that can be used interchangeably with other inventory items.

2. Some Inventory KPIs to consider for your implementation are as follows:

Metric Title	Metric Description
% Inactive stock items	Percentage of all stock items that have had no activity in the past 12 months.
% Controlled maintenance spares	Percentage of all parts used by maintenance that are in controlled warehouses.
% Items filled on demand	Number of items issued on demand divided by all items issued.
% Total orders filled on demand	Number of orders issued on demand divided by all orders filled.
Total inventory value	Total dollar value of all inventory items in stock.
% Annual stores investment used	Percentage of the inventory value that is used annually.
Inventory turn ratio	The value of total orders for inventory items annually, divided by the total value of inventory.
% Non-critical spares as a % of total inventory value	Percentage of all inventory items that are considered non-critical to the operation.
% Non-critical spares as a % of total inventory value	Percentage of all inventory items that are considered non-critical to the operation.
% Critical spares as a % of total inventory value	Percentage of all inventory items that are considered critical to the operation.
% Storeroom inventory value to total maintenance costs	Inventory value divided by total maintenance costs.
Total inventory value as a % of sales	Inventory value divided by total sales generate annually.
Total value of obsolete parts	Total value of obsolete parts.

3. Item Set:



There are three categories of inventory items in Maximo: stocked, non- Stocked, andstocked, and special order items.

Category	Description
Stocked Items	Items that you always need to have on hand because they have a regular turnover rate and are frequently needed. Stocked items have reorder criteria specific to each storeroom location.
Non-stocked Items	Items you need only occasionally and do not want to maintain in inventory throughout the year. Non-stocked items are not automatically reordered. However, you do want to keep records for non-stocked items in the database because you are likely to order these items again at some point.
Special Order Items	Typically items that are ordered only once, often for unexpected needs or for a one-time work order. These items are not kept in stock, and you do not need a permanent record of them in your database.

Maximo uses condition codes to enable you to represent a single item as

existing in multiple conditions with corresponding condition values. For example:

- New
- Used
- Rebuilt

Condition codes are optional features of classifying inventory items as they are stocked in storerooms. In this course we will only be introducing the functions of the Condition Codes application. Consult your MRO instructor for more information.

4. Rotating Items (Equipment)

4.1 Introduction

Your company might use interchangeable units of assets that are moved into
and out of service as needed. These pieces of assets are often called rotating assets or rotating spares.

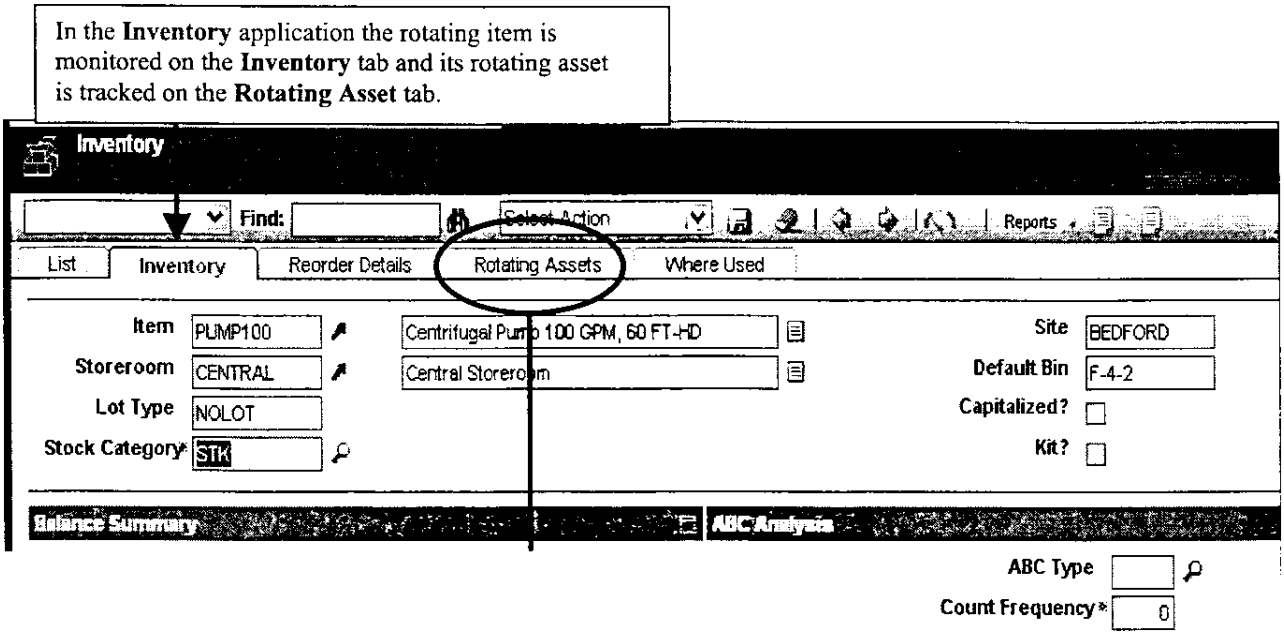
You can also set up items as rotating assets that are not necessarily moved into and out of service, such as a vehicle. These serialized assets (rotating assets) are typically high value and/or critical to your overall operations.

Identifying and tracking them allows you to monitor item performance, track the life-cycle costs, audit life-cycle movement, and analyze the impact of locations on the items.

4.2 Definitions Revisited

A rotating item is an inventory item with a generic item number and a current balance (which can be greater than one). Multiple instances of rotating items can be used in multiple locations. For example, "450HPENG" is the generic item. A unit of rotating asset is an individual instance of a rotating item, identified by an individual asset number.

5. Inventory module screen:



Use this tab...	To...
List	Search for inventory records.
Inventory	Enter, display, and update inventory information. Alternate or interchangeable items can also be entered or viewed.
Reorder Details	Enter or view reorder details, such as: • reorder point • lead time • issue units In addition, you can enter or view information about one or more vendors for an item, as well as information about multiple manufacturers or models for each vendor.
Rotating Assets	Identify and track rotating assets—interchangeable pieces of assets that can be identified with a single item number.
Where Used	List all units of assets on which an item is listed as a subassembly or spare part.

6. Reordering:

Setting up and using reorder in Maximo reduces "stock outs" and also allows for improved purchase planning. Organizations can realize a 5% to 10% or higher reduction in inventory levels.

Example:

Satellite stores reordering from the Primary - hub storeroom will allow you to consolidate purchasing.

Depending on your business and how you keep inventory, you can use the Maximo reorder routine regularly to reorder inventory items. In Maximo, there are two actions that allow you to reorder items:

- Reorder Items
- Reorder for Direct Issue Items

Chapter 6: Assets

1. Term:

1. Non-Rotating Asset.

Assets for which you want to keep a repair history, but that will not be stored in inventory.

2. Rotating Item/Rotating Asset.

Assets that are interchangeable, such as motors, pumps, fire extinguishers, or PC monitors. Rotating assets have both a unique asset number and an inventory item number. The item number lets you track assets as a group as they are moved into and out of inventory and other types of locations. Each piece will have the same item number and a different asset number.

For example, a company might have five similar centrifugal pumps in that all five are the same make and model. Therefore, they all have the same item number. However, each pump is a unique unit of asset with its own history of use and repair. Therefore, each pump has its own unique asset number, which enables you to track maintenance and related costs.

3. Items.

Generic identifications of assets or spare parts. IT establishes the attributes of the rotating asset (asset) associated with it.

4. Locations.

Functional identifications where assets can reside.

2. Performance Matrix (KPI):

Metric Title	Metric Description
% Total downtime	Percentage of the total operating hours resulting in downtime for all causes.
% Maintenance downtime	Percentage of the total operating hours resulting in downtime for maintenance reasons.

% Planned/Scheduled downtime	Percentage of downtime that was planned or scheduled.
% Unscheduled downtime—mechanical	Percentage of unscheduled downtime that was for mechanical problems.
% Downtime caused by breakdowns	Percentage of downtime that was caused by breakdowns.
Direct costs of breakdown repairs	Direct costs for repairs of breakdowns.
% of breakdowns preventable	Percentage of breakdowns that were preventable.
% Asset uptime	Percentage of time the asset was up, ready to run.
% Time assets are utilized	Percentage of time that assets were utilized.
Asset availability	Asset run hours budgeted minus breakdown and overhaul hours divided by budgeted hours.
Mean Time Between Failure (MTBF)	A measure of the typical duration between any failures for a critical asset (breakdown).
Mean Time Between Repair (MTTR)	A measure of the average time it takes to correct failure on an asset.
% Root cause failure analysis performed	Percentage of asset failures that root cause failure analysis is performed per year.
Mean time between stops (MTBS)	Average time between stops for production.
% Repetitive asset failures	Percentage of asset failures that are repeat failures.
% Critical asset design studied	Percentage of critical asset design that has been studied for possible improvement in performance.

3. Reports for Assets (Common):

Report	Description
Details of an Asset's Failures	Summarizes the failures, by problem code, for an asset between the specified dates. Links are available to view these failures graphically. Problem codes are linked to the Drilldown into Asset's Failures report.
Drilldown into Asset's Failures	Displays problem causes and remedies for the selected problem code.

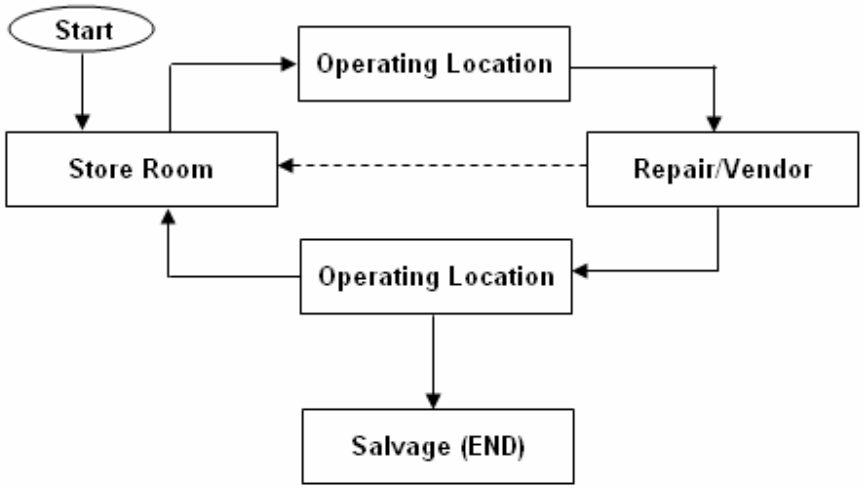
Asset Cost Rollup	Displays an update of an asset's year-to-date and total costs. The list includes the option to update the database with the new asset cost values.
Summary of Asset Failures by Location	Displays the total number of failures reported against the selected assets during the specified time period.
Asset Measurement History	Displays meter readings and results for specified action/warning limits. Also accounts for characteristic meter readings. Counts for over specified time frame. Depending on meter type, a line or scatter graph is displayed.

In MAXIMO, Asset can be divided into two groups:

1. Rotating Asset

Might start its lifecycle as a stocked item in a storeroom, to be issued and transferred. Rotating asset can be tracked in inventory.

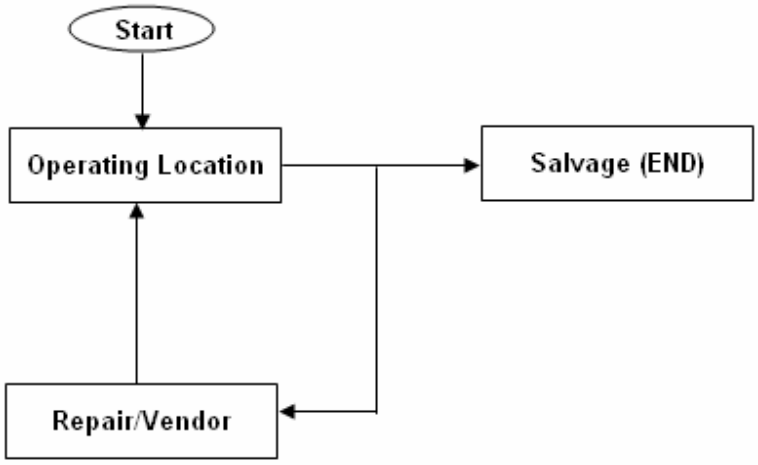
4. Rotating asset scheme:



2. Non-Rotating Asset

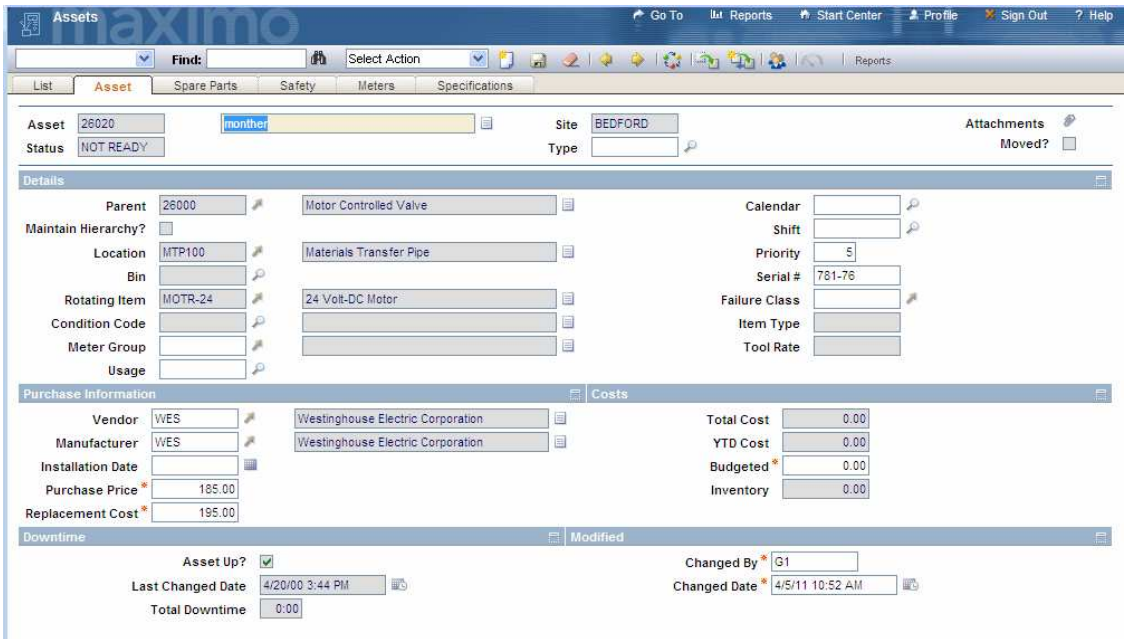
Start its lifecycle at a location. Non-rotating assets do not move into and out of storerooms and are not tracked in inventory.

5. Non-Rotating asset scheme:



The Assets application enables you to keep and update the records of all of your assets and operating locations. Use the Assets application to add new assets to the database and define relationships among these assets.

Asset Screen:



6. Asset Status:

The Status field is used to indicate when an asset is:

- Not Ready - Default status for new asset records. Asset records can be created before assets have been received, installed, configured, inspected, or otherwise approved for their intended use.
- Decommissioned - Asset has been retired from service and moved to scrap or salvage.
- Operating - Asset has been received, installed, configured, inspected, or otherwise approved for use or operation.

7. Spare Parts (in this case: Sub Assembly):

In Maximo there are several ways to associate spare parts to an asset:

- Use the Item Assembly Structure application to build and apply spare parts to an asset or to an item. You can also apply an IAS at the time of receiving an asset or item.
- On the Assets application's Spare Parts tab, associate those items as spare parts to the selected piece of assets.
- In the Item Master application, select the Add Spare Parts option to indicate that the item will be added as a spare part for the assets when issued, if the item is not already a spare part.

8. Asset Type:

Asset Category	Description
Production	Production assets are generally understood to be those involved in discrete or process manufacturing. This includes, for example, robots on the assembly line at an automobile plant, or the steppers used in computer chip manufacturing. However, the definition of production assets is considerably broader. In the utility industry, for example, production assets are turbines and compressors used for power generation; they also include the transmission and distribution assets that deliver output to end users. In the telecommunications industry, the antennas and microwave towers involved in producing and delivering output to customers are also production assets.

Facilities	Facilities assets include types of buildings, from corporate headquarters, casinos (e.g., MGM Grand), and museums (e.g., the Louvre), to stadiums, shipyards, and passenger terminals (e.g., Zurich Airport). Maintaining these facilities can involve mechanical, HVAC, and electrical systems, as well as landscaping and parking lots. There are also many specialized facilities, such as clean rooms, surgical theaters, laboratories, and satellite ground stations.
Fleet	Fleet assets are often over-the-road vehicles such as cars and trucks; however, this category also includes airborne fleets (aircraft), rolling stock (rail cars), and marine assets (passenger boats and ships). Companies might have mission- critical fleet assets around which the core of their business is built; for example, a commercial shipping company depends on its trucks and aircraft. Vehicles for a public transit organization like Long Island Railroad also fall into this first category. Additionally, companies might have enterprise fleet assets that are important to the overall function of an operation but do not directly generate revenue, such as employee shuttle buses, repair trucks, or forklifts.
IT	The operations of most companies today are critically dependent on the organization's IT infrastructure. On the hardware side this includes servers, desktops, laptops, cell phones, PDAs, hubs/routers, and telecom assets. Software is equally important in day-to-day operations, and ensuring software license compliance is an important part of IT asset management.

Chapter 7: Job Plans

A job plan is a detailed description of labor, materials, services, and tools to be performed on a work asset. It shows quantities, descriptions, and costs of the inventory items, labor, and tools you indicate that you will need for the job. Job plans can be used with any type of work order; they are most often used with preventive maintenance (PM) work orders, but they can also be used for unscheduled work such as emergency recovery, planned outages, annual overhauls, and winterization.

1. Job Plans Performance Matrix (KPI):

Metric Title	Metric Description j
% of Planned Maintenance Work	Percentage of work orders that were j planned.
Weekly Plan Attainment %	Measure of the successful completion of the maintenance plan on a weekly basis.
% Planned/Scheduled downtime	What percentage of asset downtime was planned or scheduled.
Unplanned %	The level of unplanned maintenance activities against available time.
% of Work Orders with Job plans	Percentage of work order that had job plans associated to it.
% of Work Orders with Work plans independent of Job Plans	Percentage of work orders with work orders independent of a job plan being associated to it.

A job plan is the heart of a proactive maintenance program. It represents the accumulated knowledge of the manufacturer, skilled mechanic, and engineer. It indicates what to do, what to use, what to look for, how to do it, arid when to do it.

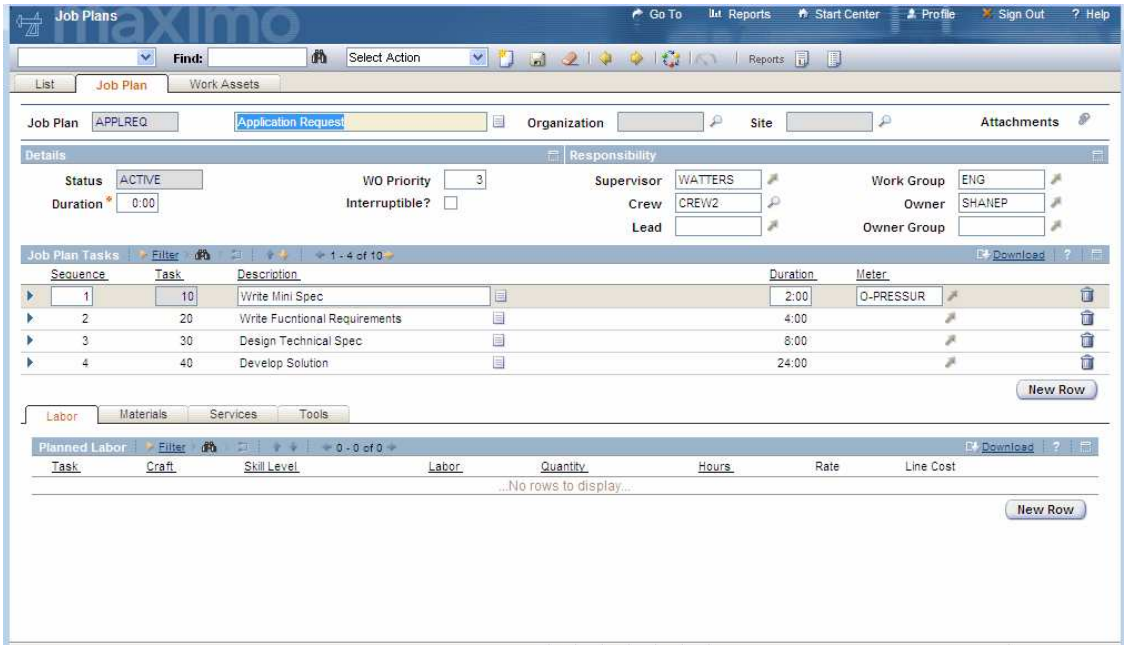
In Maximo, job plans are used as templates for work orders that have been associated to a record in the Preventive Maintenance, Condition Monitoring, and Routes applications, or associated to a work order in a Waiting for Approval (WAPPR) status.

Use job plans to:

- estimate the operations, materials, labor, and tools required for maintenance tasks before the work is requested; and
- establish a template for maintenance work that is repetitive (e.g., major overhaul, monthly preventive maintenance program work).

A work plan describes the labor, materials, tools, and tasks needed to complete a specific work order. The work order contains tasks for each operation in the work plan. When you generate a work order, Maximo copies an associated job plan to the work order as a work plan. This allows you the flexibility to modify tasks in a work plan without modifying the original job plan; these changes do not affect the original job plan.

2. Job Plan Main screen:



Chapter 8: Work Order and Preventive Maintenance

The Work Orders module is the core maintenance tool of Maximo. Work orders are used to carry out work on your assets and are created for many reasons, including:

- Preventive maintenance,
- Emergency maintenance and
- Corrective maintenance.

Before work orders can be associated with an asset, the status of the asset must be Operating.

1. Maximo uses asset meters to generate PM work orders as follows:

- Using the **Condition Monitoring application**, where PMs are generated when the assets' acceptable upper and lower limit meter readings are reached.

Introduction

- Using the **Preventive Maintenance application, meter-based PM tab**, where PM frequencies are based on defined meter units used since the last work order was completed or targeted to start.

2. Meter Types

Three types of meters can be created:

- Continuous meters are cumulative and tend to measure consumption or accumulation.

Example: Miles, flight hours

- Gauge meters show a range of values.

Example: Fuel level, temperature, pressure, noise level, oil level

- Characteristic meters are observational and have a list of possible values

Example: Oil color, flame color

Maximo uses asset meters as one criterion to generate PM work orders. PM

Associating Assets and frequency is based on elapsed time in days or in meter units used since the last work order was completed or targeted to start. The Meters tab lets you enter multiple meter readings per asset record.

3. Work Order Performance Matrix (KPI):

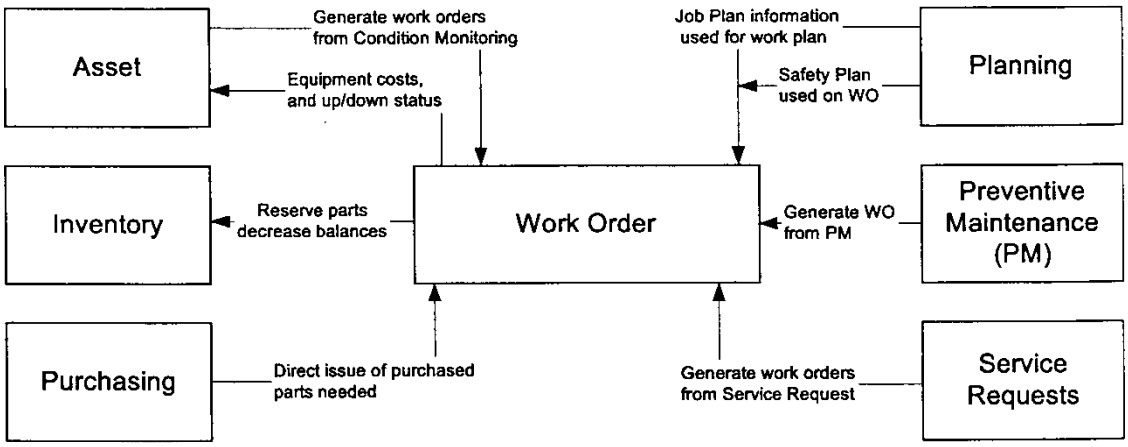
Metric Title	Metric Description
% Maintenance labor $ captured on work orders	The percentage of completed work orders that have labor entered.
% Maintenance material $ captured on work orders	The percentage of completed work orders that have material entered.
% Maintenance contract $ captured on work orders	The percentage of completed work orders that have contract $ entered.
% Maintenance downtime captured on work orders	The percentage of work orders that have downtime information recorded on them. This is only maintenance related and not total asset downtime.
% Maintenance labor captured on standing work orders	The percentage of labor $ entered on standing work orders.
% Maintenance material captured on standing work orders	The percentage of maintenance material $ entered on standing work orders.
% Maintenance work orders planned	The percentage of all work orders that are planned.
% Maintenance hours scheduled	The percentage of all labor hours that are scheduled.
% Maintenance hours scheduled that were completed	The percentage of scheduled hours that were completed as scheduled.
Estimated hours/actual hours on planned work	The estimated hours for all work orders divided by the actual hours for the same.
% Work orders completed within 20% of estimated labor	What percentage of work orders were completed within plus or minus 20% of the labor estimate.
% Work orders completed within 20% of estimated material $	What percentage of work orders were completed within plus or minus 20% of the material estimate.
% Work orders waiting on parts	What percentage of work orders are waiting on parts.

Outstanding work order backlog hours	What is the total remaining estimated hours for all work orders not yet completed or canceled.
Breakdown work orders during period	How many work orders were generated during the period for breakdowns.
% Emergency work labor hours	What percentage of all work orders were emergencies.
% Preventive work labor hours	What percentage of all work orders were PMs.
% Predictive work labor hours	What percentage of all work orders were predictive.
% Corrective work labor hours	What percentage of all work orders were corrective.
% Work orders overdue	What percentage of work orders were not completed by the due date.

4. In Maximo, maintenance activities can be specified as different work types:

- Corrective (CM): is repair work that can be planned and scheduled.
- Emergency (EM): is unplanned, unscheduled breakdown maintenance. EM also means Reactive Maintenance.
- Preventive (PM): is scheduled work (fully planned) that is based on either time or meter.
- Capital Project (CP): is fully planned scheduled project work.
- Event (EV): is an unscheduled event that stops work (production) but does not necessarily require a maintenance crew to fix.

5. Work Order Module Relation:

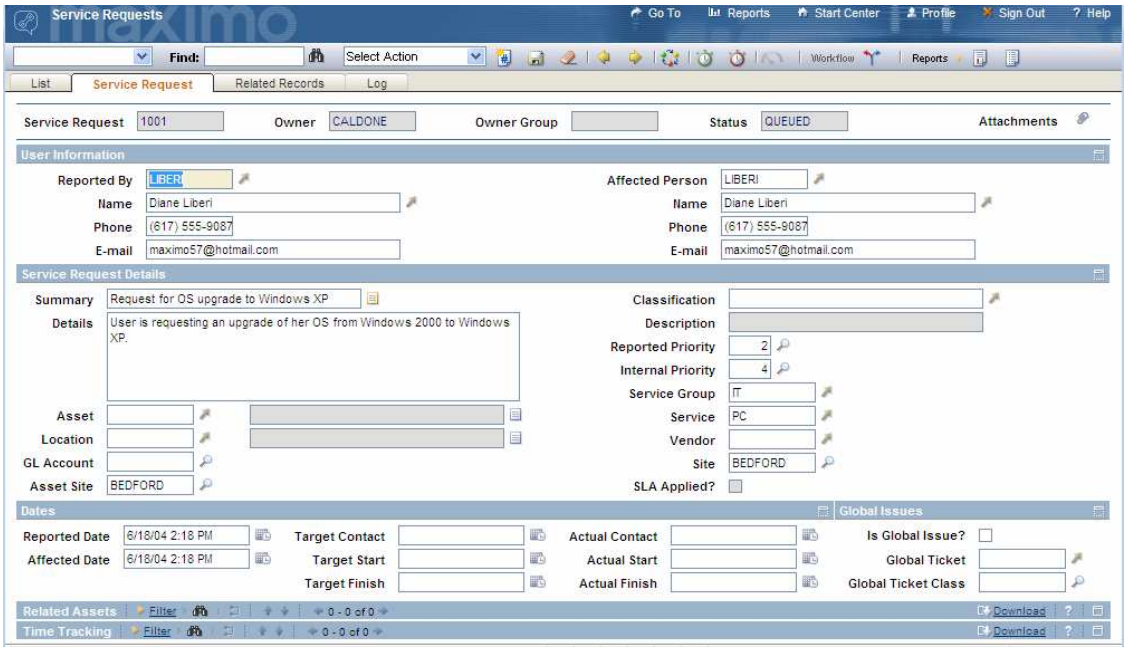


6. Work Order Life Cycle:

Stage	Description	Status
1	A work order is either manually or automatically generated. If manually generated, it will have a Waiting for Approval (WAPPR) status. If automatically generated, depending on how it is set up, the work order can have a status other than WAPPR. For example, you can set up the PM application to generate PM type work orders to have a Waiting to be Scheduled (WSCH) status. If emergency work is entered into the Quick Reporting application, the status is In-Progress (INPRG)	WAPPR WSCH INPRG
2	The planner reviews the work order. If applicable, depending on the type of work, the following can be attached or added to the work order: a job (work) plan, safety plan, or service contract. Upon an Approval (APPR) or Waiting to be Scheduled (WSCH) status, the Work Order materials and tools are reserved in inventory. If materials are not available, the work order status will be Waiting for Materials (WMATL). The work order is then scheduled, assigned, printed, and distributed to the staff	WMATL APPR WSCH
3	The supervisor or staff member initiates the work (INPRG). If necessary, the staff member goes to inventory and picks up needed parts and the physical work begins.	INPRG

4	*The* work actuals (labor, materials, and tools) are entered into the system using either the Quick Reporting or Work Order Tracking application. If necessary, a follow-up work order is generated. Depending upon your business process, someone reviews the work and completes the work order ' (COMP) using either the Quick Reporting, Work Order Tracking, or Assignment Manager application. If necessary, issued but unused items are returned to inventory, and/or a follow-up work order is entered into the system. After all system data is entered, work order is closed (CLOSE) and stored in history.	COMP CLOSE

7. Work Order Request (Service Request) Screen in MAXIMO:



8. PREVENTIVE MAINTENANCE

8.1 Preventiv Maintenance (PM) Performance Matrix:

Metric Title	Metric Description
% PM inspections overdue	What percentage of PMs was not completed b> the due date.
% PM inspections completed	What percentage of PMs was completed.
% PM inspections completed by due date	What percentage of PMs was compie&d by the due date.
% PM tasks audited annually	What percentage of PMs is audited! aMiually.
% Corrective work orders generated from PM inspections	What percentage of all corrective woii orders is generated from PM inspections ammally.
Metric Title	Metric Description
% PM inspections overdue	What percentage of PMs was not completed b> the due date.
% PM inspections completed	What percentage of PMs was completed.
% PM inspections completed by due date	What percentage of PMs was completed by the due date.
% PM tasks audited annually	What percentage of PMs is audited!
% Corrective work orders generated from PM inspections	What percentage of all corrective work orders is generated from PM inspections annually.

In Maximo, a PM record specifies work to be performed regularly, based on elapsed time or on meter readings that indicate service hours or mileage. PM records are templates that contain job plans, routes, and scheduling information. You can generate work orders from single PMs or from PMs that you group into a hierarchy. A PM hierarchy models your asset hierarchy as you generate sequenced work order hierarchies.

PM Generation As we said earlier, PM work orders are triggered by one or more conditions:

- Time-based PMs are based on elapsed time since previous work. For example, every 6 months.

• Meter-based PMs are based on meter readings off an asset record. For example, every 7,000 miles.

• Seasonal-based PMs are based on seasonality defined by a period of time For example, December 1 - February 1.

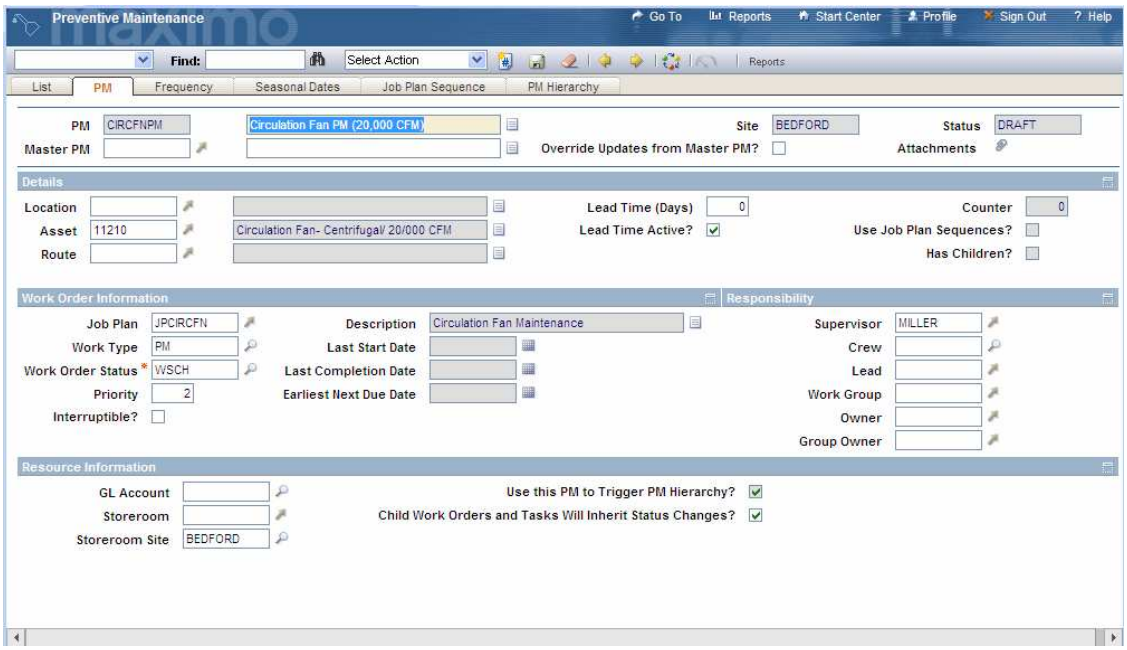
• Combination-based PMs are based on time and meter readings. For example, every 3,000 miles or 3 months.

Note: If a PM is both time-based and meter-based and a generated work order overlaps the setup of either method, both the meter and the time frequency are re-set to avoid unnecessary extra PMs.

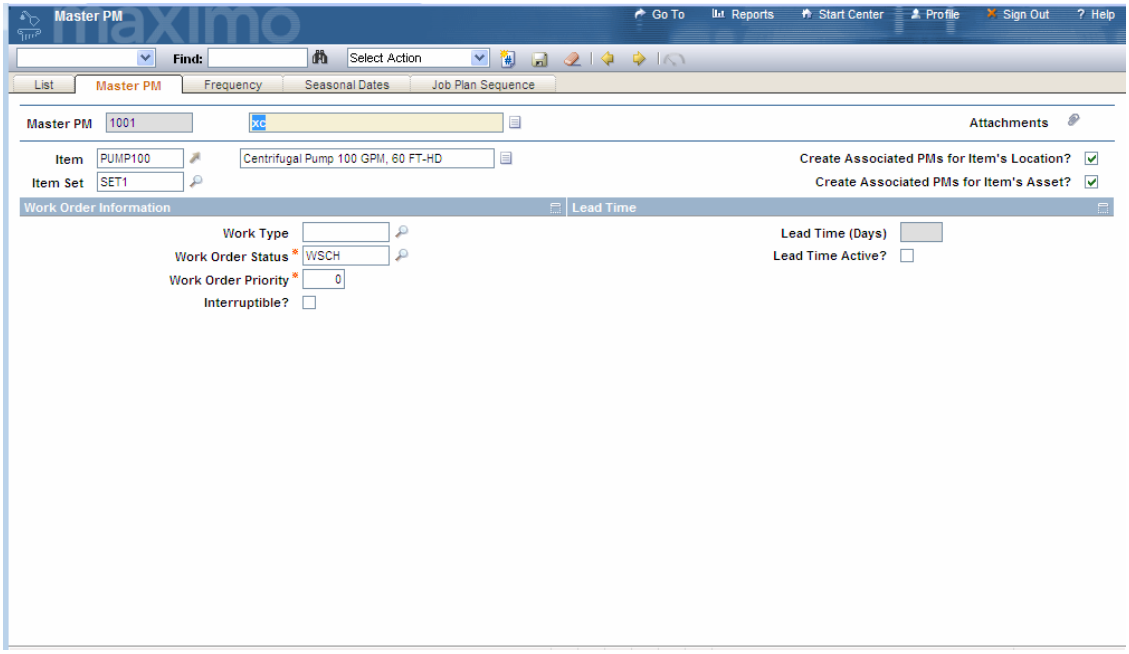
8.2 Master PM

- Master PM (preventive maintenance) records are PM templates containing scheduling information you copy to other PMs, identified as associated PMs You cannot use master PMs to generate work orders, nor can you add them :c PM hierarchies.
- Benefits of Though master PMs cannot generate work orders, using the master PM Using Master enables you to create PM plans for rotating items.

8.3 Preventive Maintenance Screen in MAXIMO:



8.4 Master PM Screen in MAXIMO:



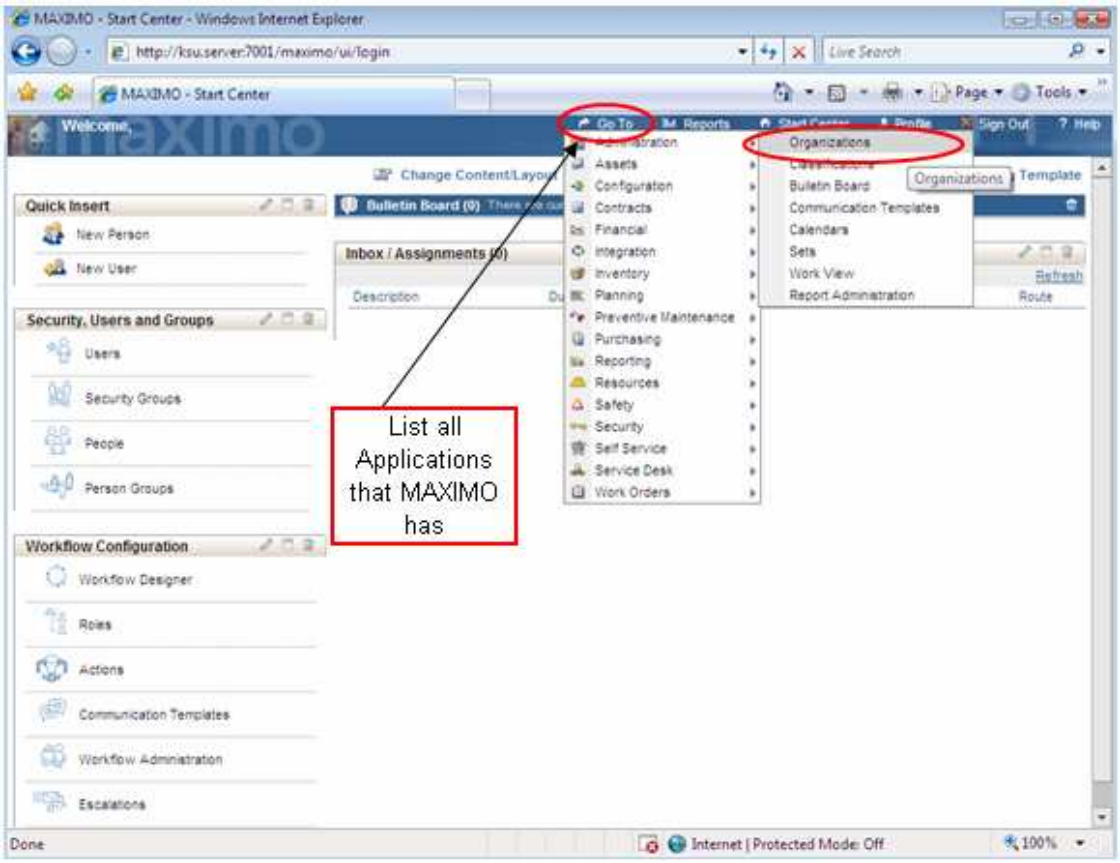
PART 2

Practice and Lab Session

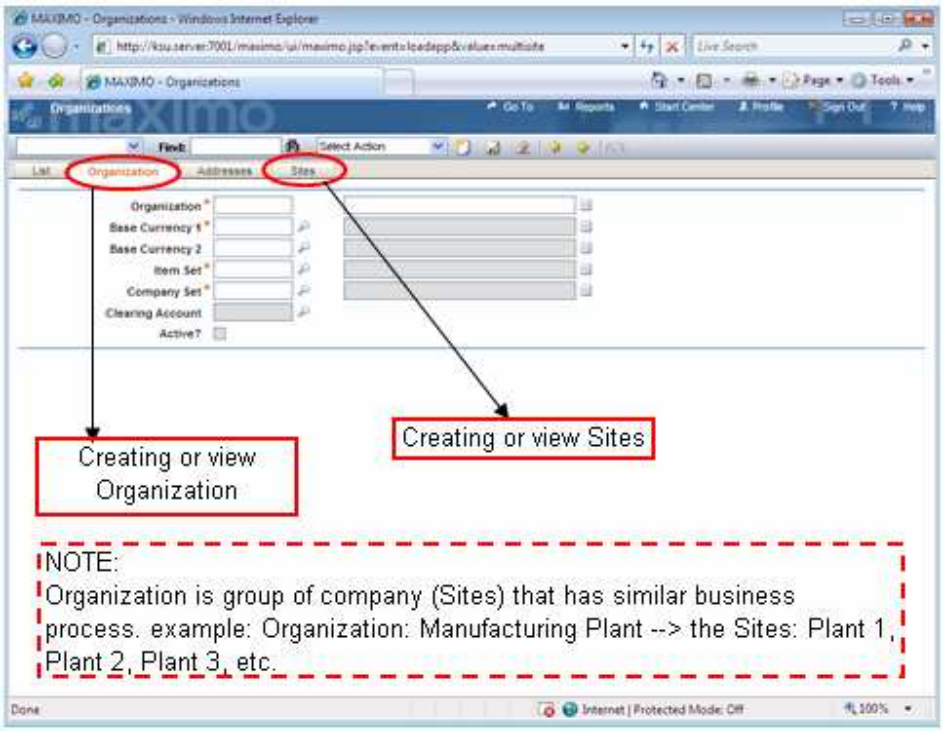
LAB SESSION 1: Setting Up Organization and Sites

Creating Organization and Sites in MAXIMO:

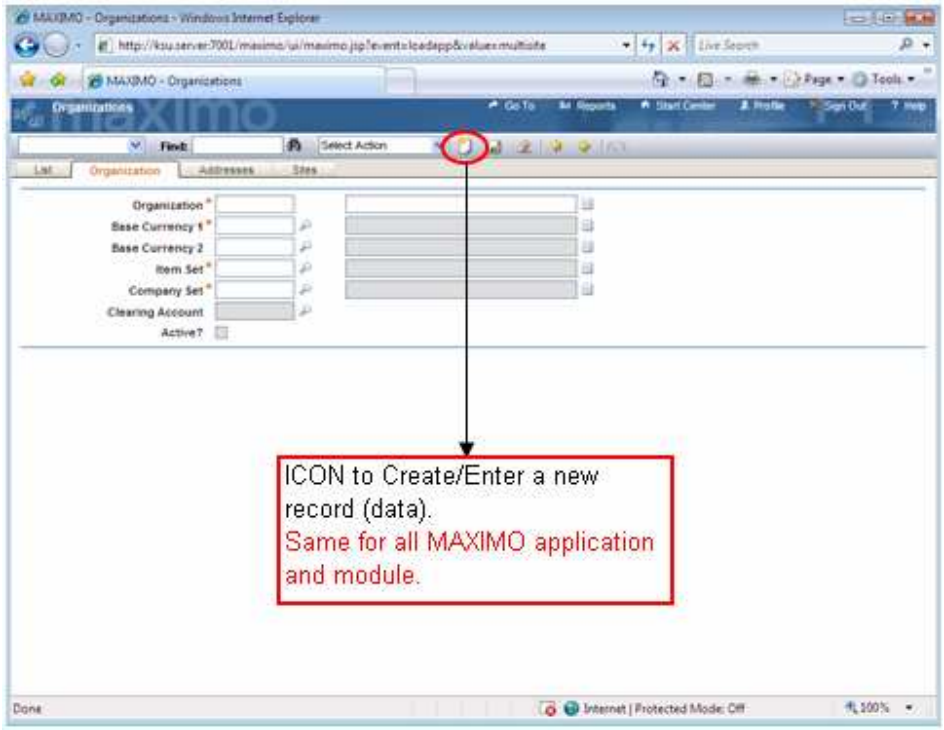
1. Goto Administration → Organizations.



Note: "Go to" menu list all applications that MAXIMO has. In each application, there are modules that we can use.

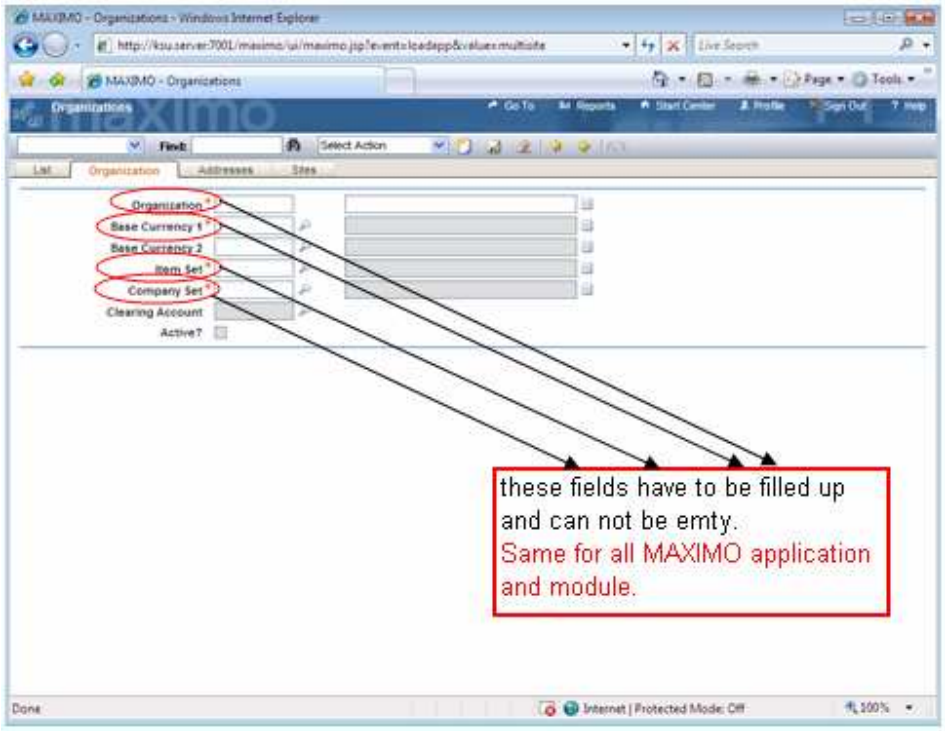


2. Click “New organization” -> a file Icon.

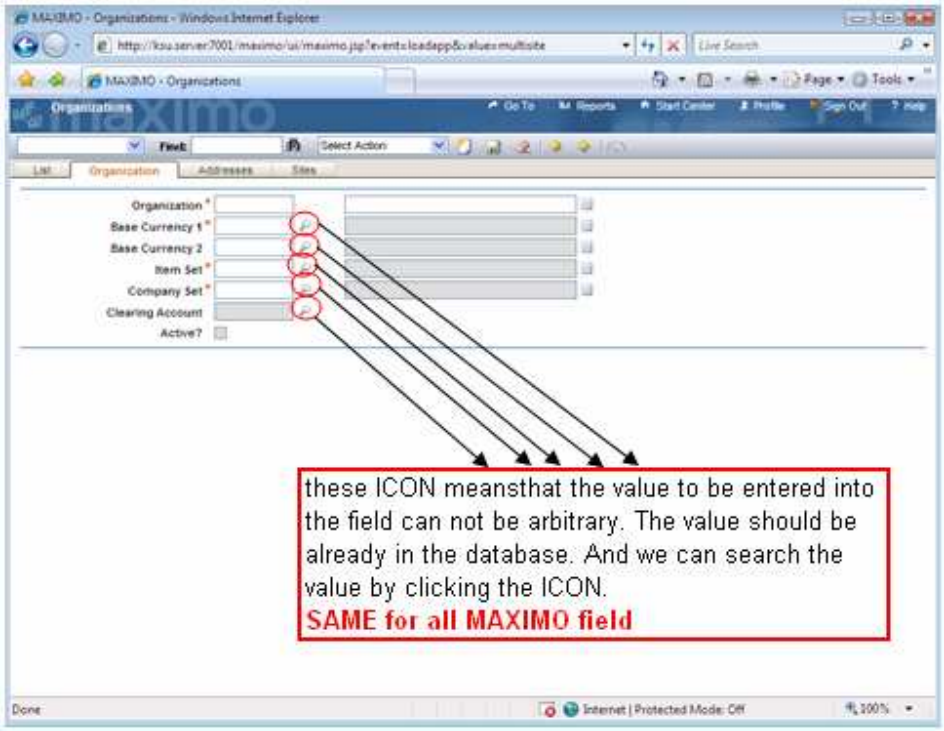


Lab Session 1: Setting Up Organization and Sites

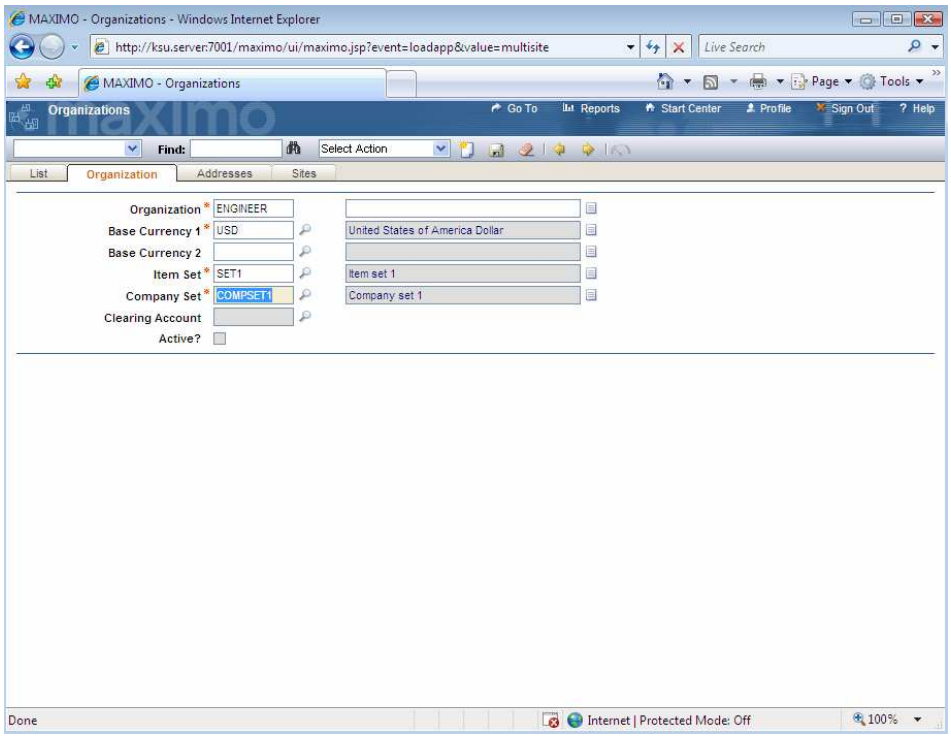
In entering new record (data), some fields will have "red star" mark. It means that, that field should be filled up and can not be empty.



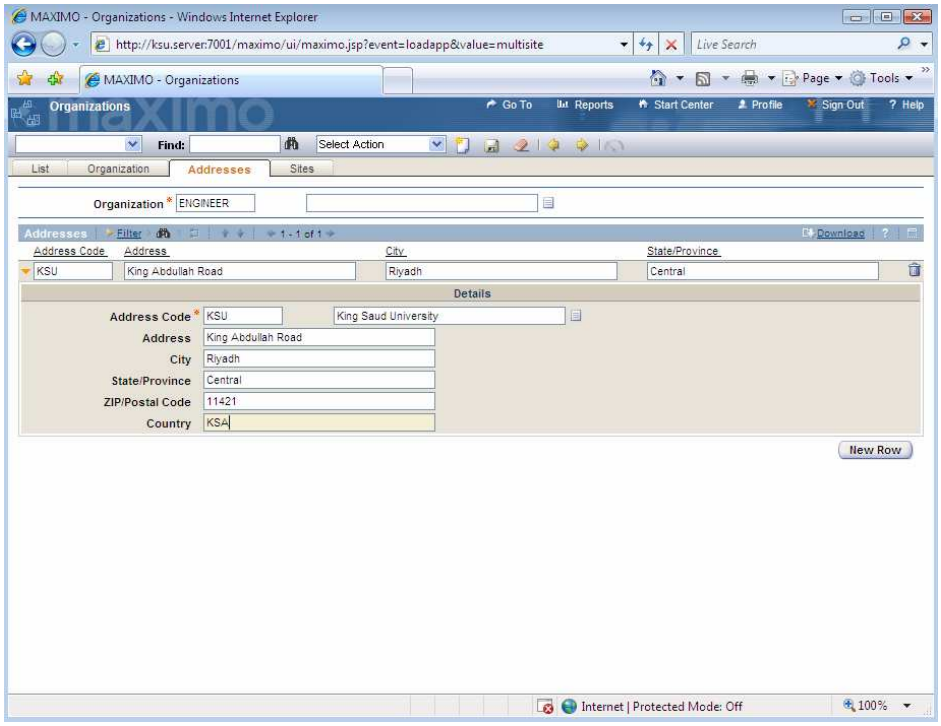
And



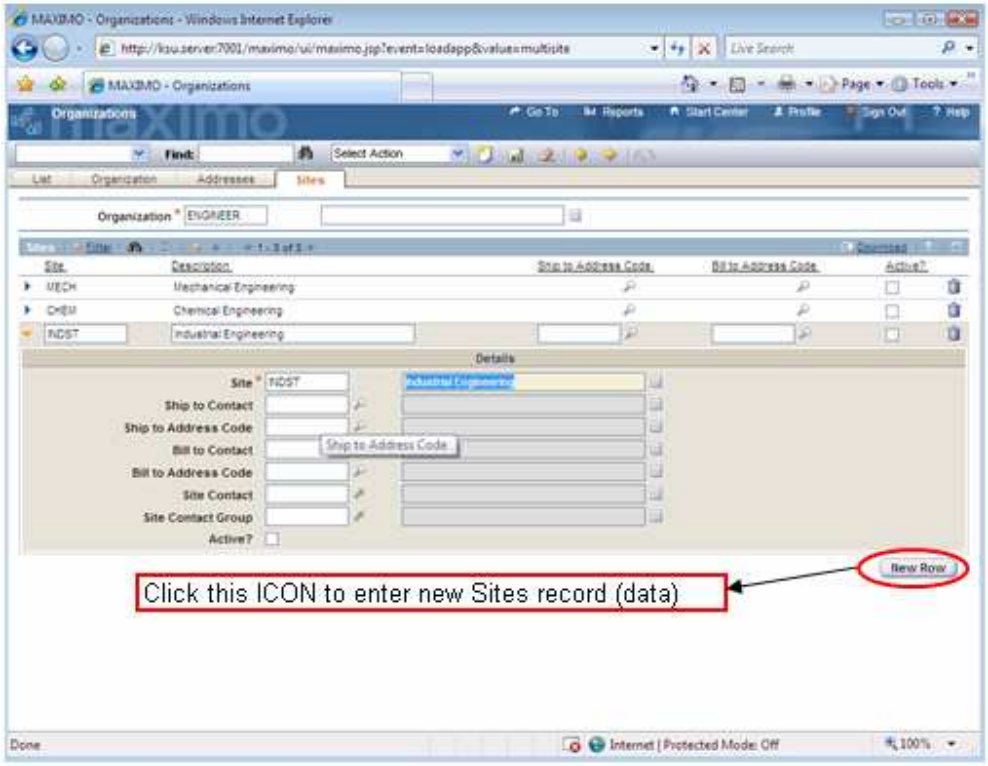
3. Input new data. The fields that have "red start" have to be filled up (compulsory).



4. Go to "Address" Tab. Click new row and filled up the address.

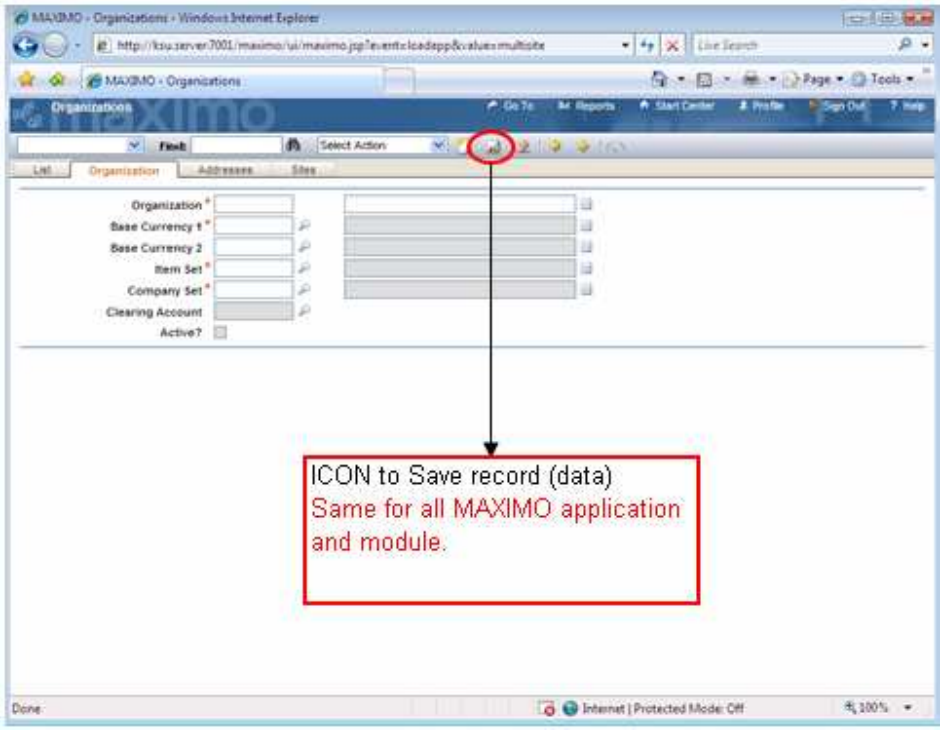


5. Go to Site tab. Click new row and enter its sites.



6. Save the record.

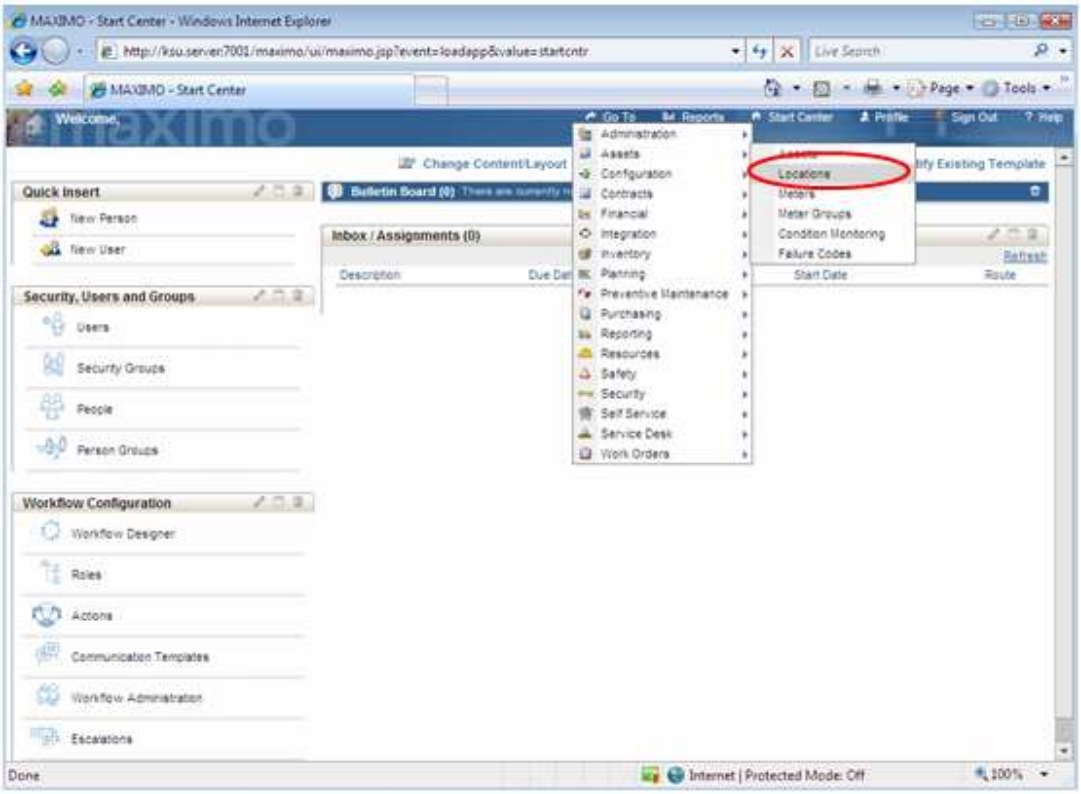
Note: It is suggested that we save the record before moving to another tab event though we can do it later on after finishing all the data in some or all tabs.



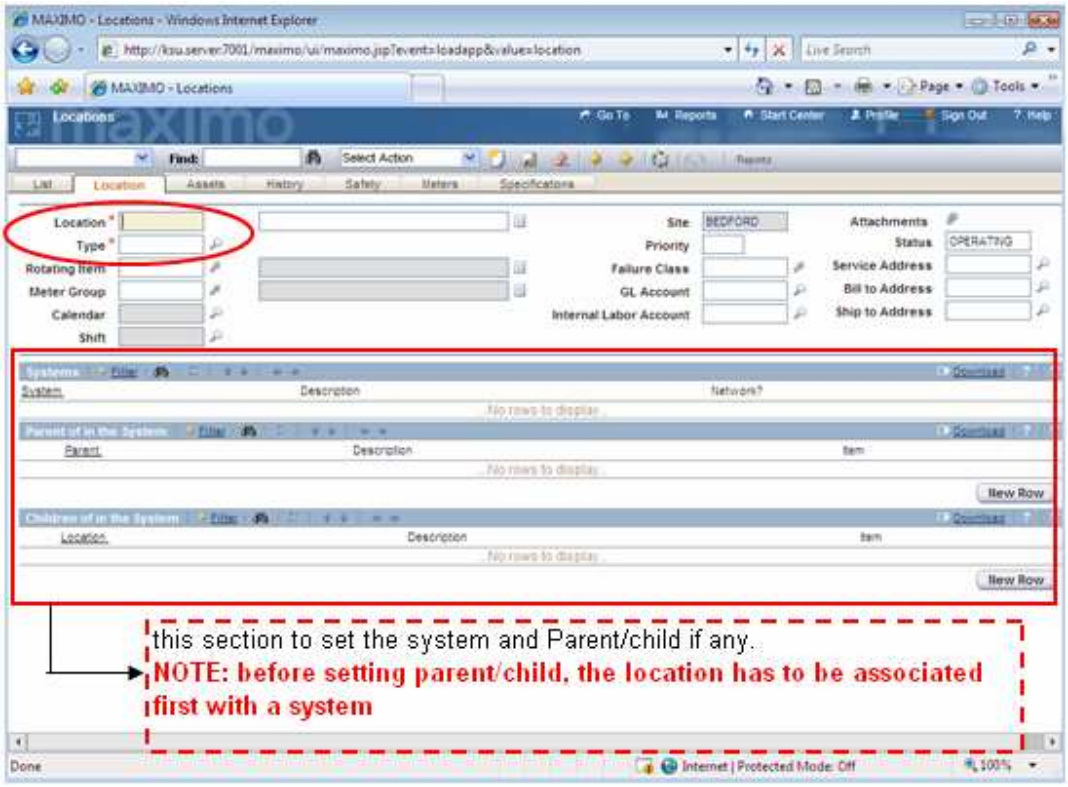
LAB SESSION 2: Setting up Locations

Creating Locations in MAXIMO:

1. Go to Asset → Location

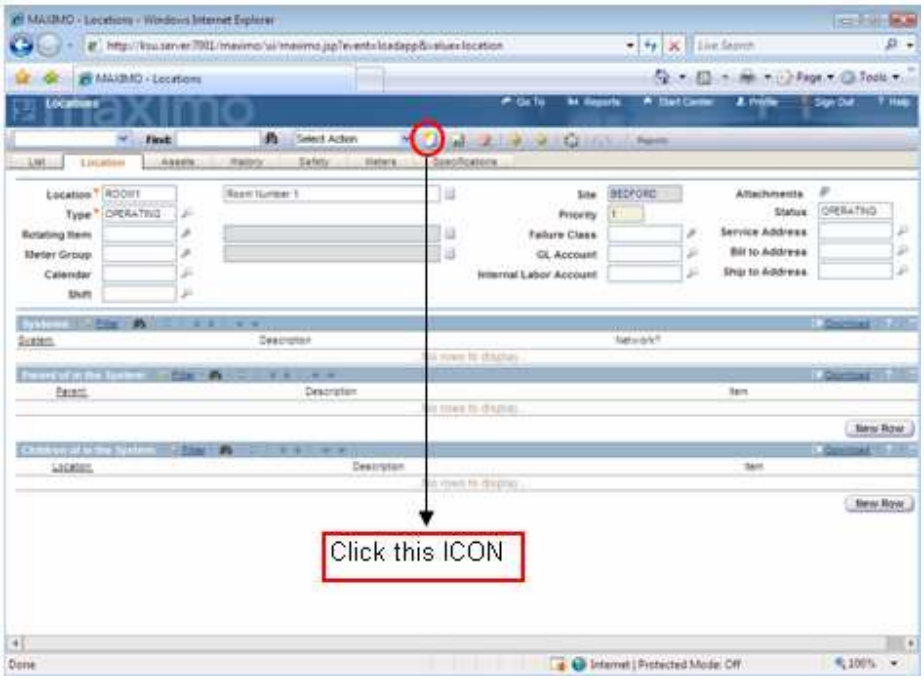


2. Click new record icon

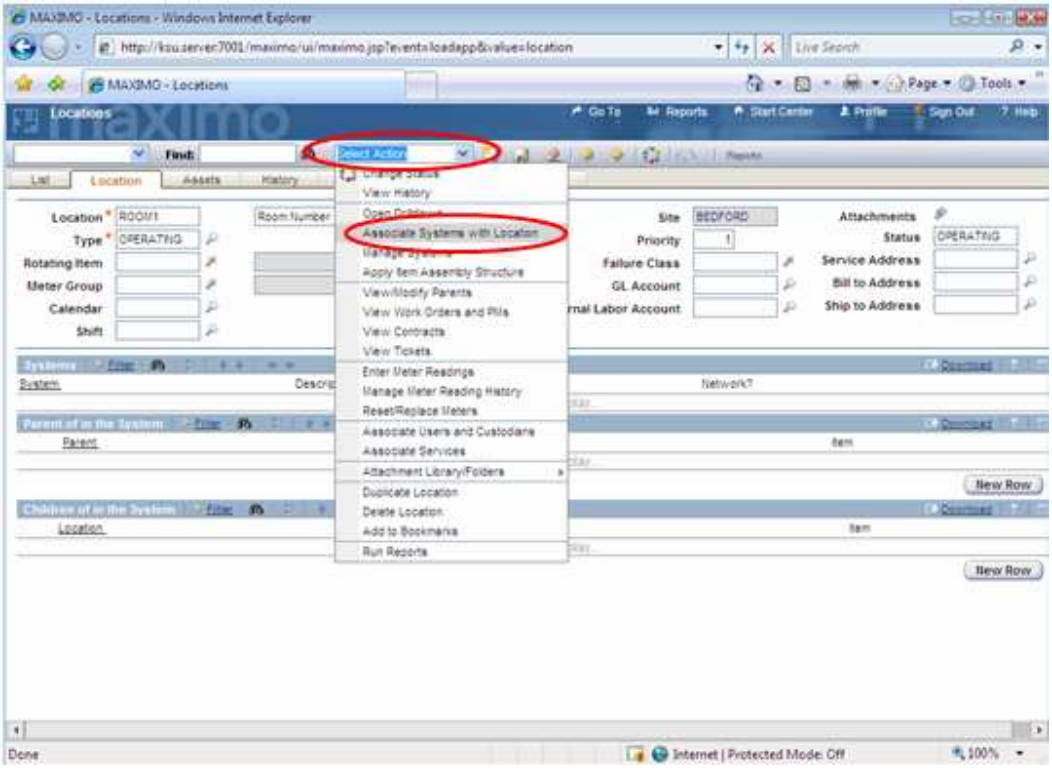


Note: for all MAXIMO field, the fields that are in Grey mean that we can not enter any value (the value is fixed by the system/filled up automatically by the system).

3. Enter the record data of the new location

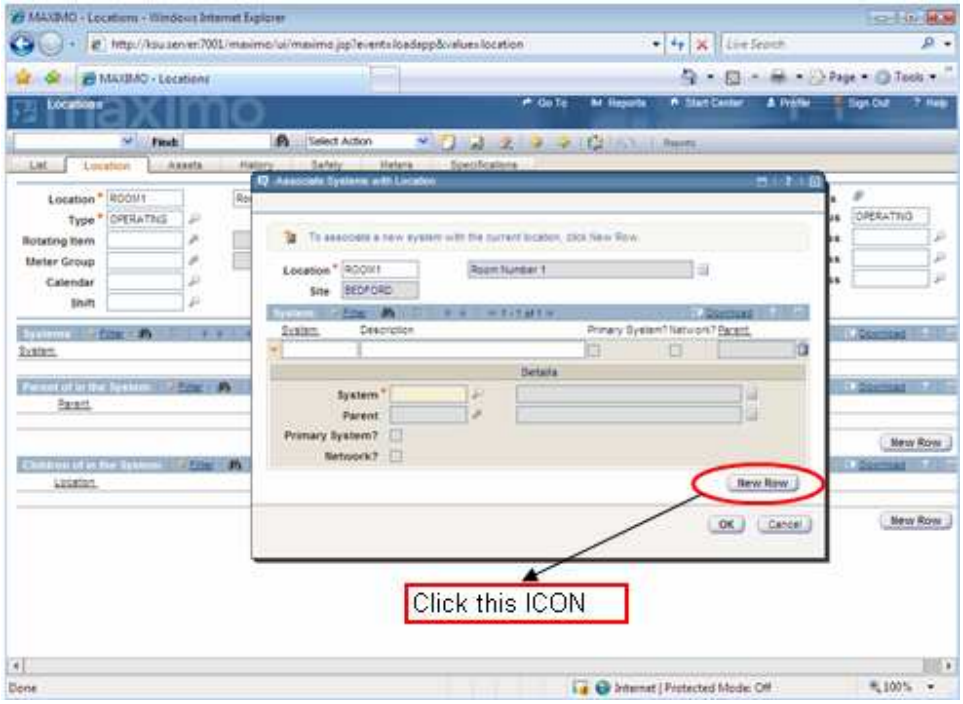


4. Associate Location with System. In “Select Action” → choose “associate Systems with location”

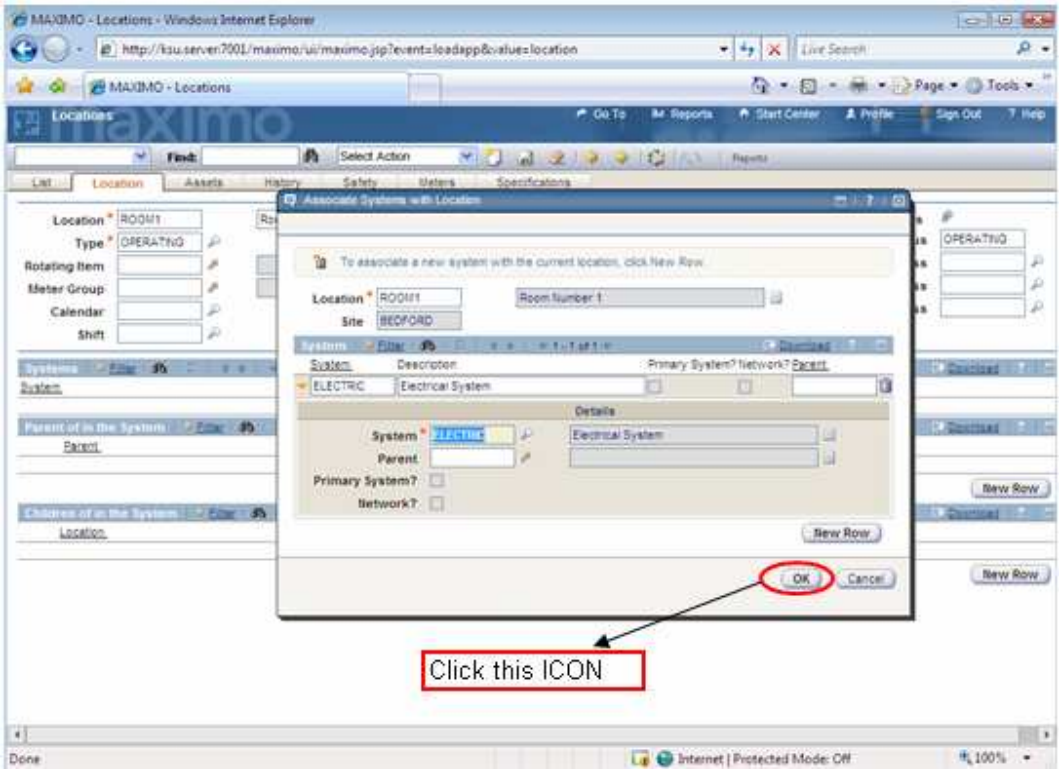


Lab Session 2: Setting Up Locations

Click new row:



And select the system that we want to associate with

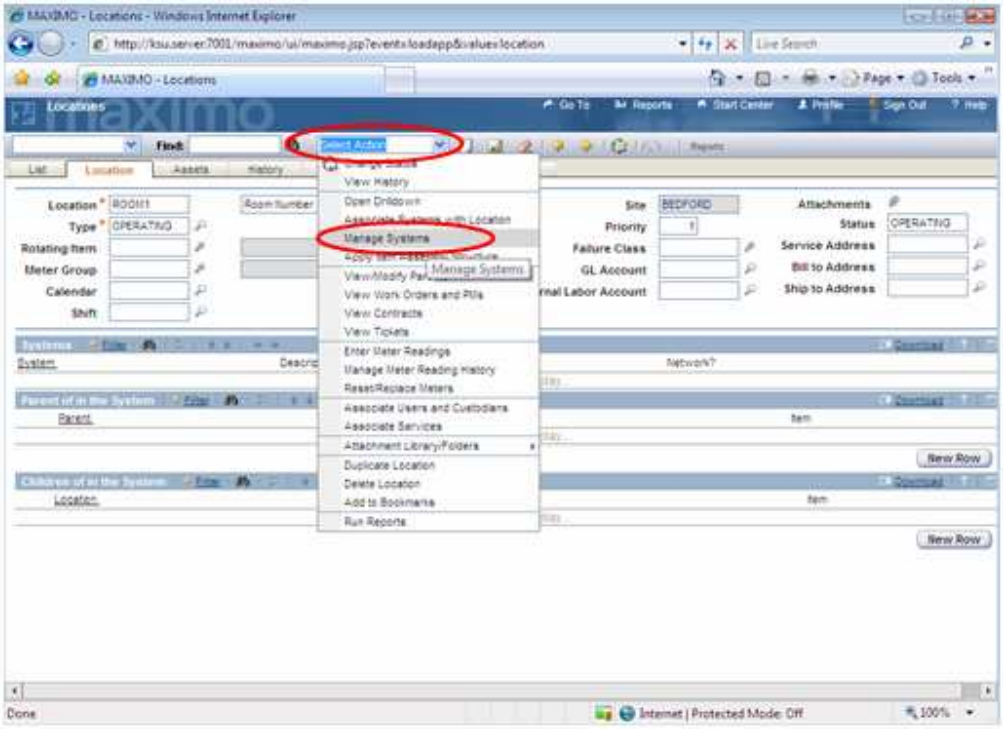


And press OK.

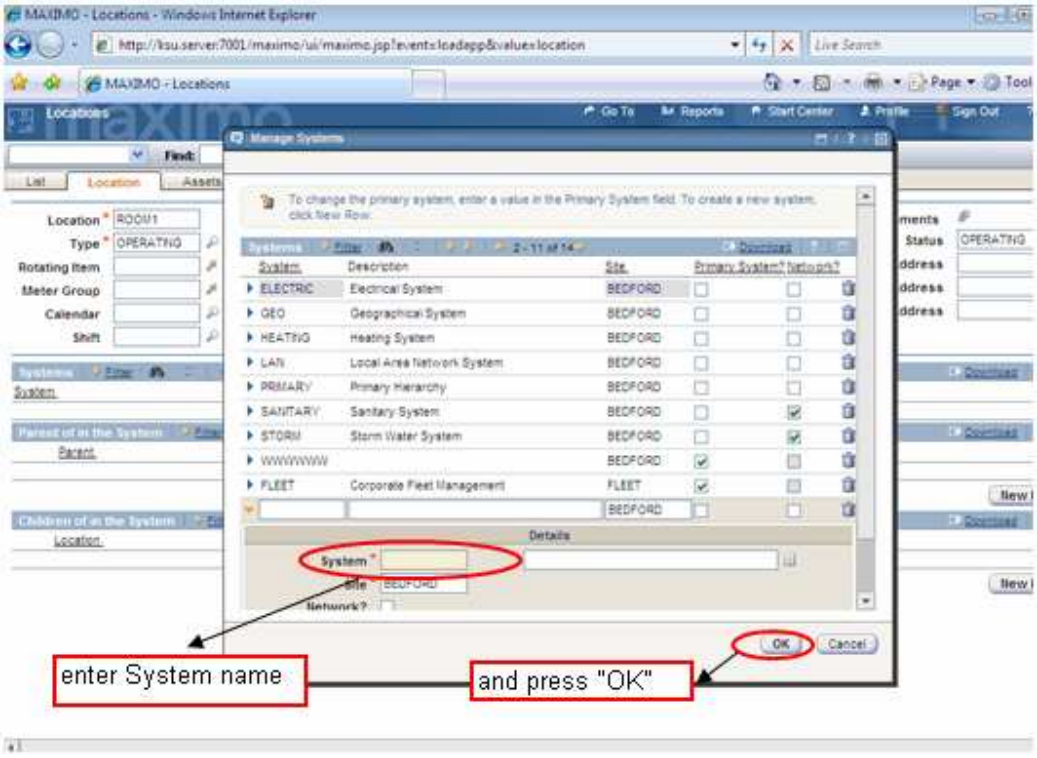
Lab Session 2: Setting Up Locations

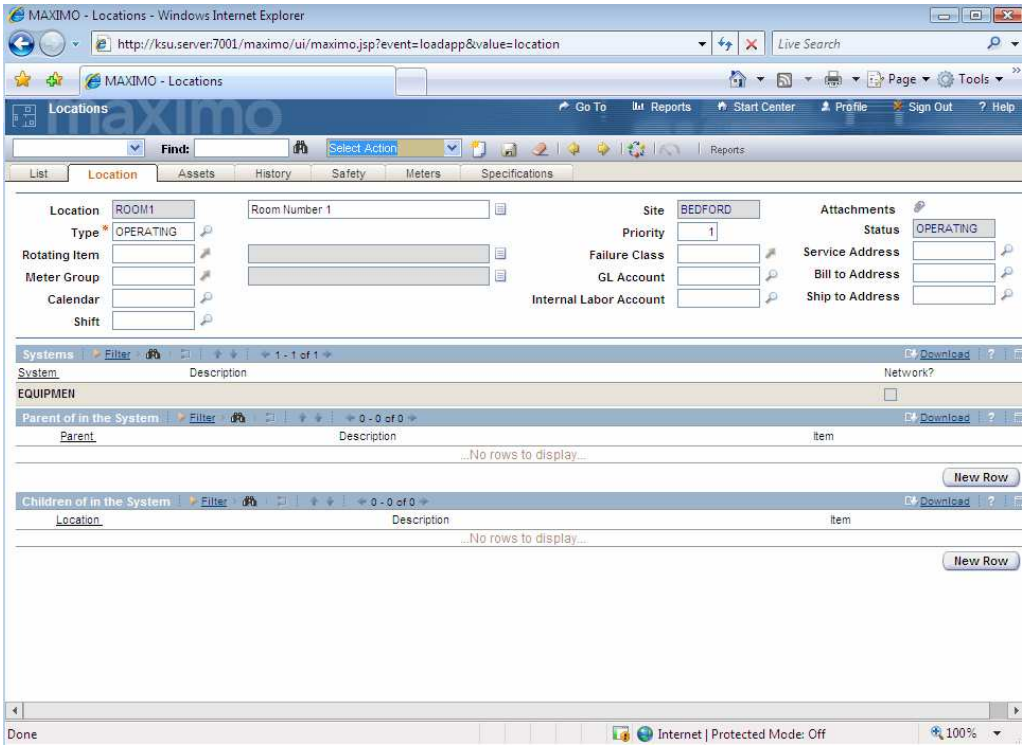
If we want to create or define new system:

- Go to select action → manage system

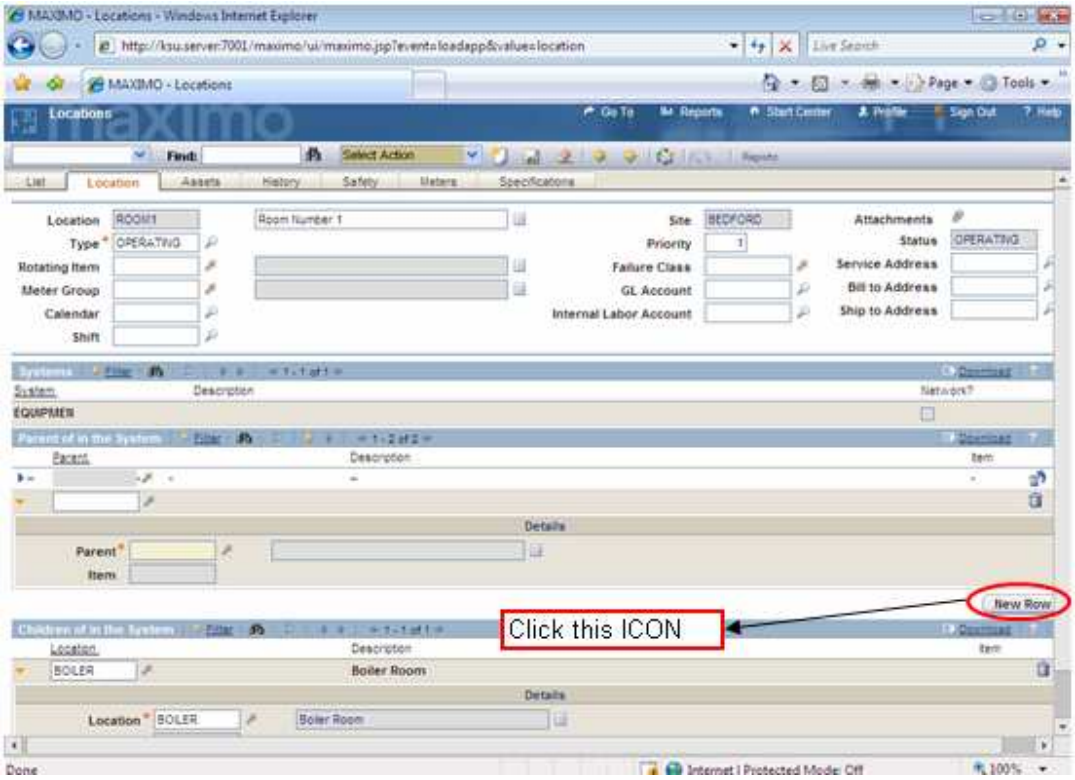


Select new row and insert the new system

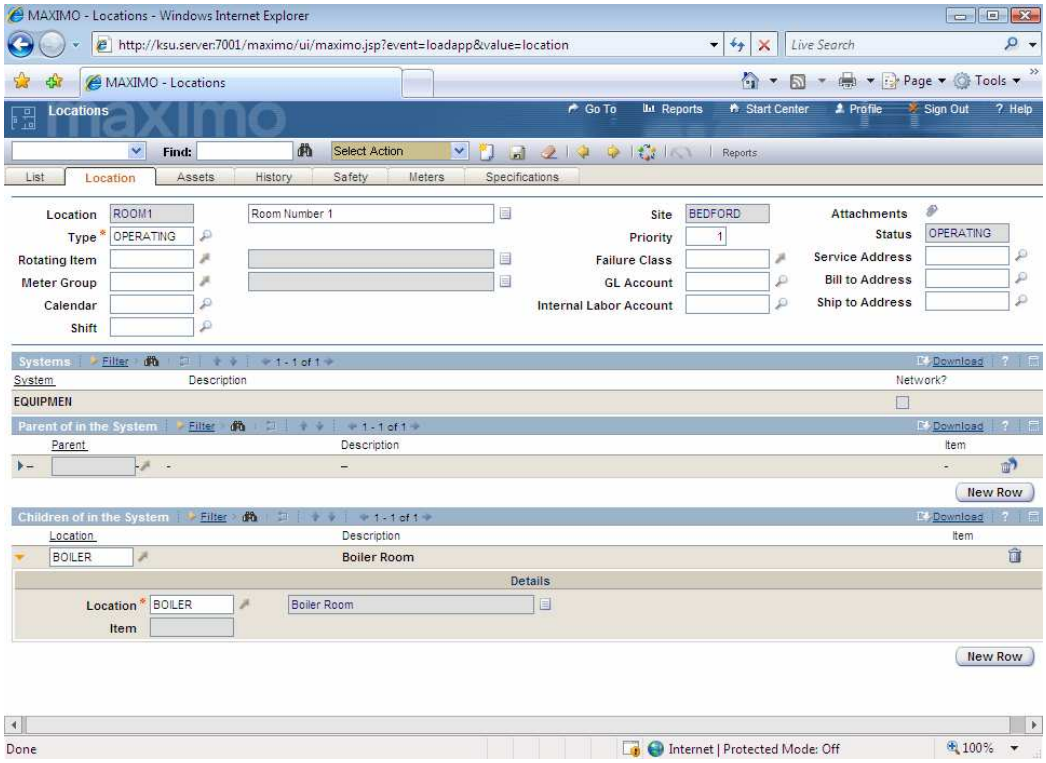




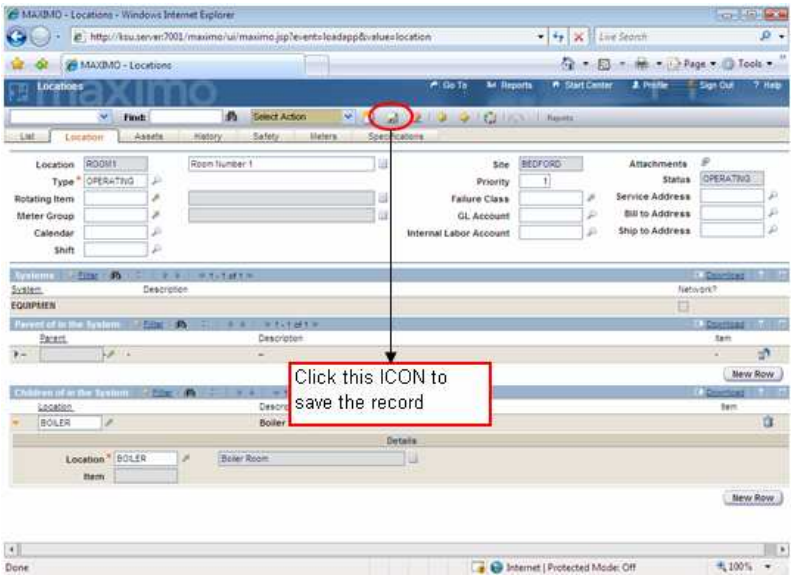
5. Set the parent (if it has) by clicking the new row in parent



6. Set the child (if it has) by clicking the new row in Children



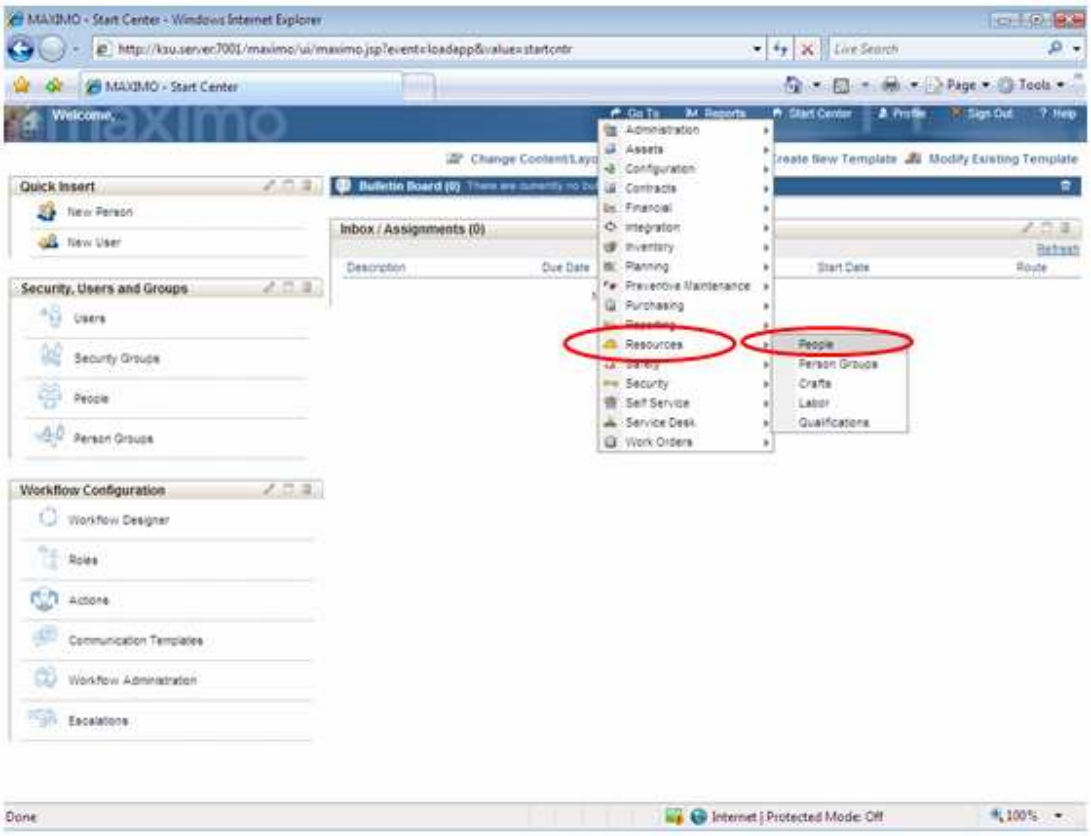
7. Check Asset tab with the location (all the asset associate with the location will be shown)
8. Save the new record



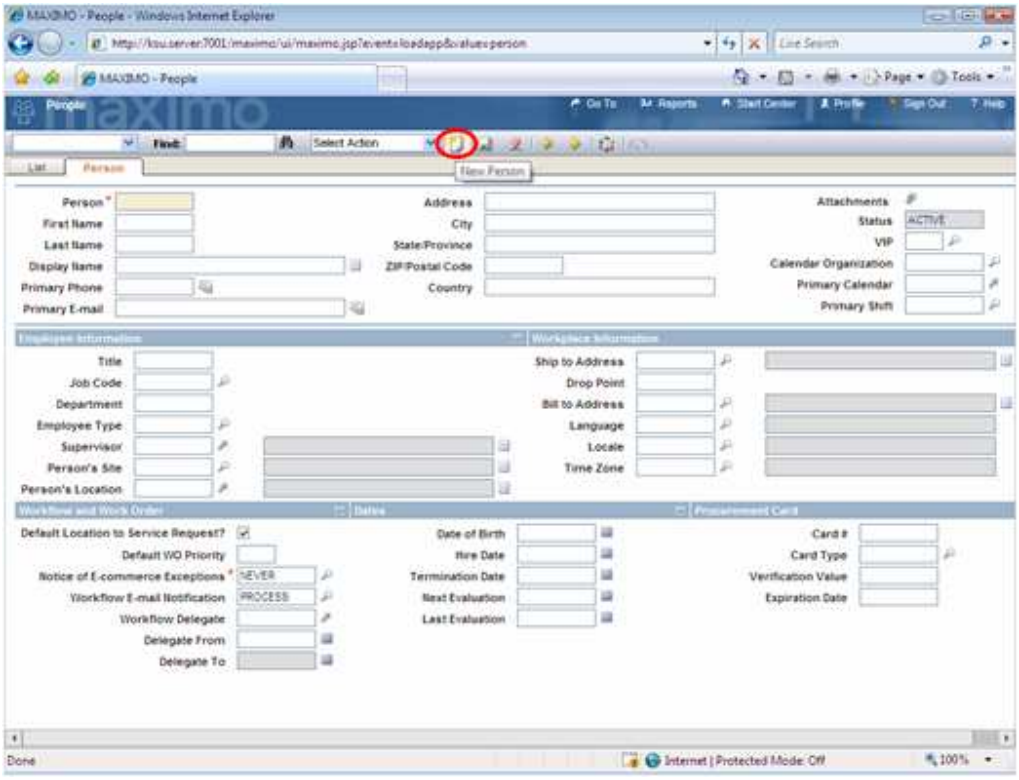
LAB SESSION 3: Setting Up Person, Craft, and Labor

Creating PERSON/PEOPLE in MAXIMO:

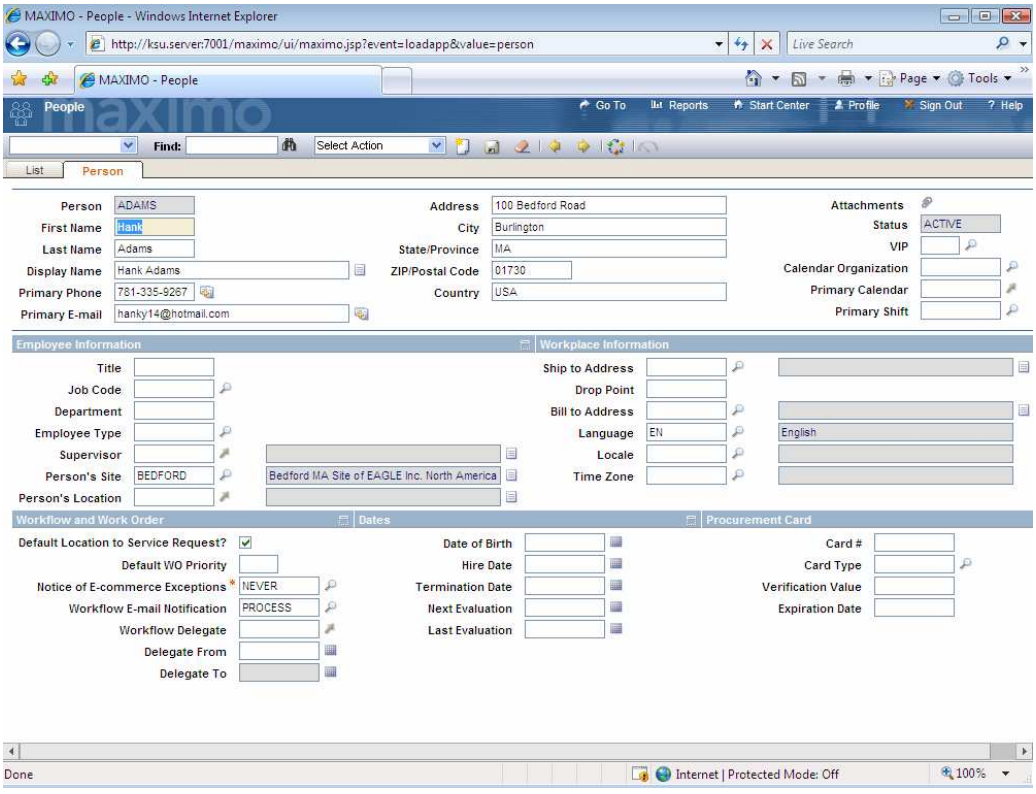
1. Go to Resource → People



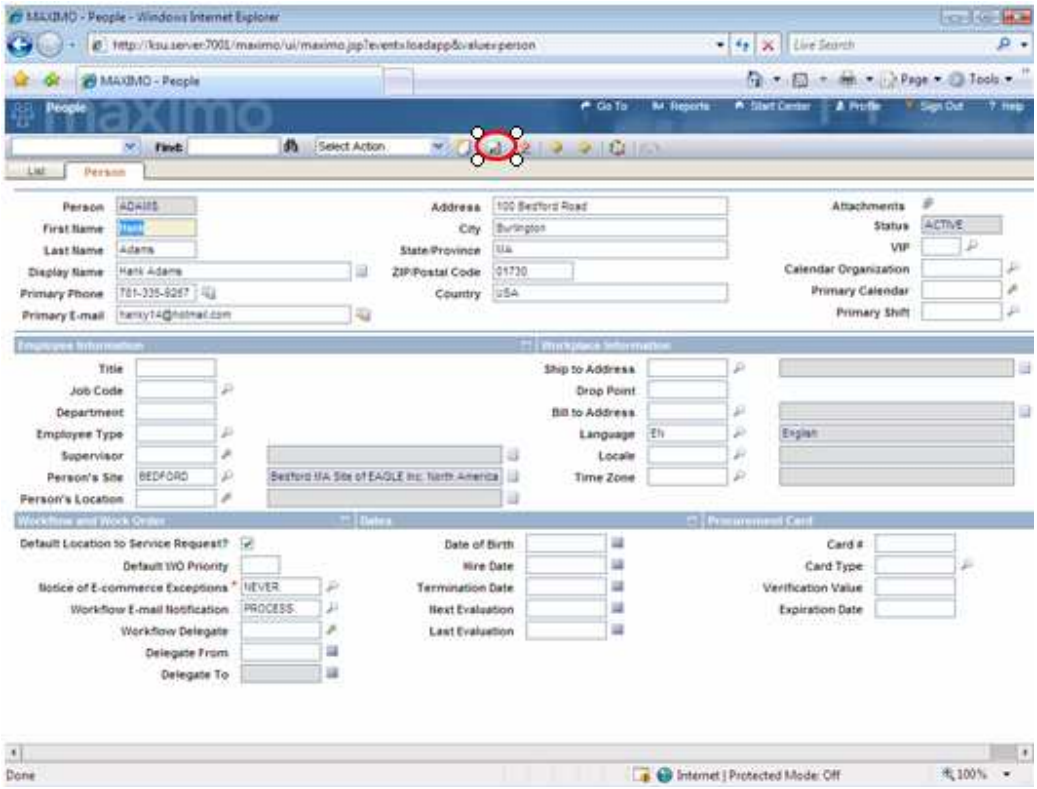
2. Go to person tab and Click the new record Icon



3. Enter the record data



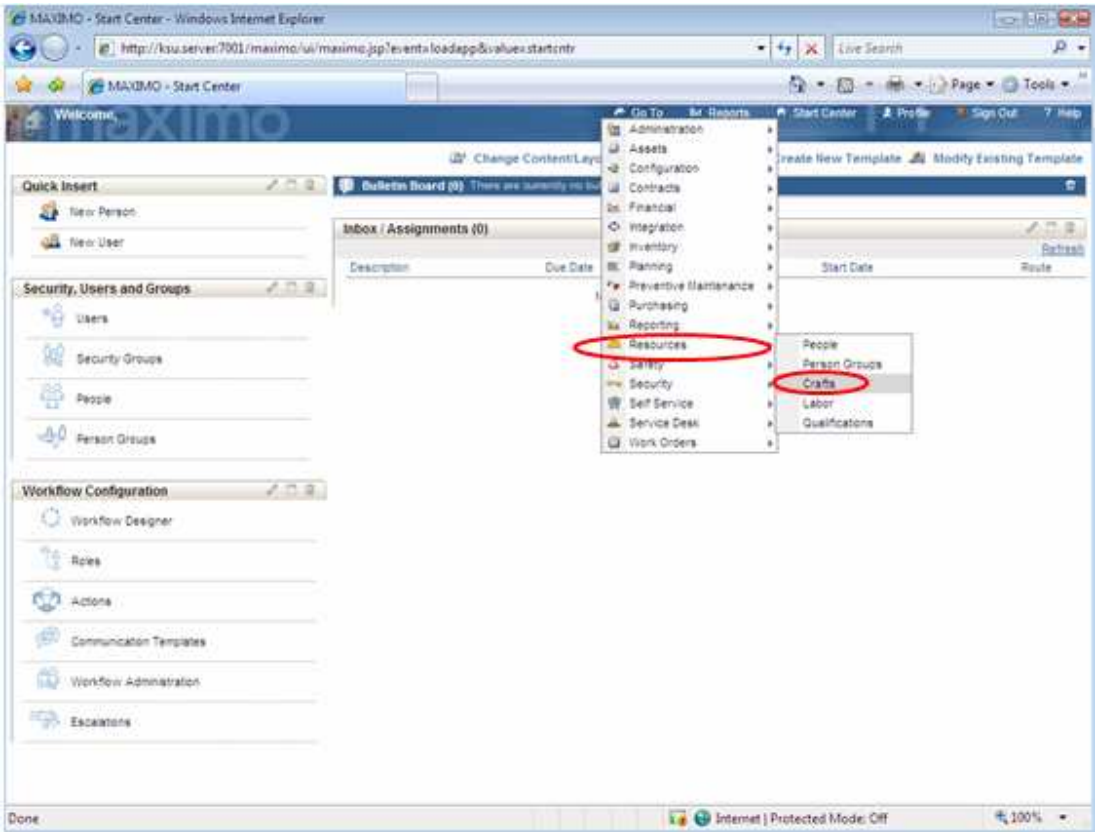
4. Save the record (Disk Icon)



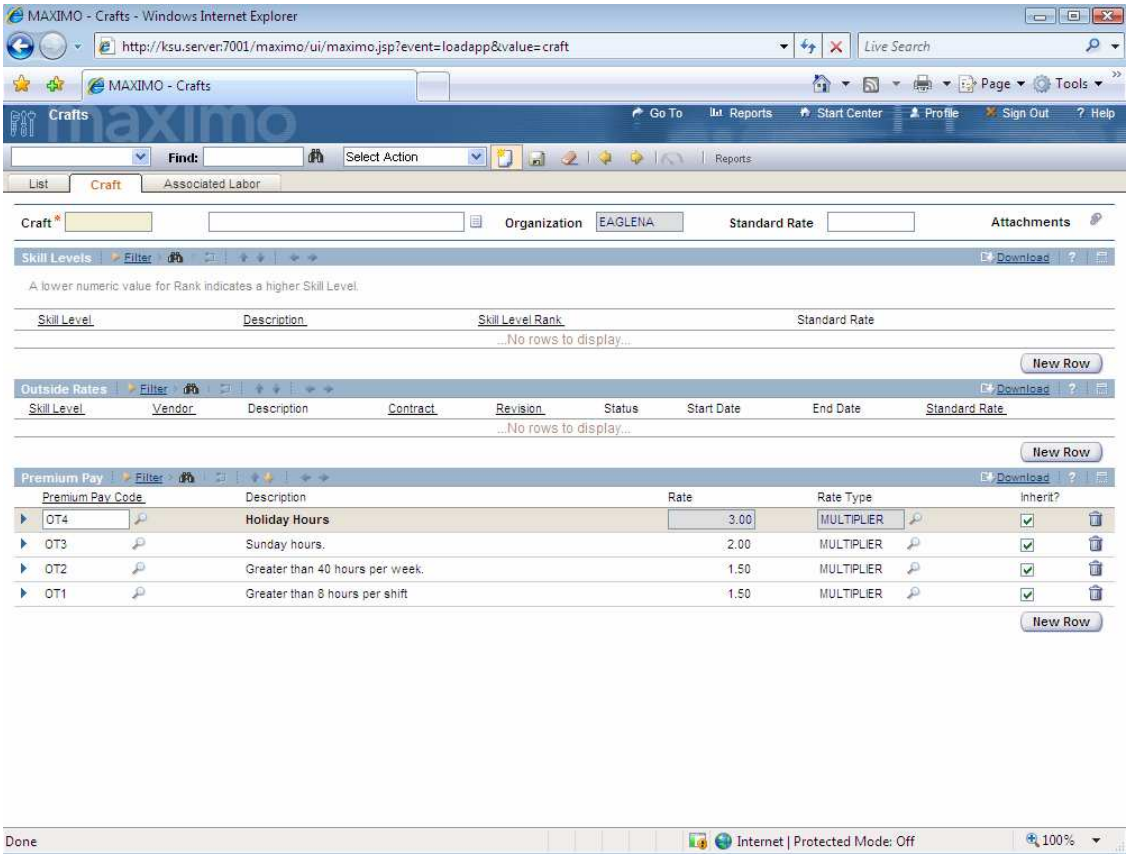
Lab Session 3: Setting Up Person, Craft, and Labor

Creating CRAFT in MAXIMO:

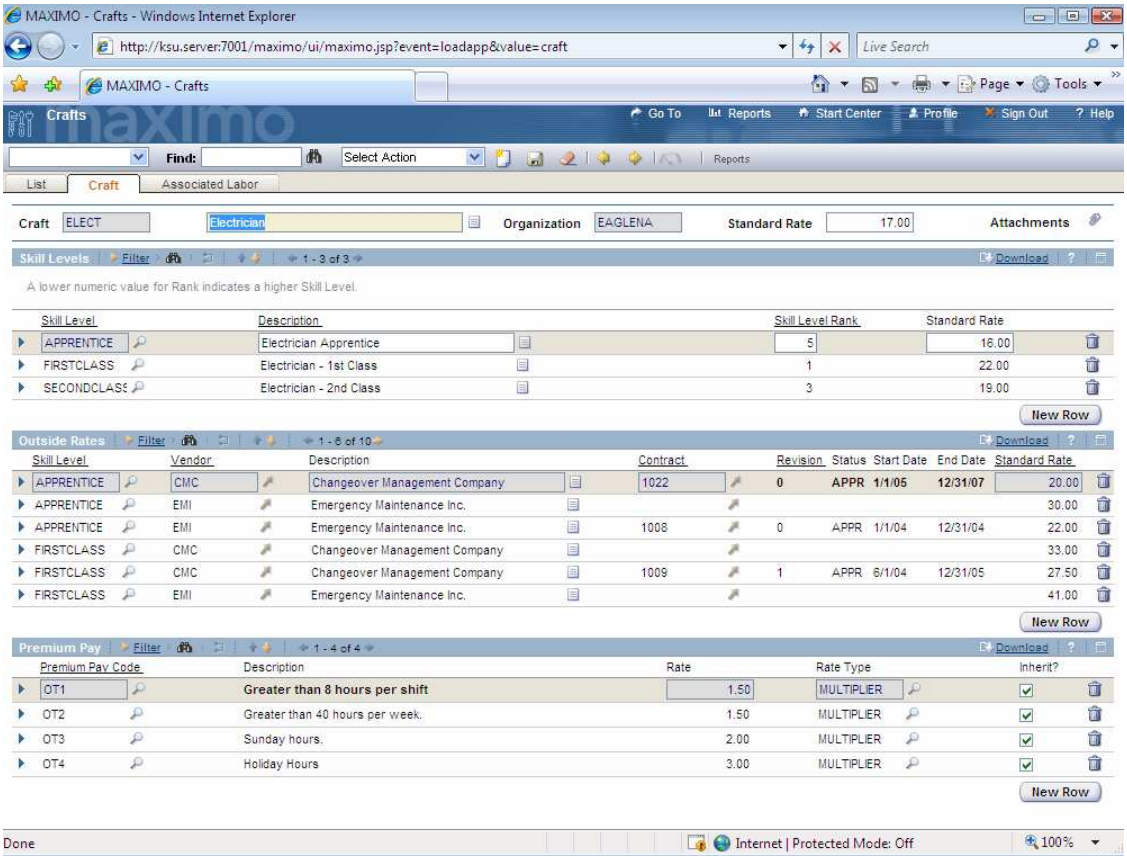
1. Go to Resource → Craft



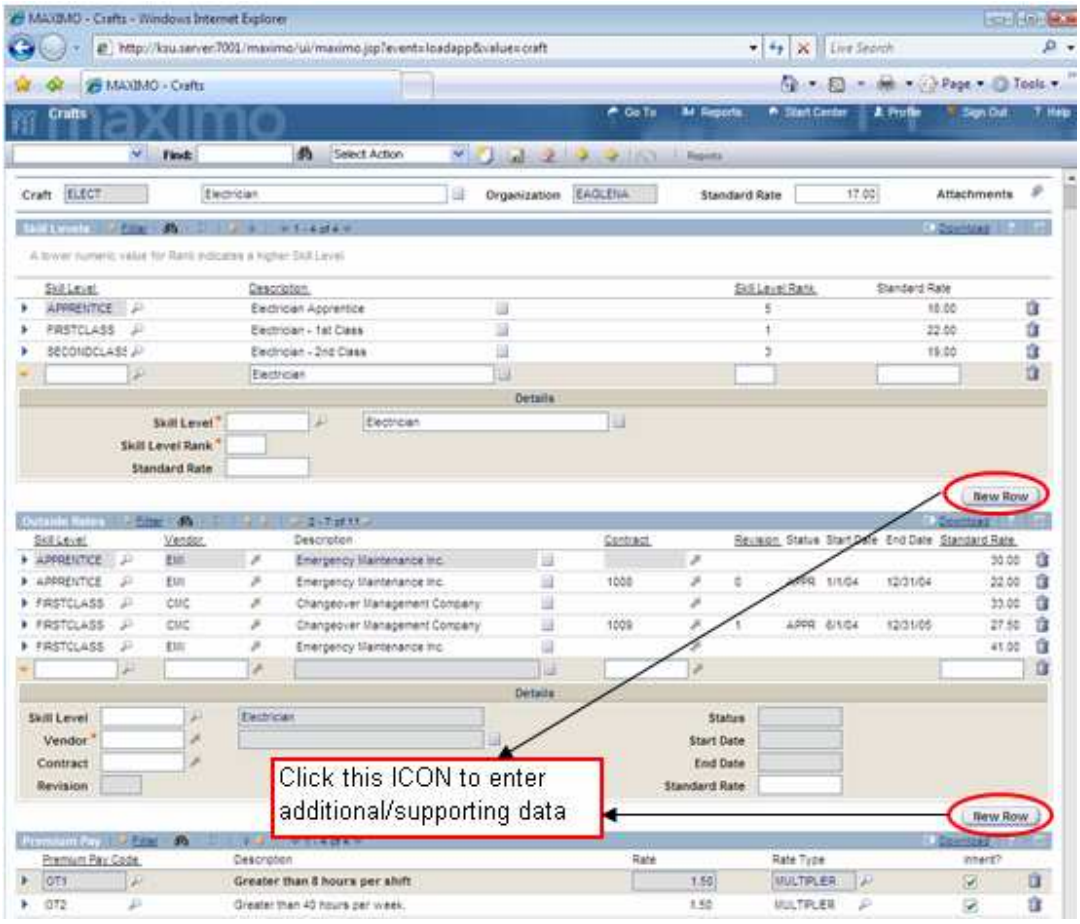
2. Go to Craft and click new record



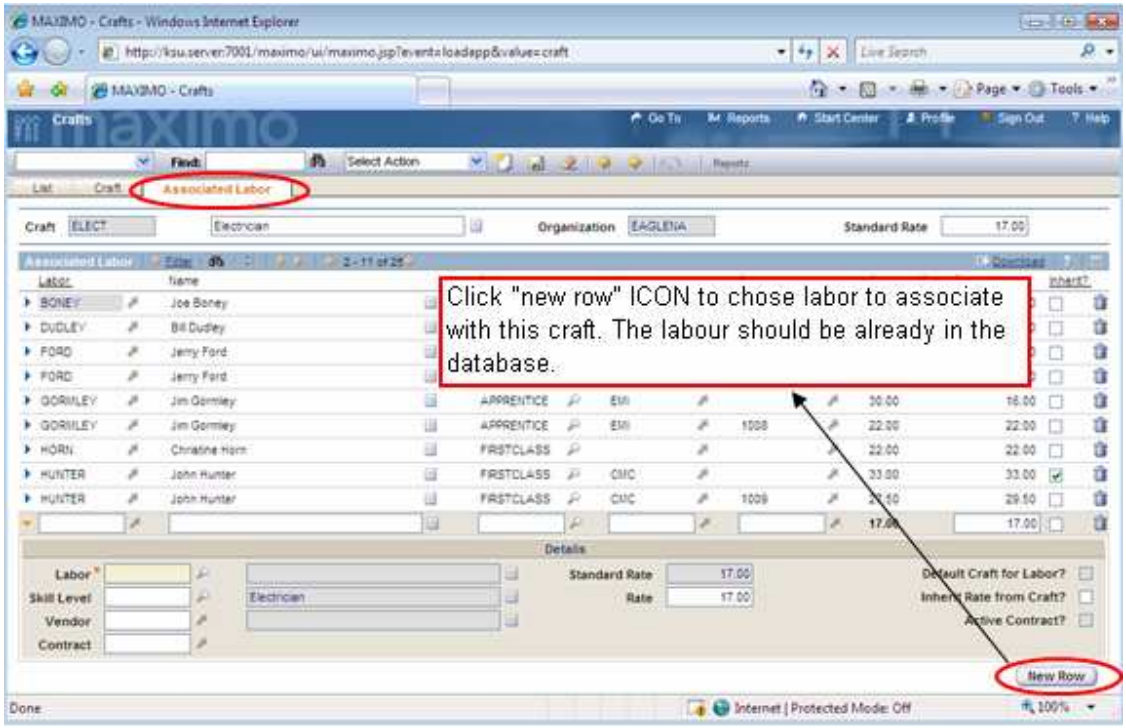
3. Enter new record data



Enter skill level in the “Skill data” by clicking new row:



4. Go to Associate Labor Tab (we can associate labor in Craft or we can associate craft in Labor).

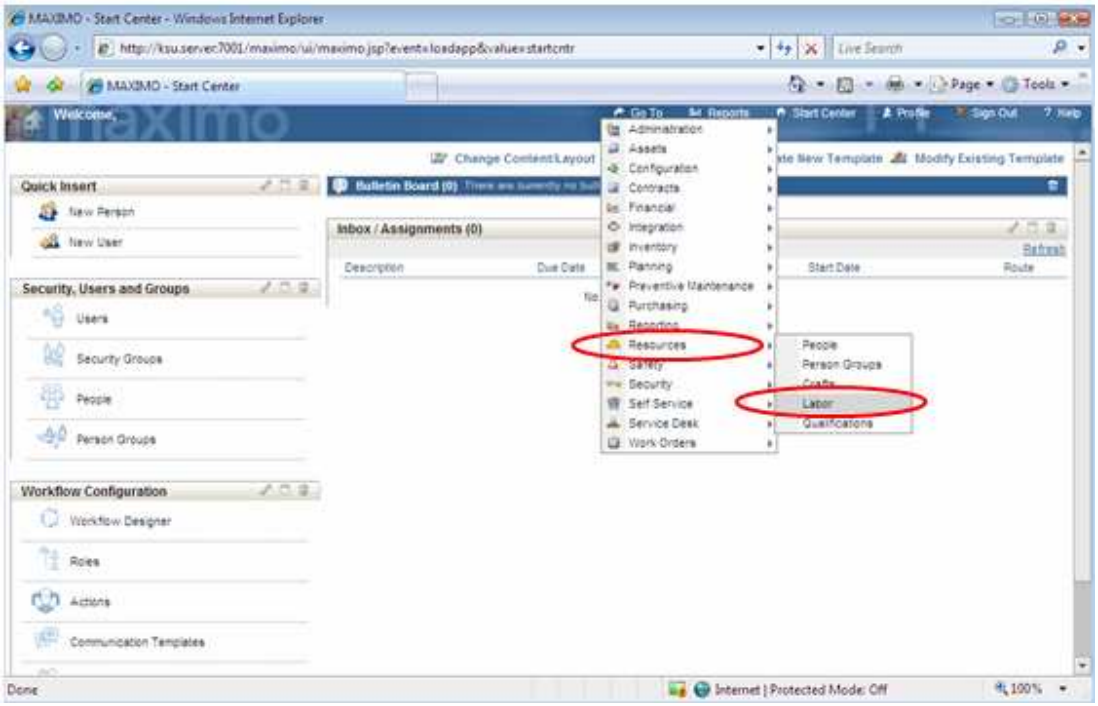


Click new row to associate craft to a labor

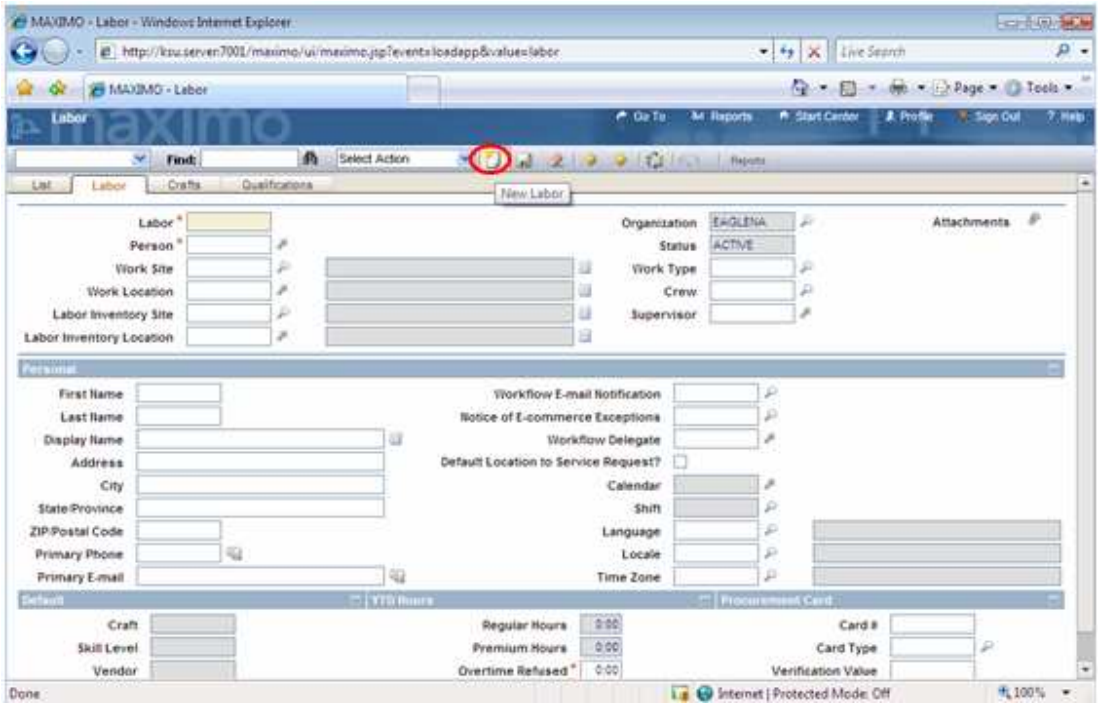
5. Save the record

Creating LABOR and Sites in MAXIMO:

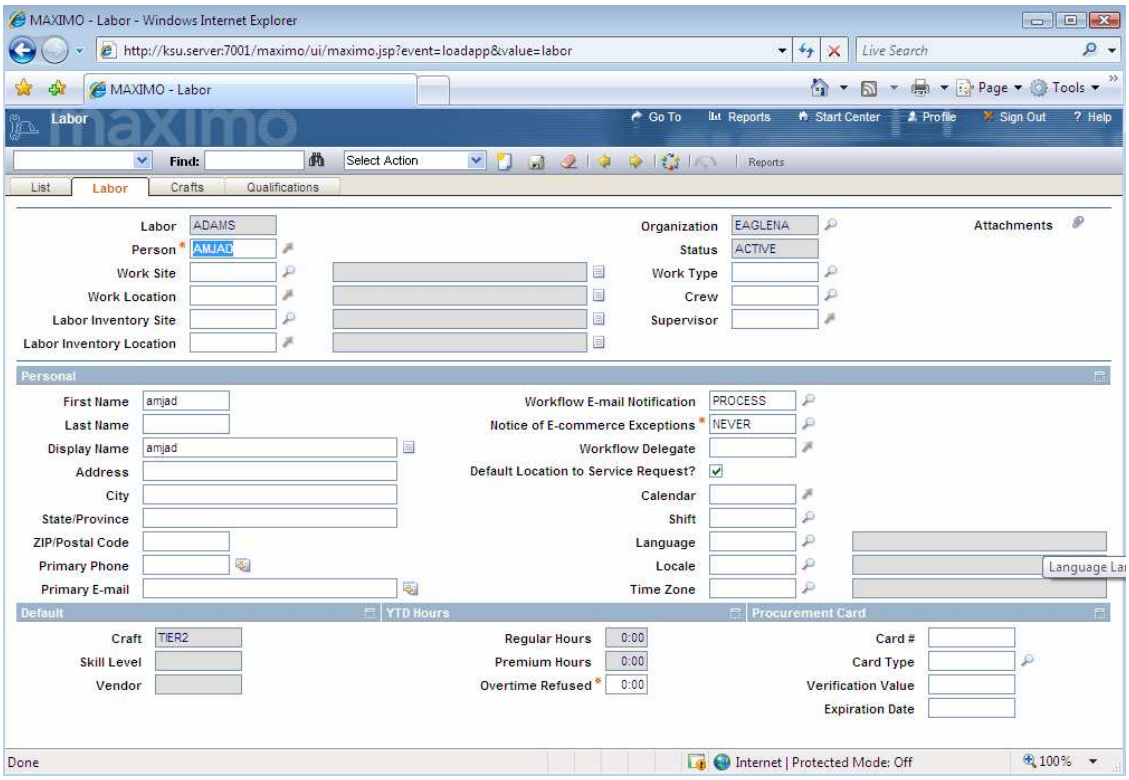
1. Go to Resource → Labor



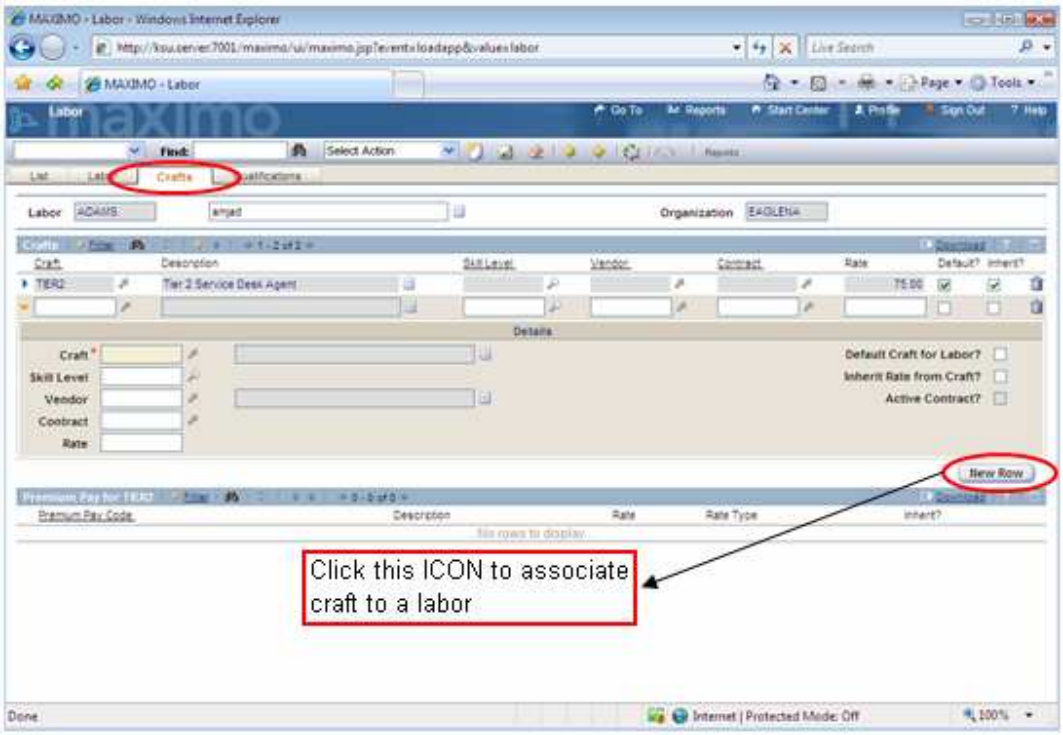
2. Go to Labor tab and Click the new record Icon

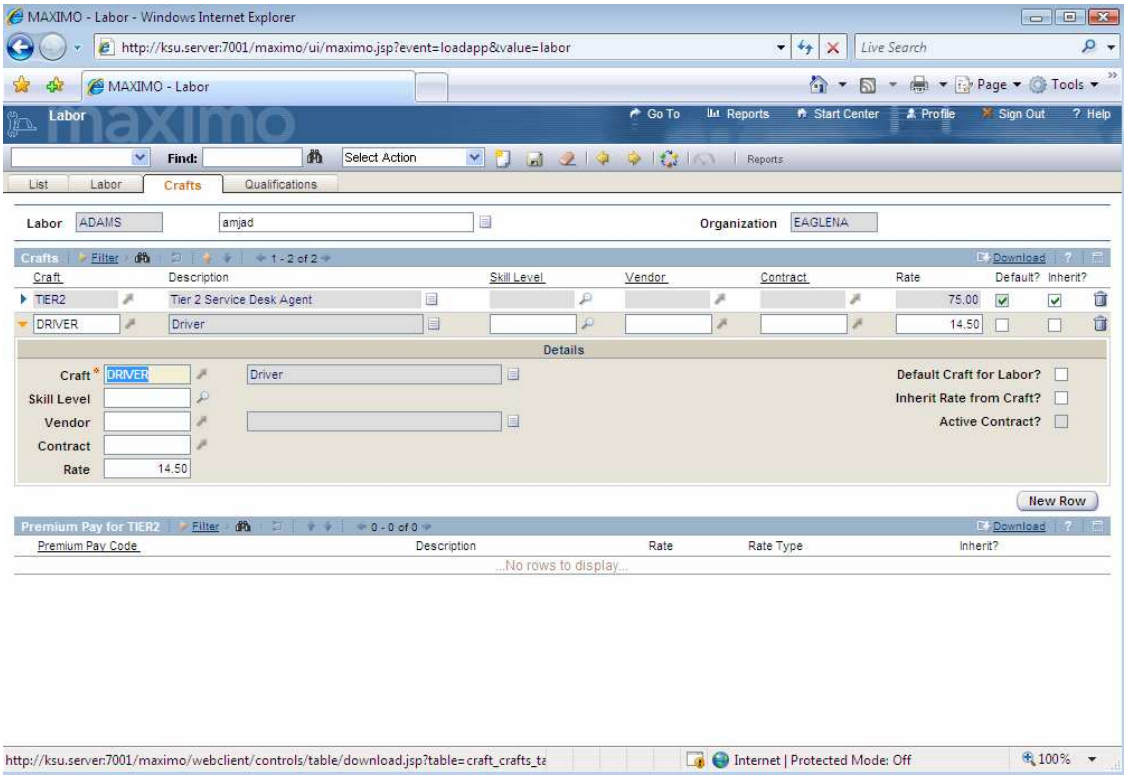


3. Enter the record data



4. Go to Craft Tab **(we can associate labor in Craft or we can associate craft in Labor).**



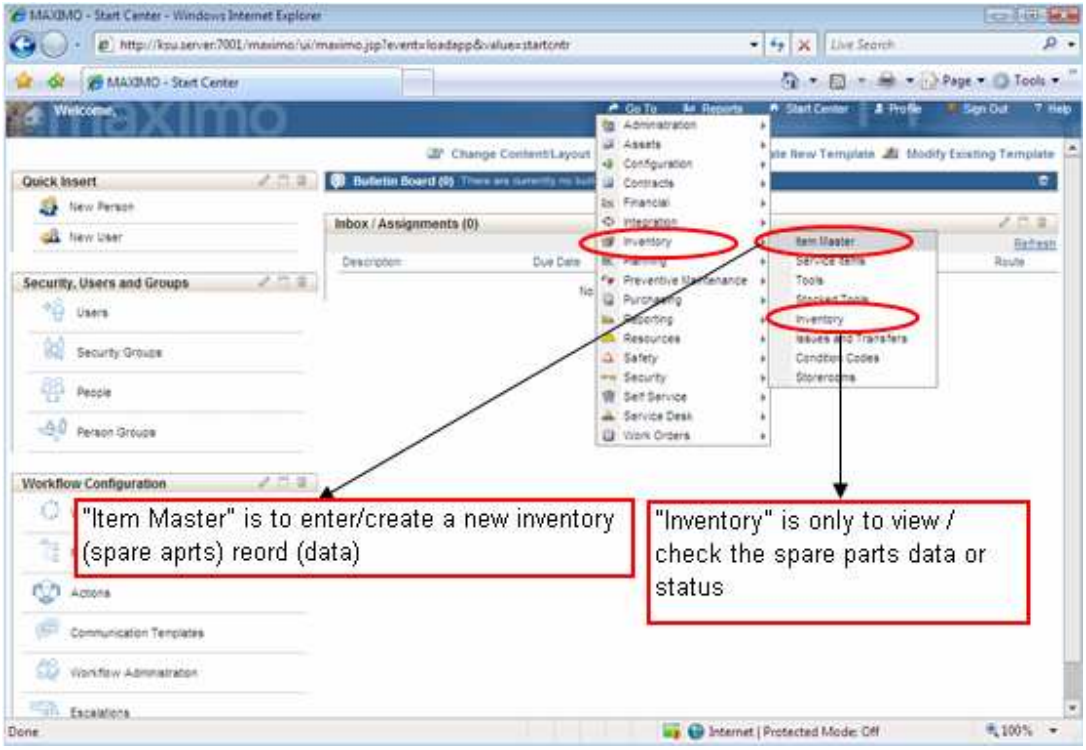


5. Save the record.

LAB SESSION 4: Setting Up Inventory (Spare Parts)

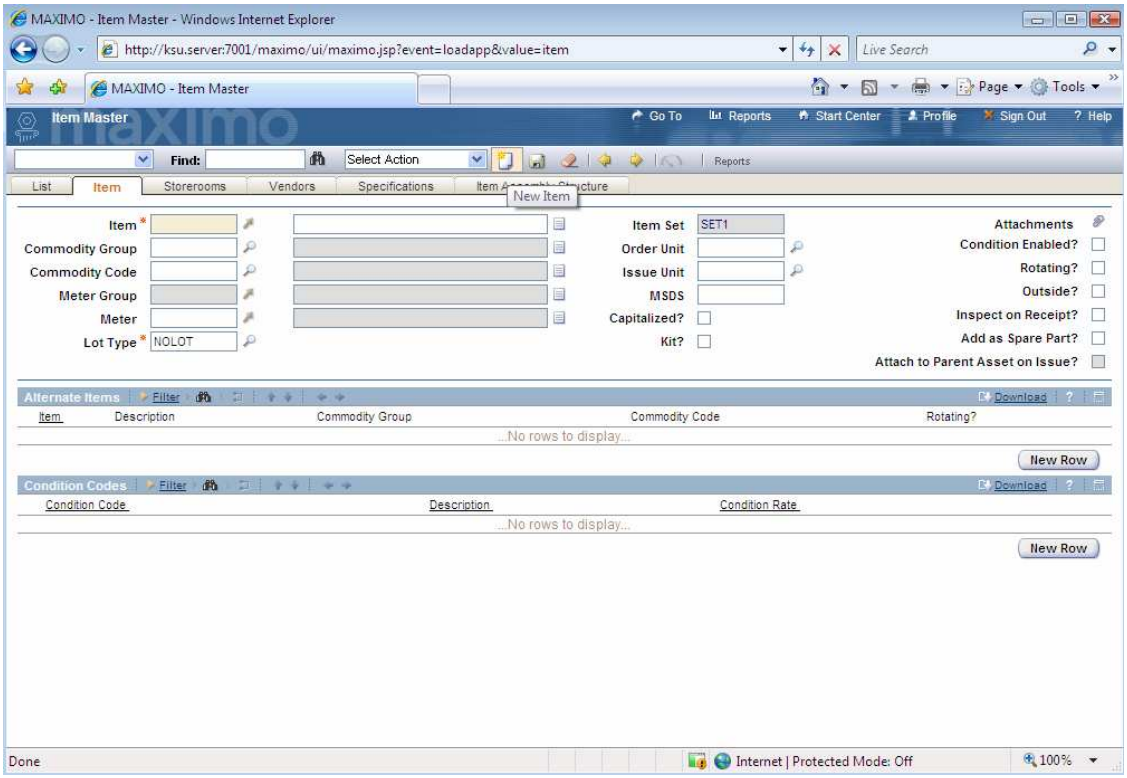
Creating INVENTORY for Spare Parts in MAXIMO:

1. Go to Inventory→ Item Master Item

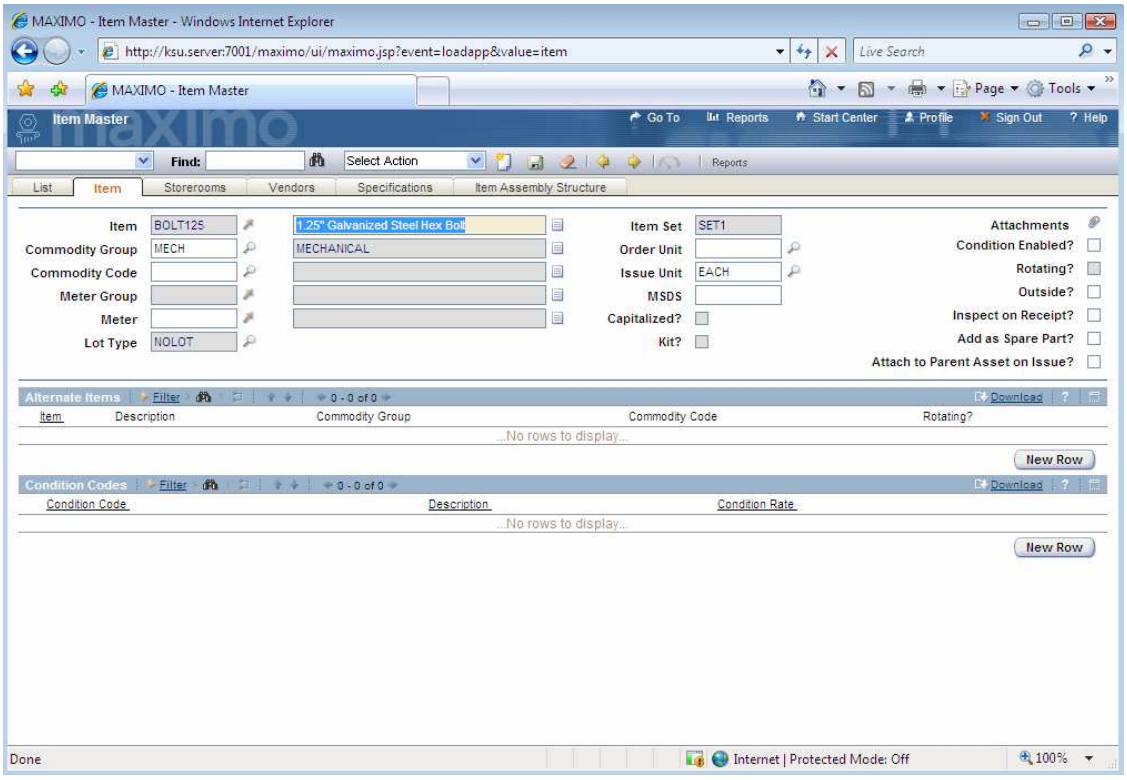


NOTE: Inventory is for spare parts (fast moving part), for example: seal, oil, oil filter, bolt, nut, washer, etc. and Asset is for the equipment, such as Generator, milling machine, pump, etc.

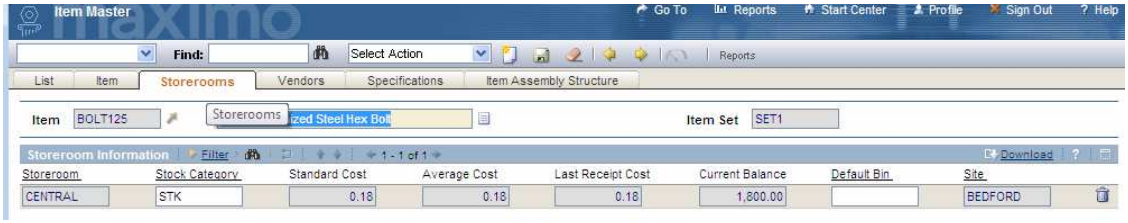
2. Go to Item Tab and click new record

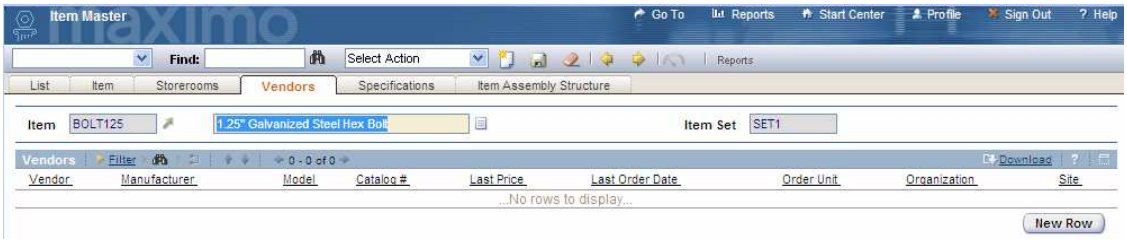


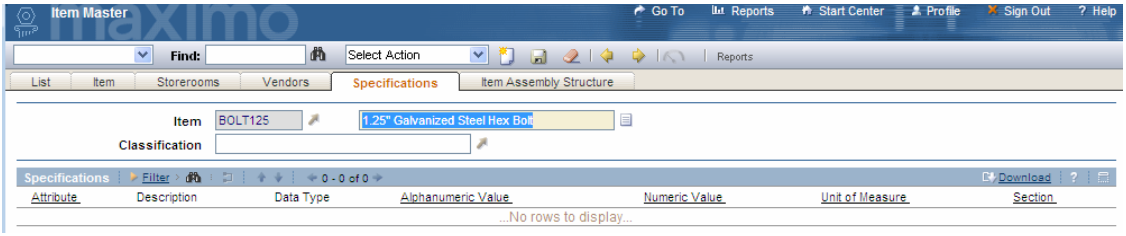
3. Entering the new item set data

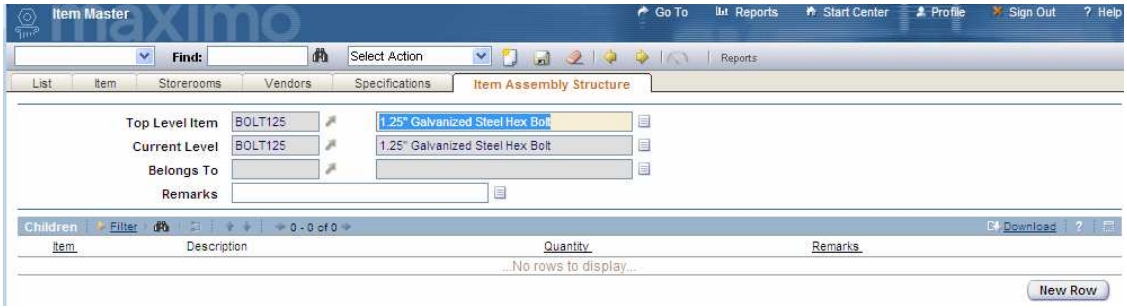


4. Enter supporting data (not compulsory) in storeroom tab, vendors tab, specification tab, and item assembly structure.



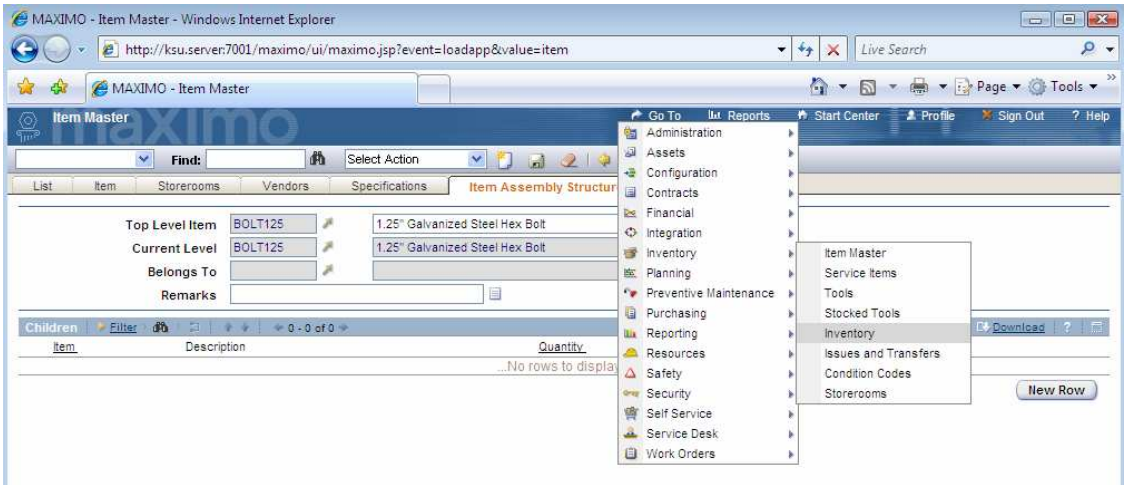


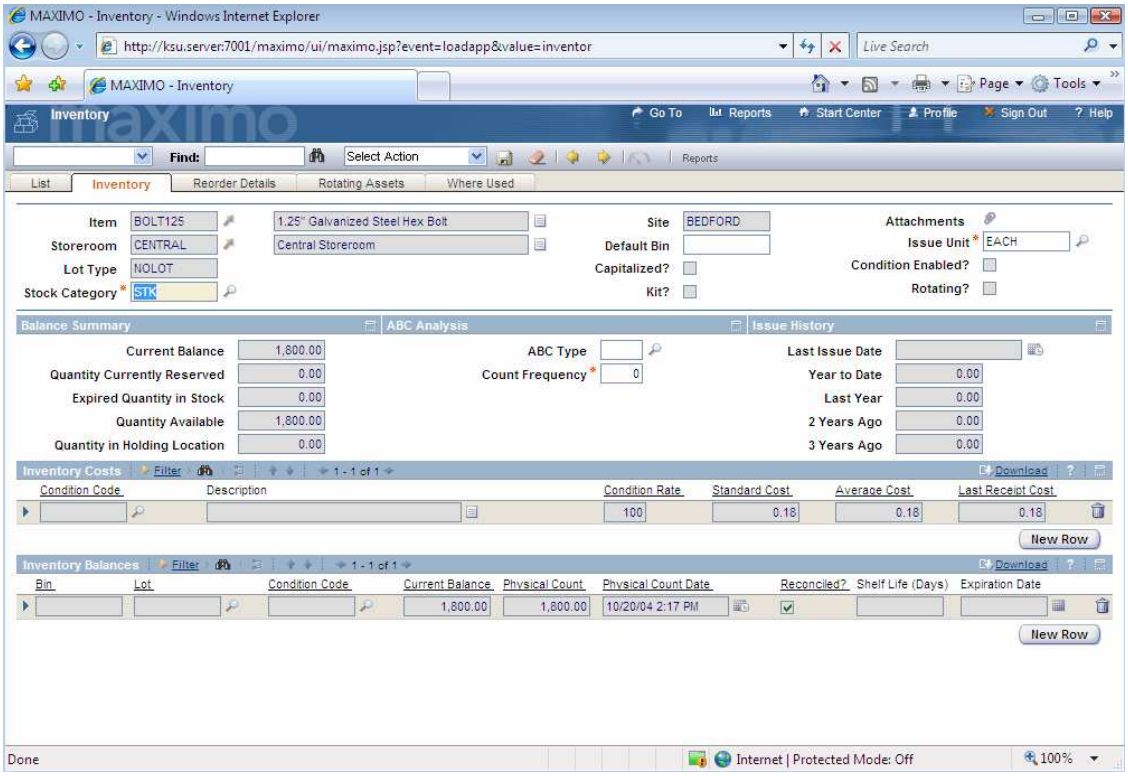




5. Save the records.

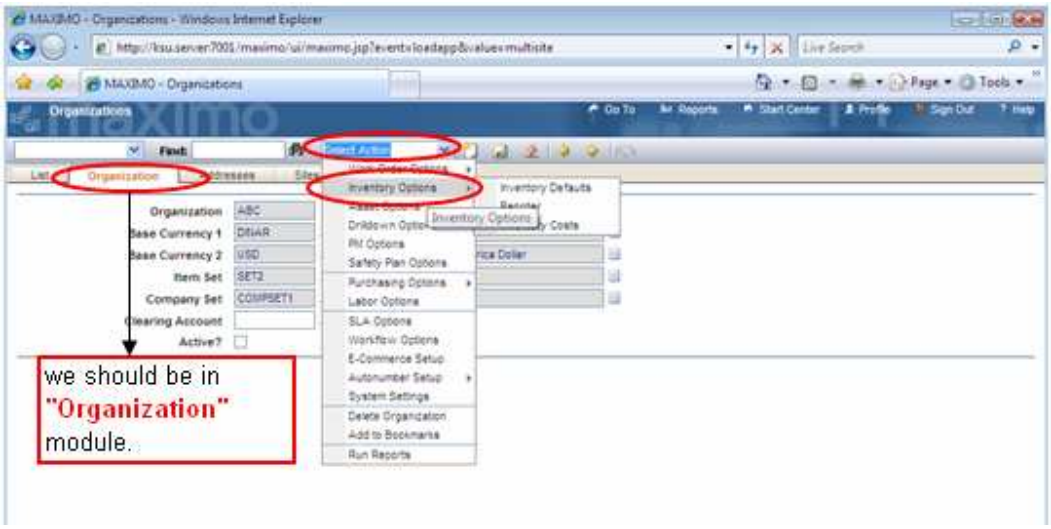
6. Go to Inventory→ Inventory to check the item and to set the property of the Inventory type



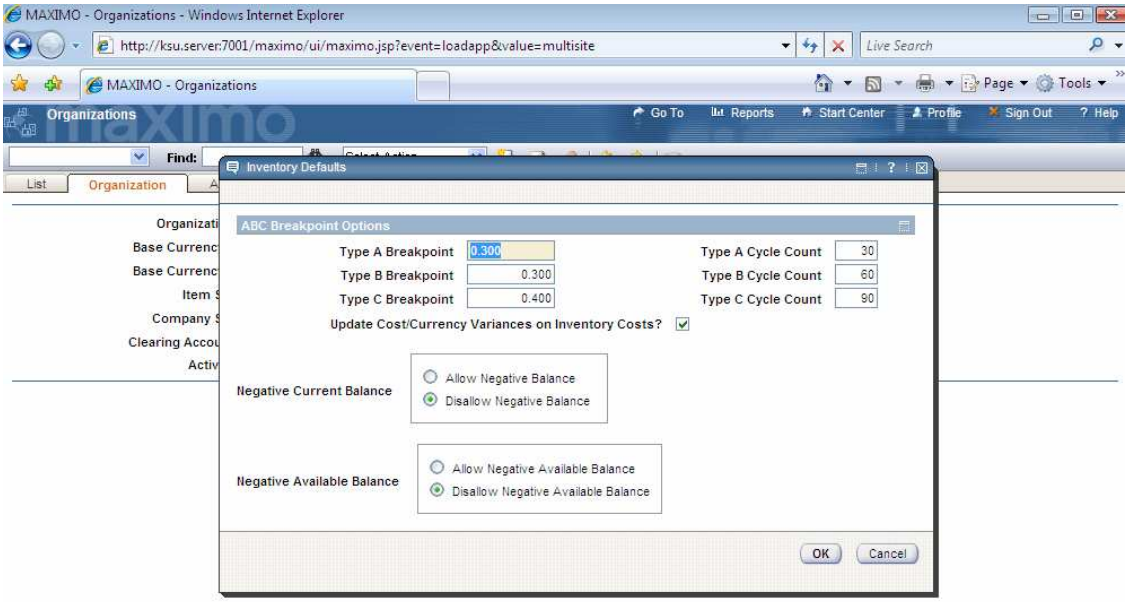


7. **Optional:** Changing Inventory Policy
   - If we want to change the policy for the Inventory, we should go to **organization Module** and go to select action

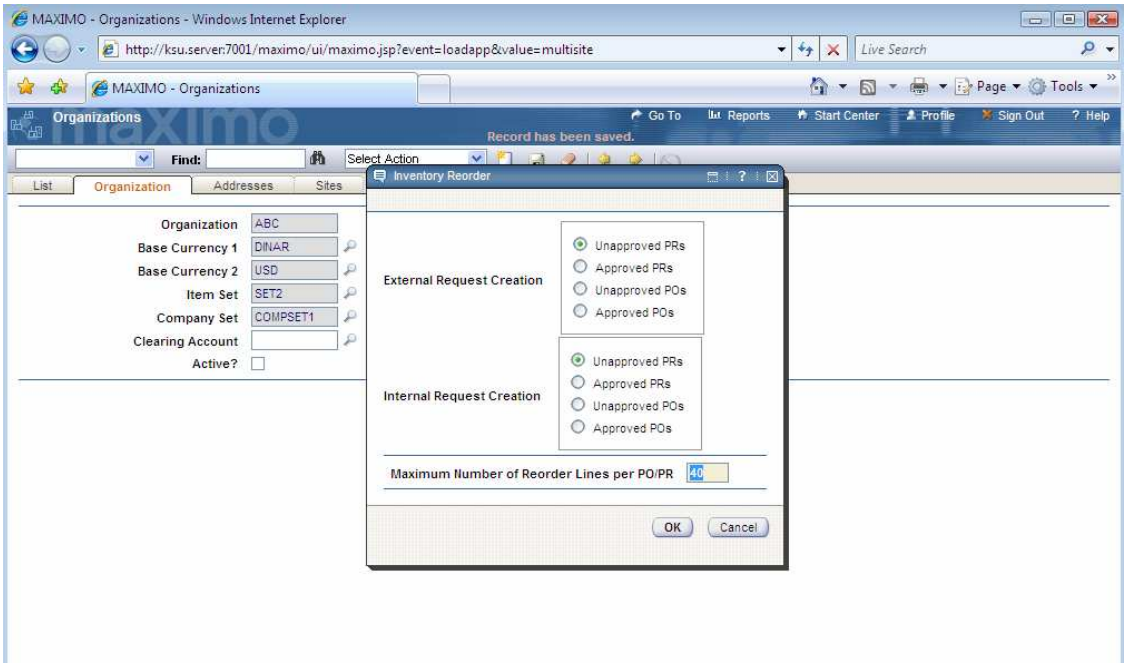
Leb Session 4: Setting Up Inventory (Spare Parts)



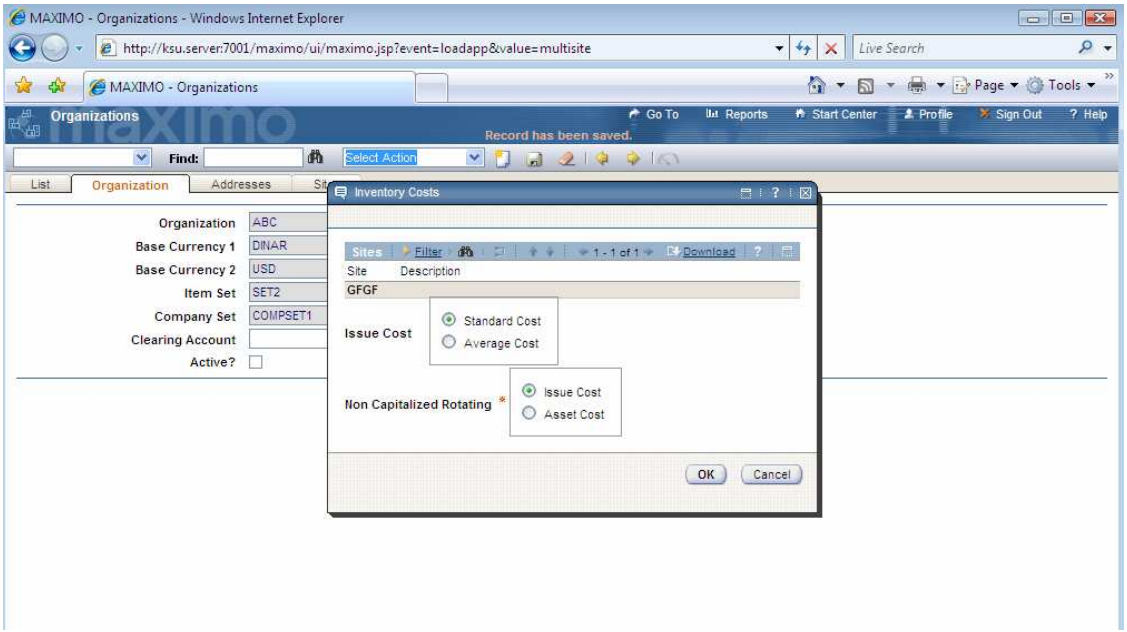
- Go to select action → inventory option → Inventory defaults



- Go to select action → inventory option → Reorder



- Go to select action → inventory option → Inventory Cost

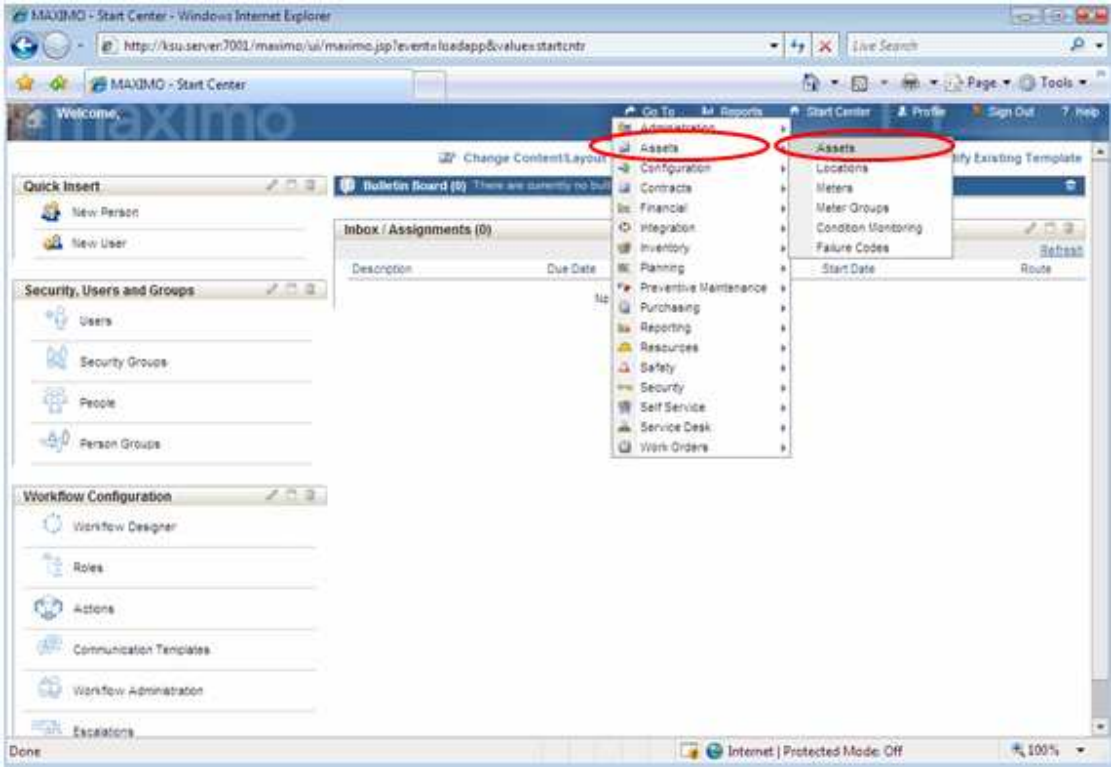


8. Save the record.

LAB SESSION 5: Setting Up Assets

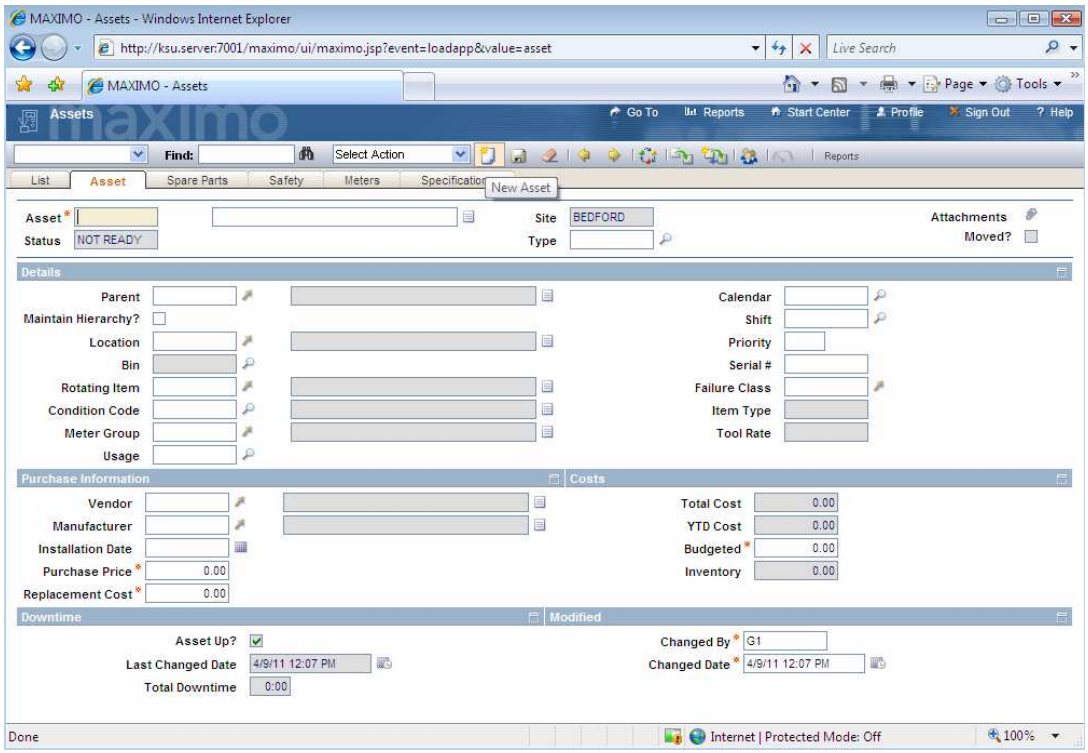
Creating ASSET in MAXIMO:

1. Go to Assets→Assets

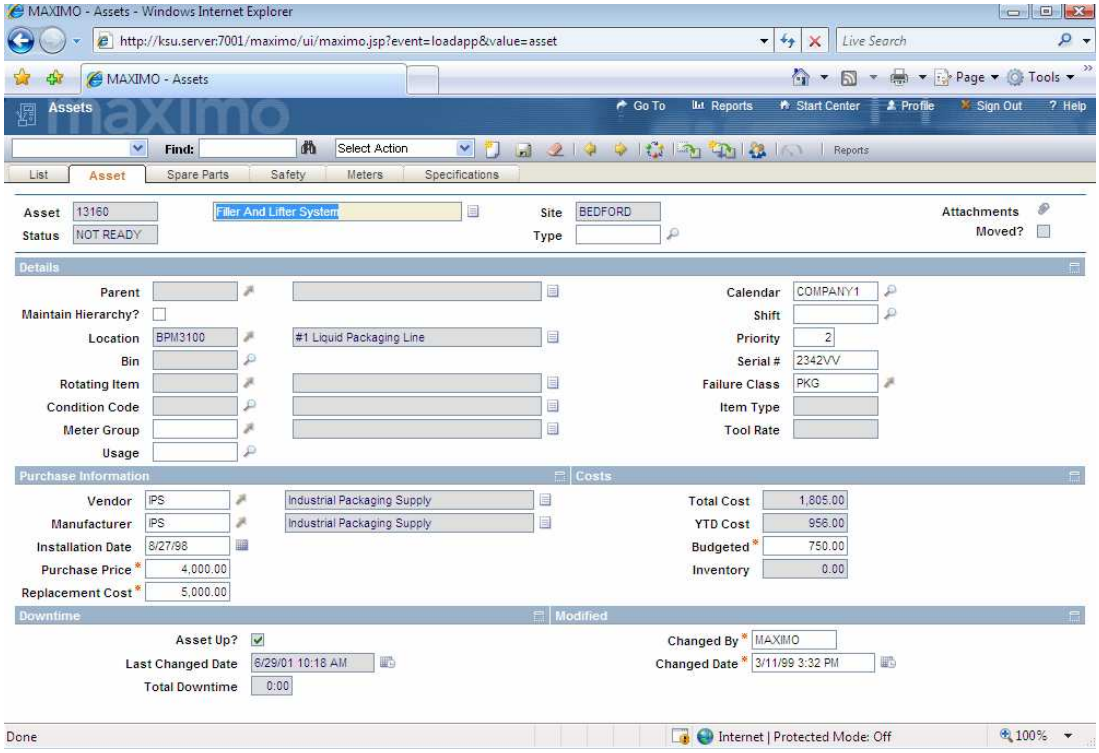


NOTE: Asset module is for equipments that the companies or organizations have. For example: **Production equipment, Facility equipment, Fleet, and IT equipment.**

2. Go to Assets Tab and click new record Icon

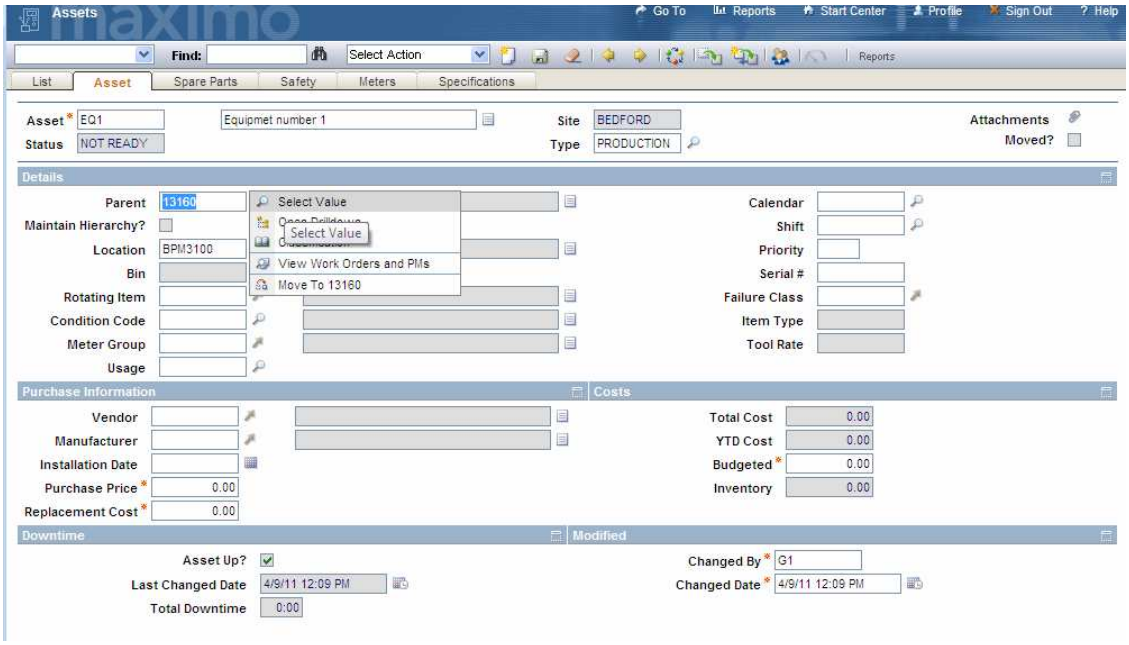


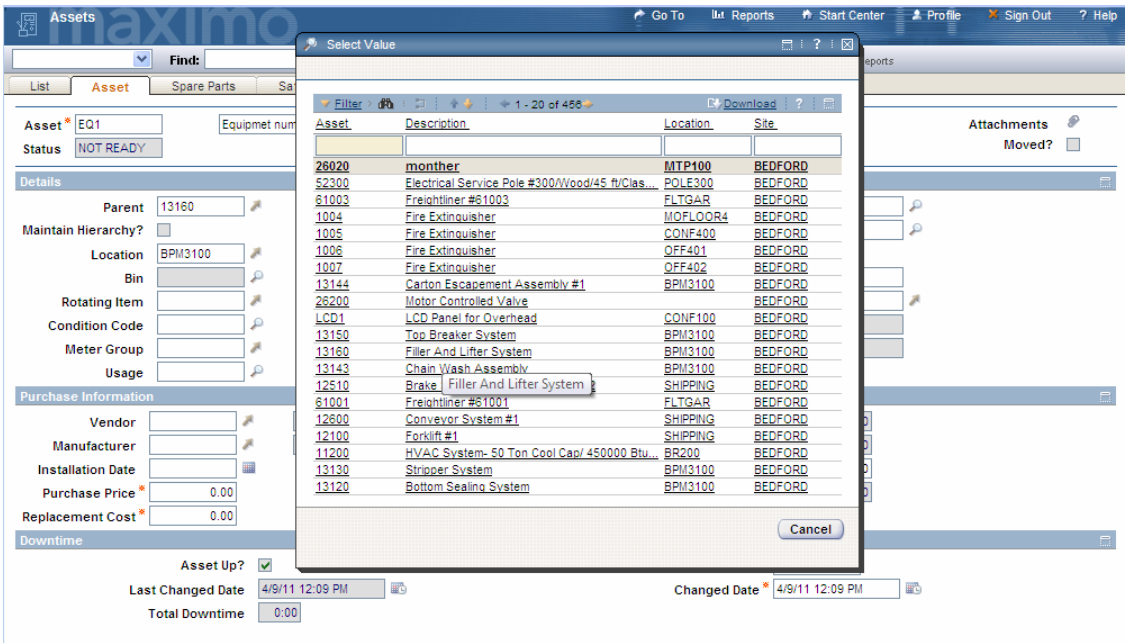
3. Enter the Asset data

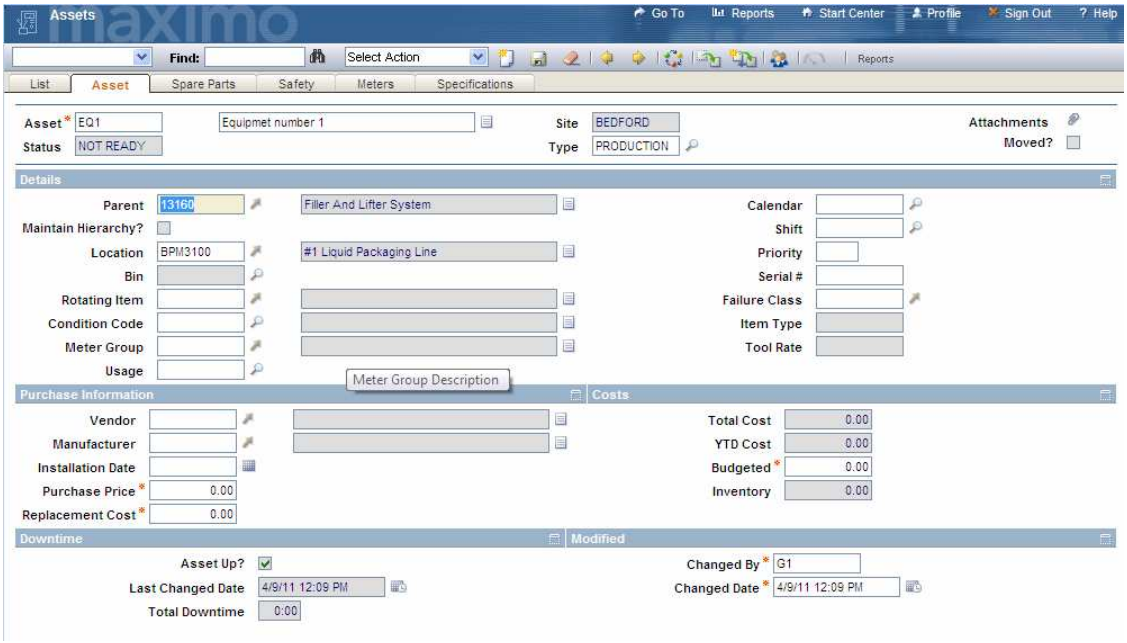


Do not forget to fill up the "Type" Field for the asset.

4. Set The parent (if it has) for hierarchical Asset



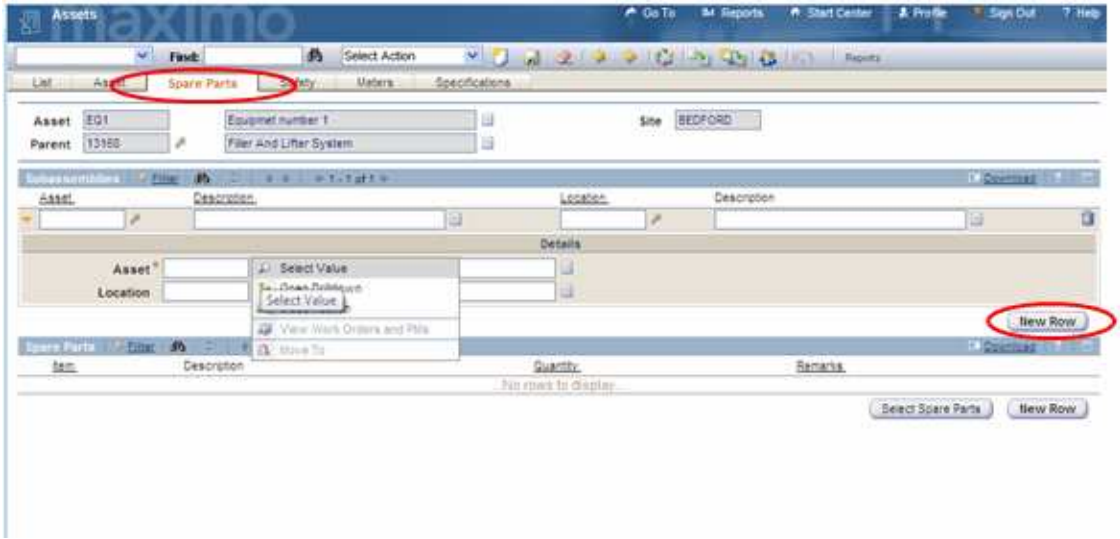


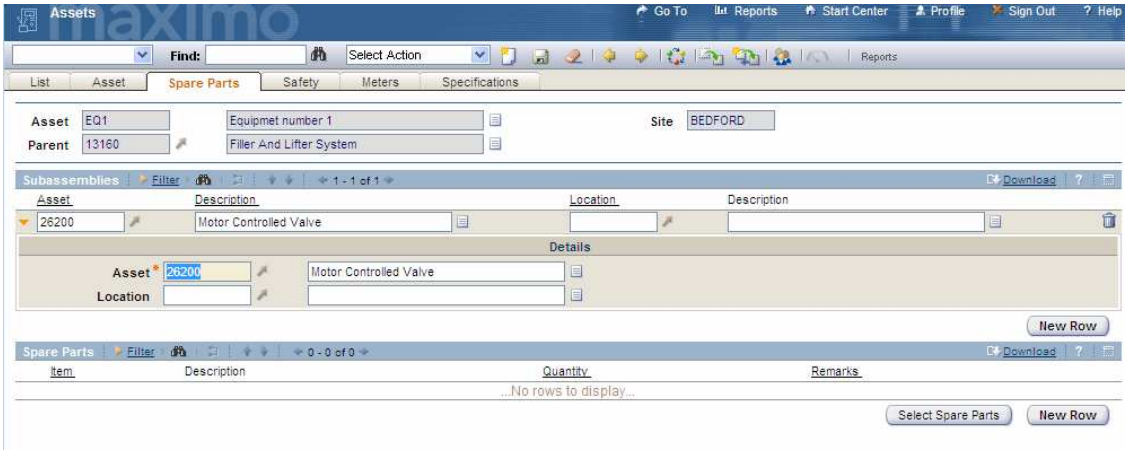


Note: when we chose a parent for an Asset, it means that the Asset will become as a Sub Assembly of the parent Asset.

5. Associating spare part (as Sub Assembly)

If we have entered the Sub Assembly record in Asset, we can associate an Asset (as a parent for its Sub Assembly) with available Sub Assembly in Spare Parts Tab



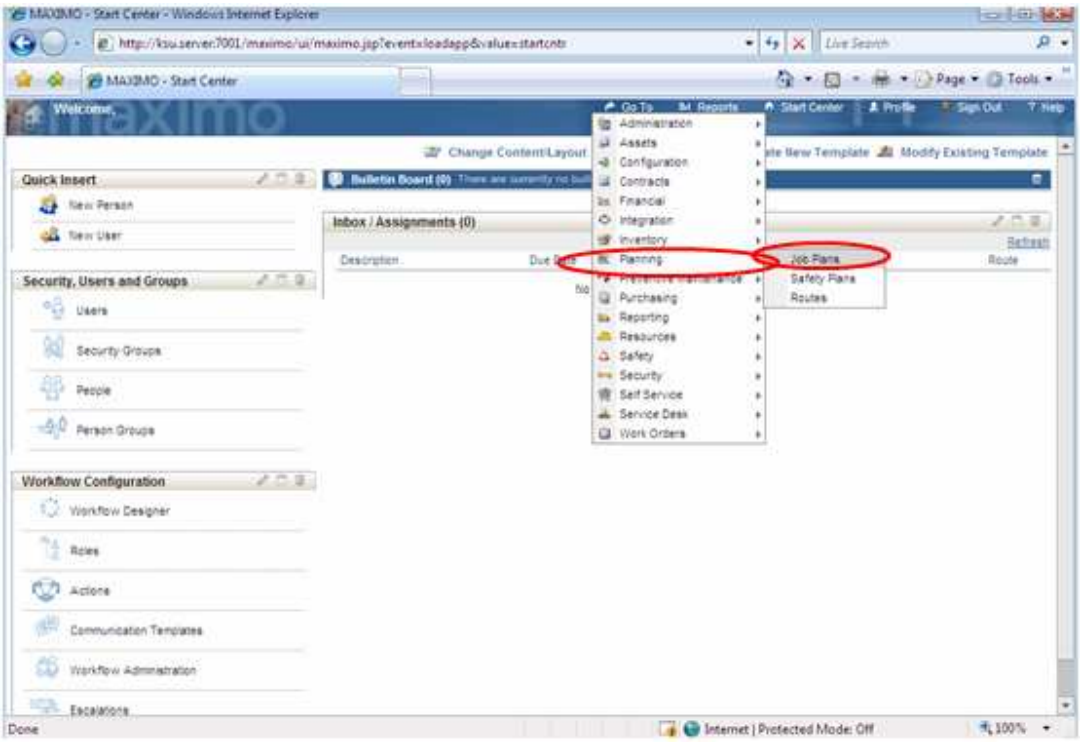


6. Save Record.

LAB SESSION 6: Creating Job Plans

Creating JOB PLAN in MAXIMO:

1. Go to Planning→ Job Plan

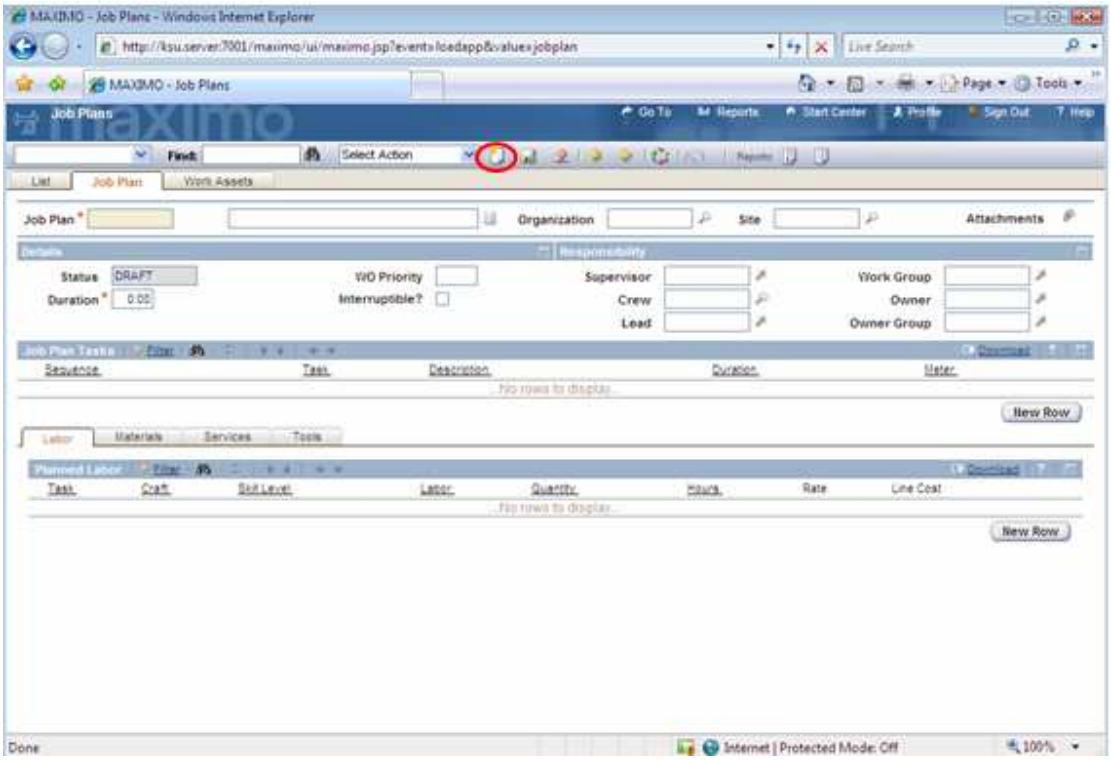


Job Plan is a module that enable user to define the sequence of a job. For example: to change the oil filter, we can create 3 sequences:

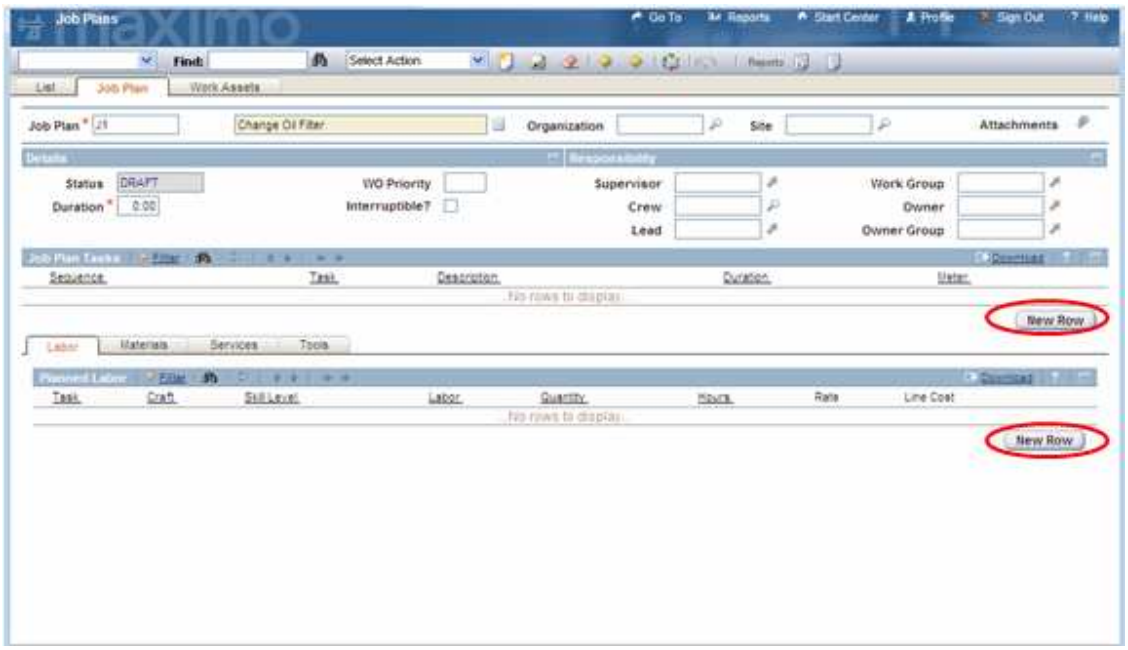
1. Open the machine cover.
2. change the oil filter.
3. Close the machine cover.

A job may have Job Plan or not. This Job plan is not a necessity for a job.

2. Go to Job Plan Tab and click New Record Item

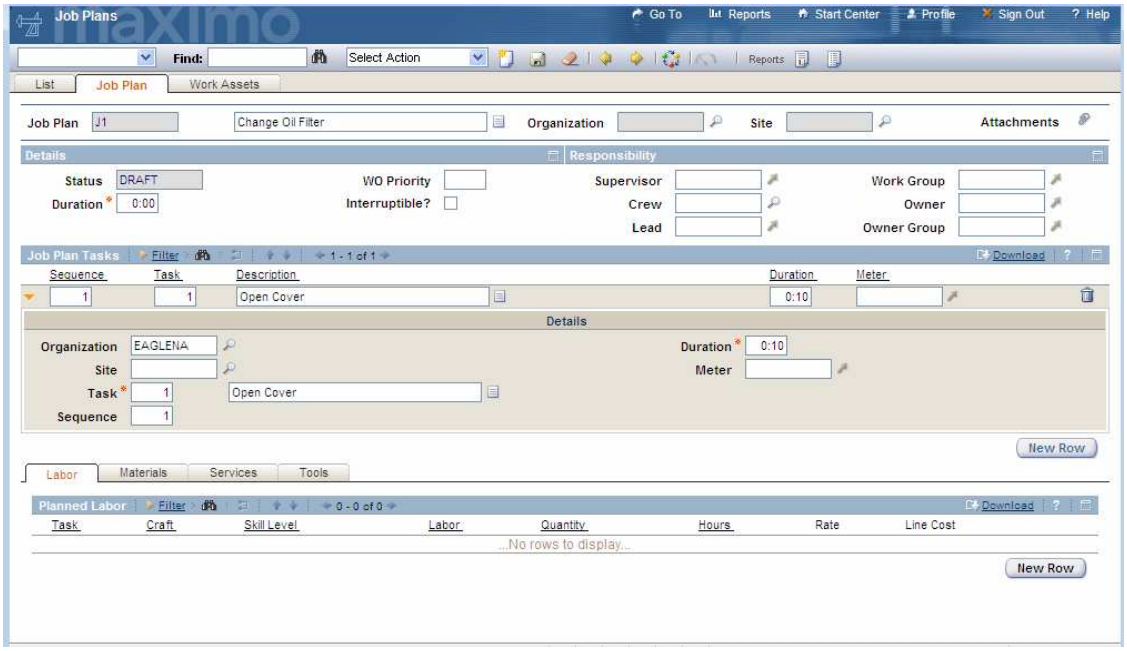


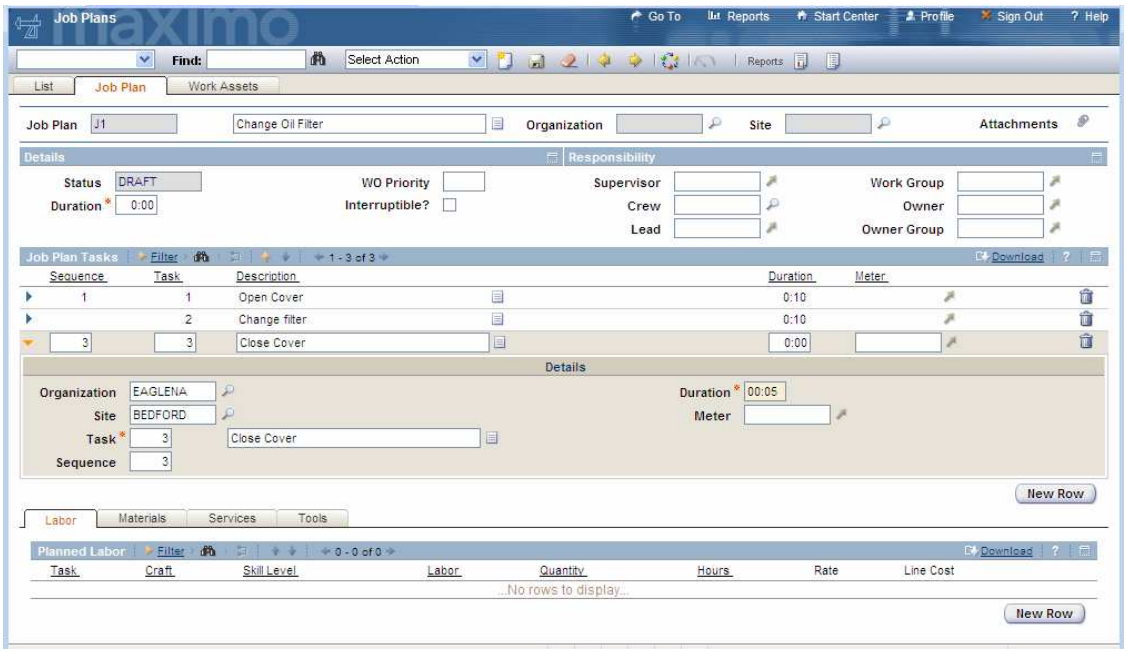
3. Entering Job Plan Data (Job Plan CODE, Job Sequence, and Associating Labor, Material and Equipment/Tools to Job Sequence/task) and save record



Lab Session 6: Creating Job Plans

- Job Sequence (Click new row in the Job Plan task)

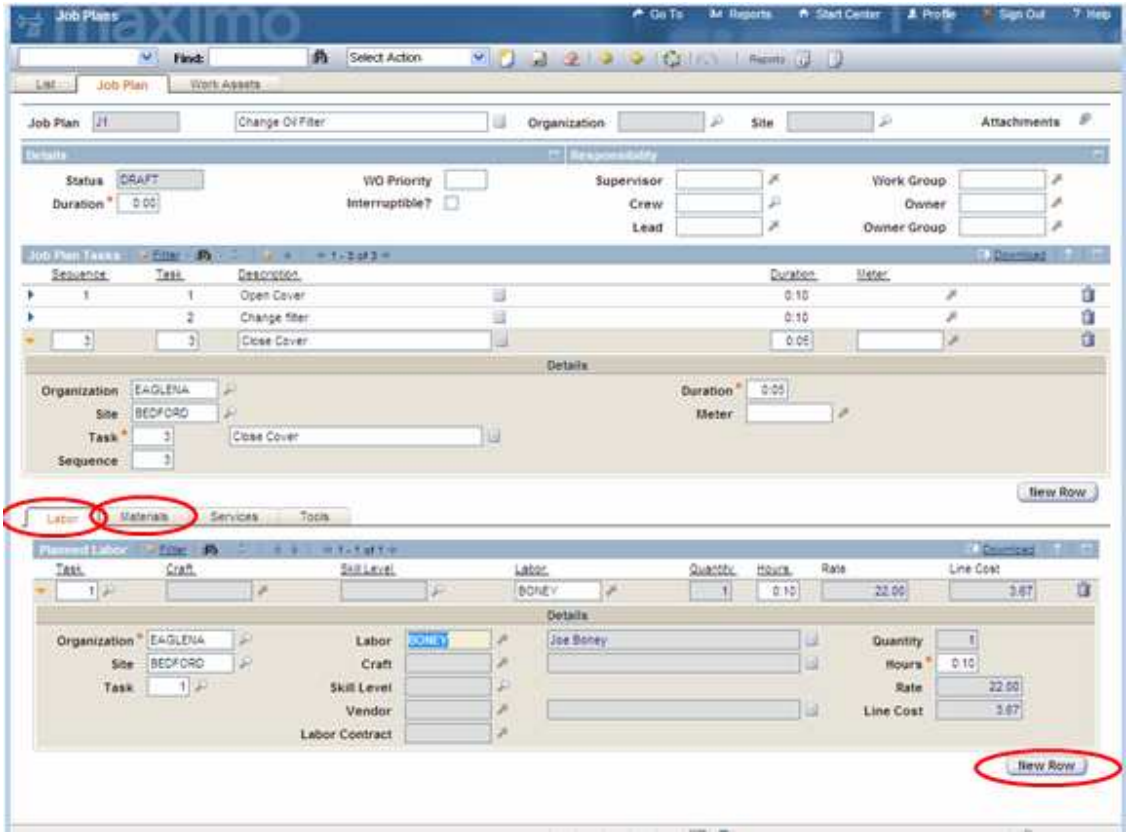




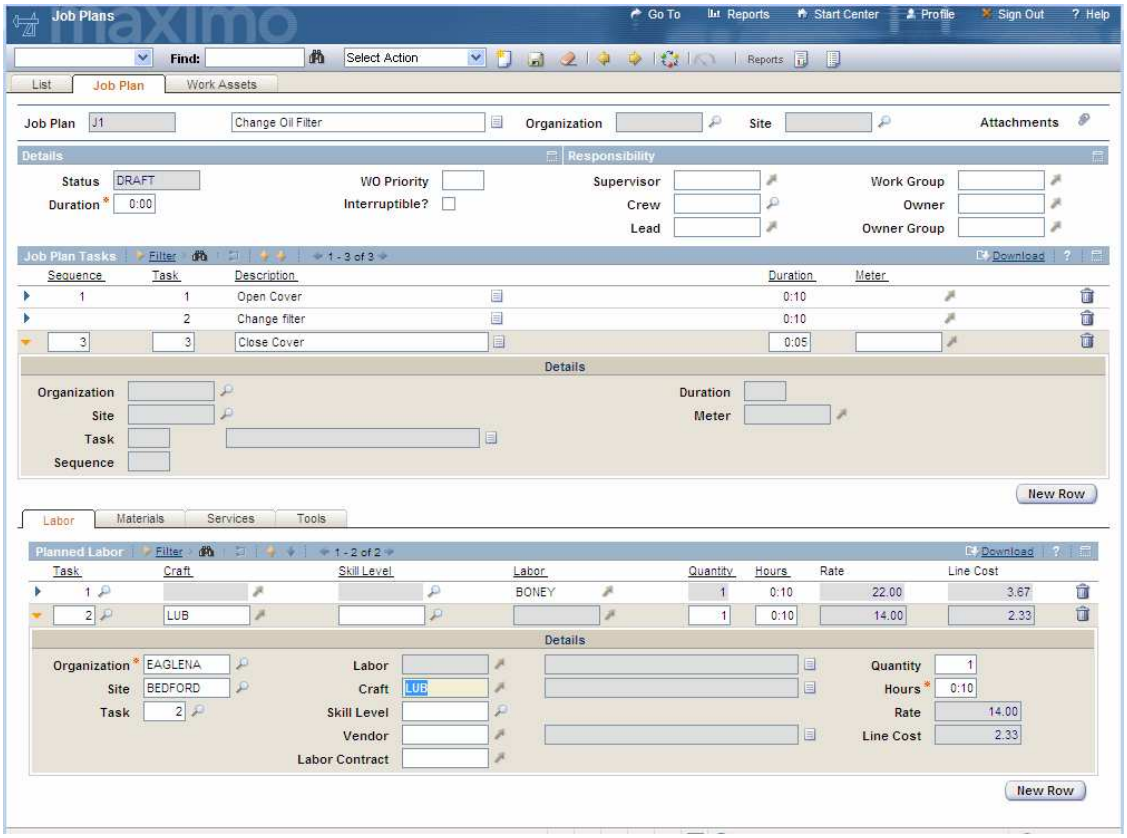
- Associating Labor

a. Click labor Tab and new row
b. We can Associate a Task 9Base on Task number) with Labor or Craft

Lab Session 6: Creating Job Plans



Lab Session 6: Creating Job Plans



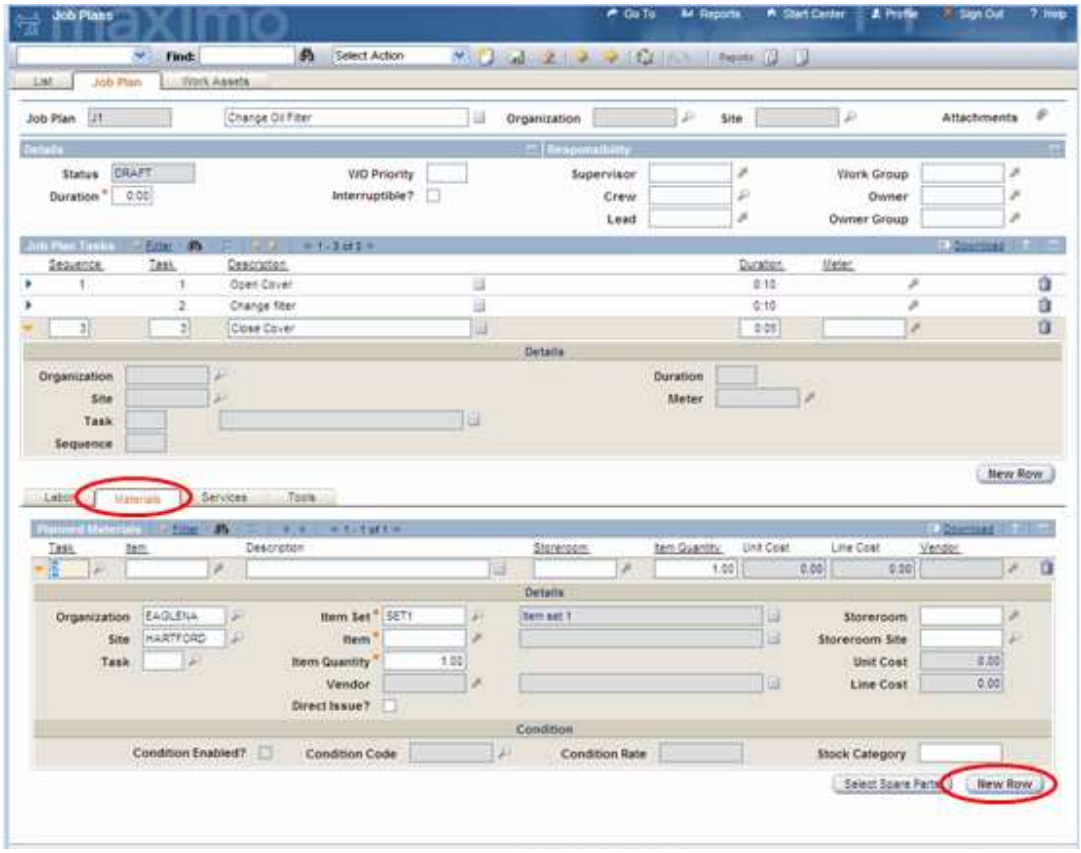
Note:

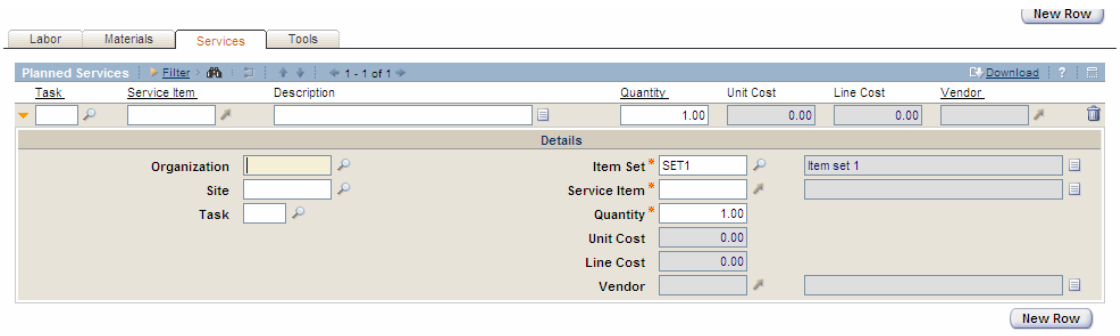
We can associate 2 or more task with 1 Person or we can associate 2 or more person with 1 task

Lab Session 6: Creating Job Plans

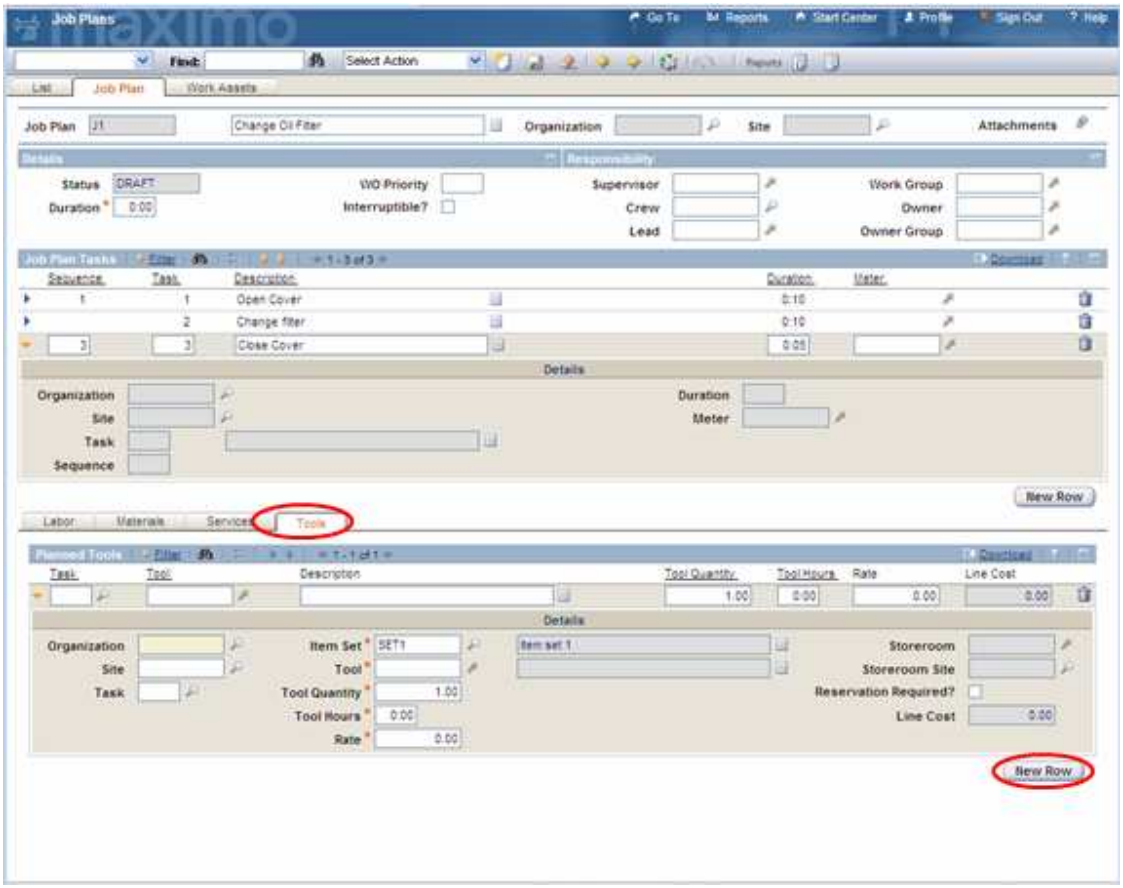
- Associating Material

Go to material Tab and Click New row





- Associating Equipment/Tool



4. Save the record.

LAB SESSION 7: Creating Work Order for PM

Creating WORK ORDER in MAXIMO:

- Work order can be create in two ways:

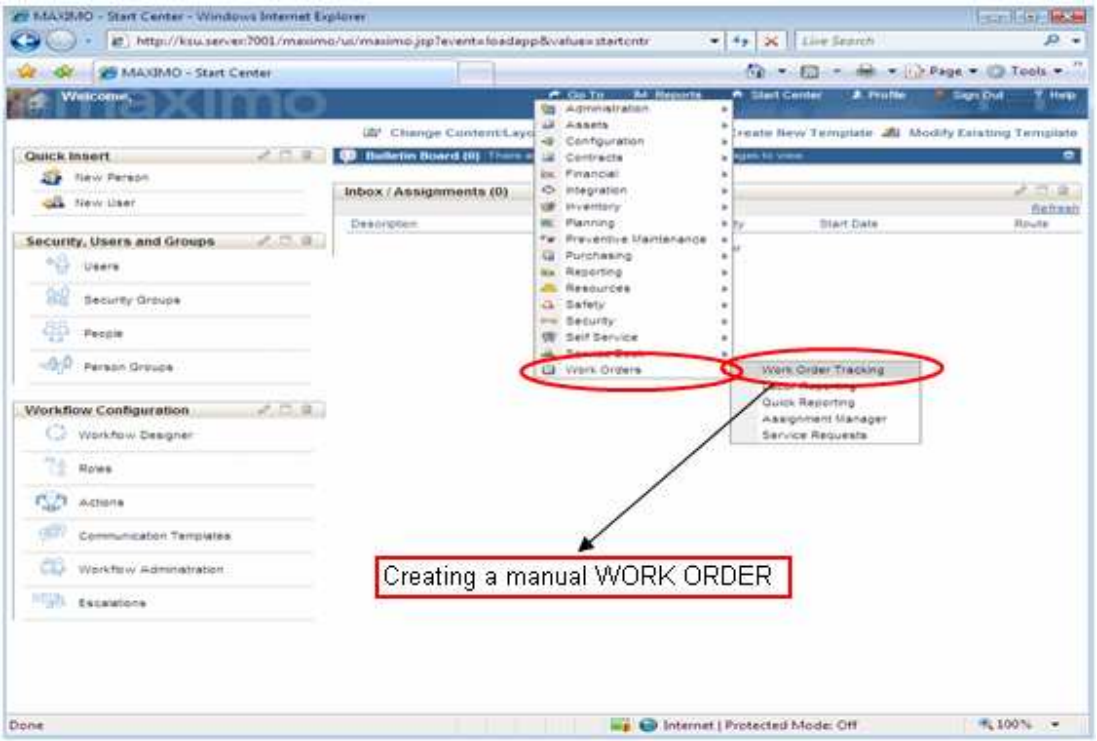
a. Manually → by using "Work Order tracking", "Quick Reportind", and "Service Request" applications.

b. Automatically → by using "Preventive Maintenance" and "Condition Monitoring" Applications.

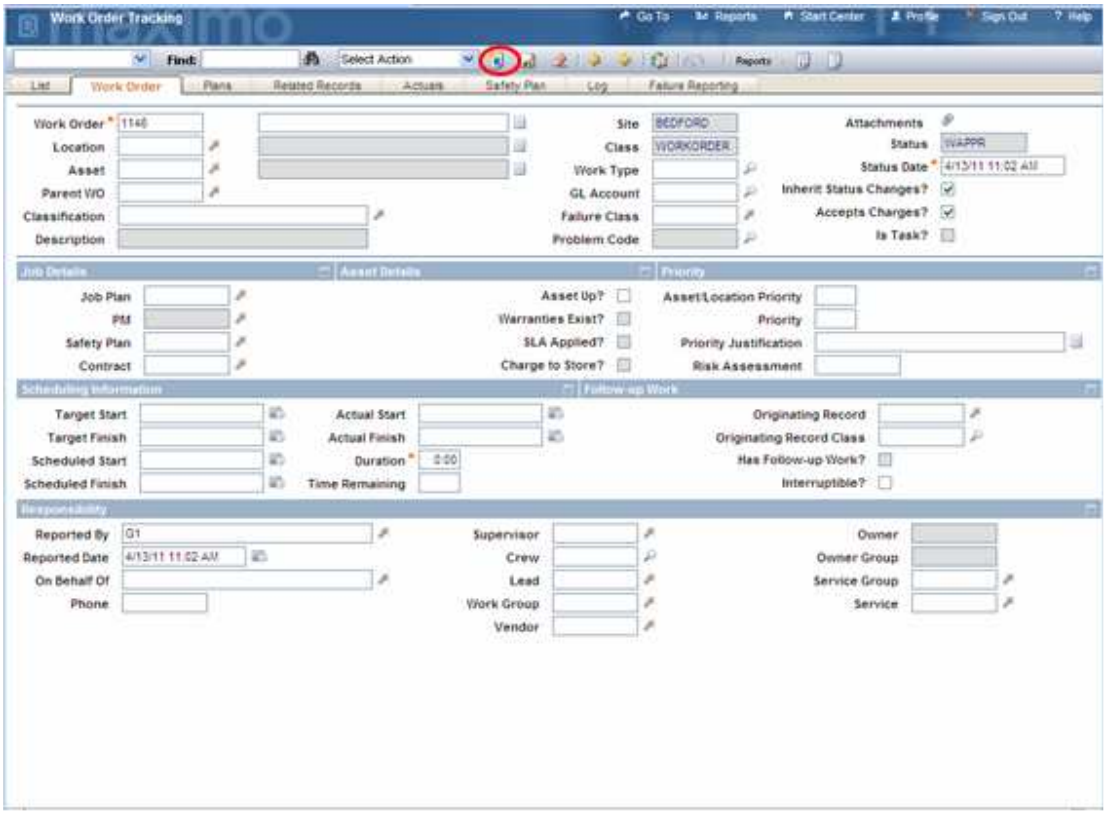
- Work order process life cycle occur when a work order is automatically or manually generated.

- Work order tracking application is related to: Planning, Scheduling, and Reporting.

1. Go to Work Order Application:



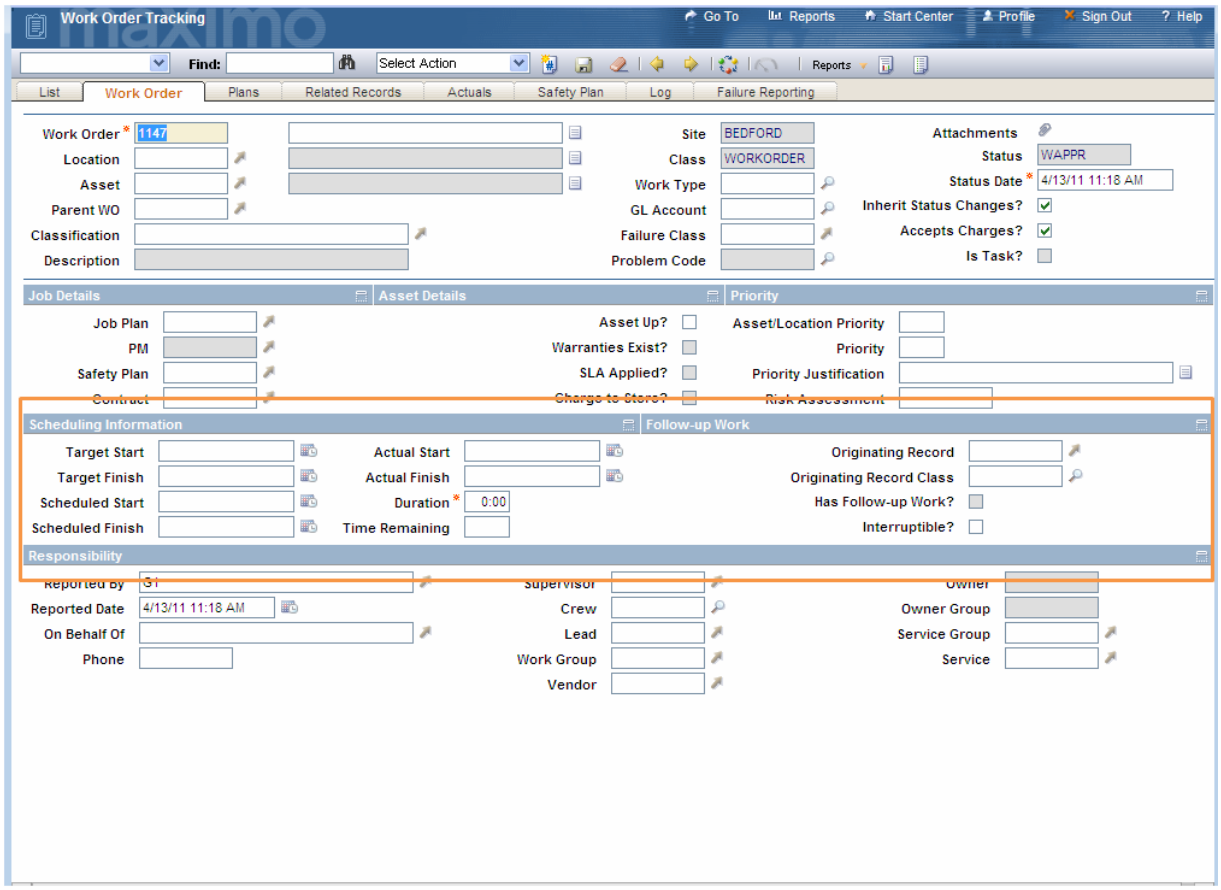
2. Click new record:



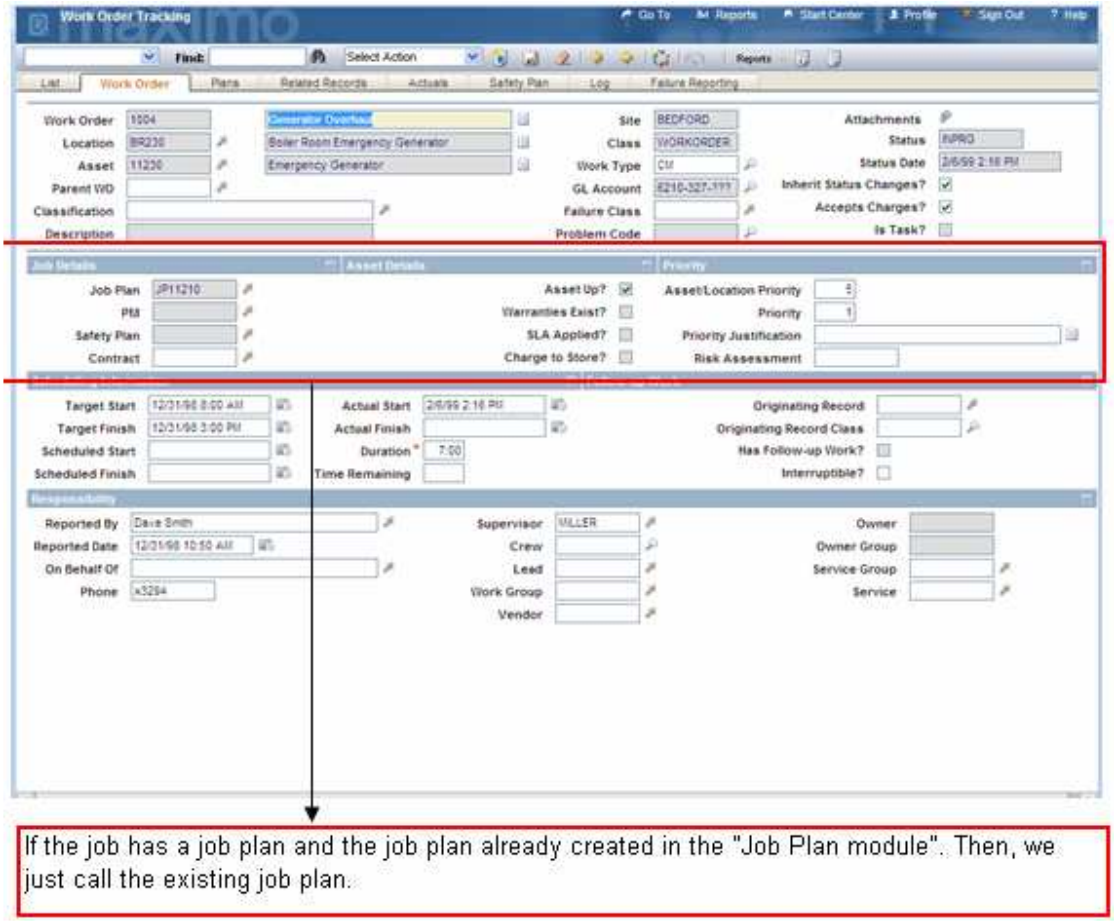
- Scheduling information:

  The filed in the scheduling information determine the status change in the work order.

Lab Session 7: Creating Work Order for PM



3. Entering record:

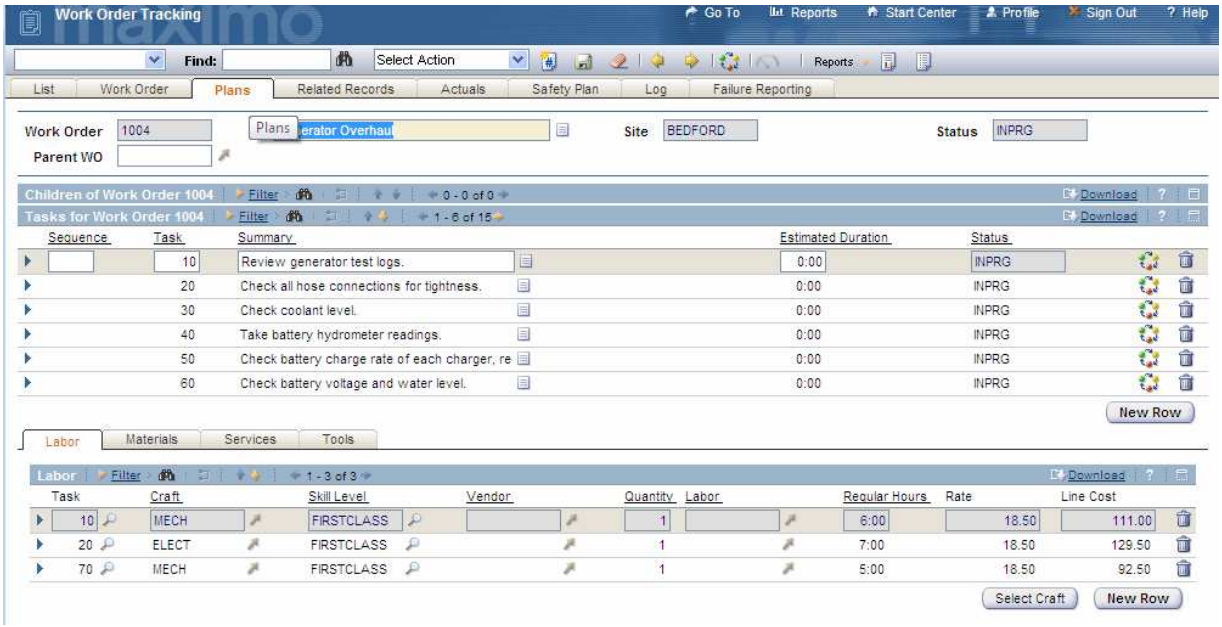


Note:
- We can enter Job Plan in “Job Details” section if we have already define the job plan in “job plan” application.
If not, we can define and create Job Plan in the Plans Tab.
- “Shceduling information” to determine the status change of the work order.
- “Responsibility” section is to enter person record related to work order.

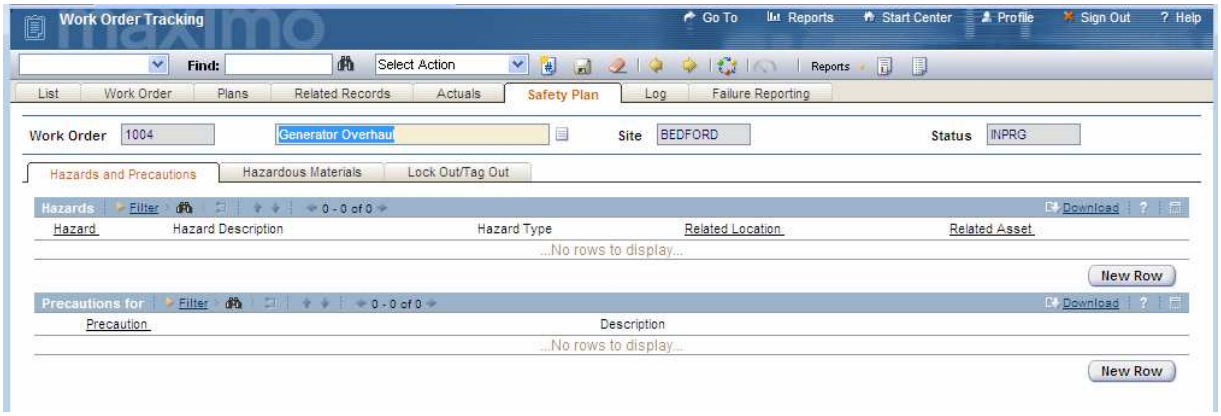
4. Go to "Plans" tab →If we want to create a Job Plan or modify an existing Job Plan.

NOTE:

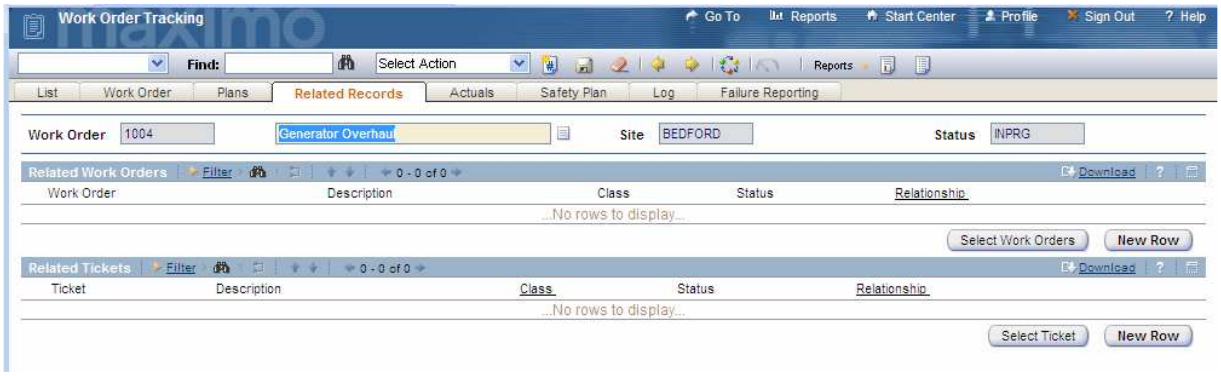
This tab is the same like the one in "Job Plan" Module. Then, we can create Job Plan also from work order module (if the job has a certain sequence (job plan) to be followed).



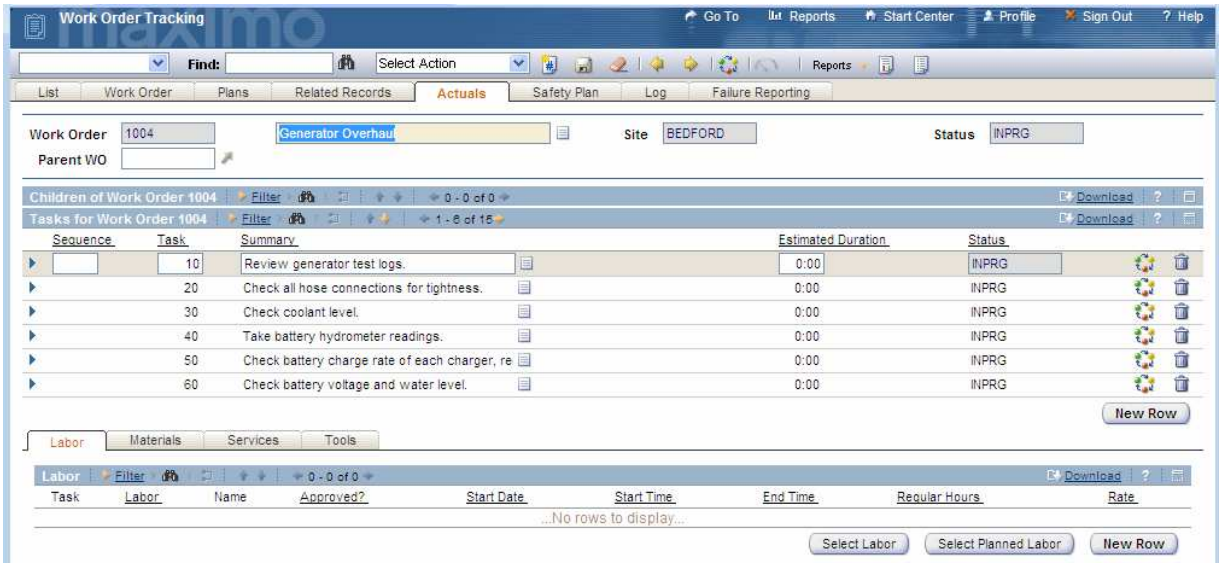
5. Go to "Safety Plan" Tab.
- the function of this data is to manage safety information needed for a work order.



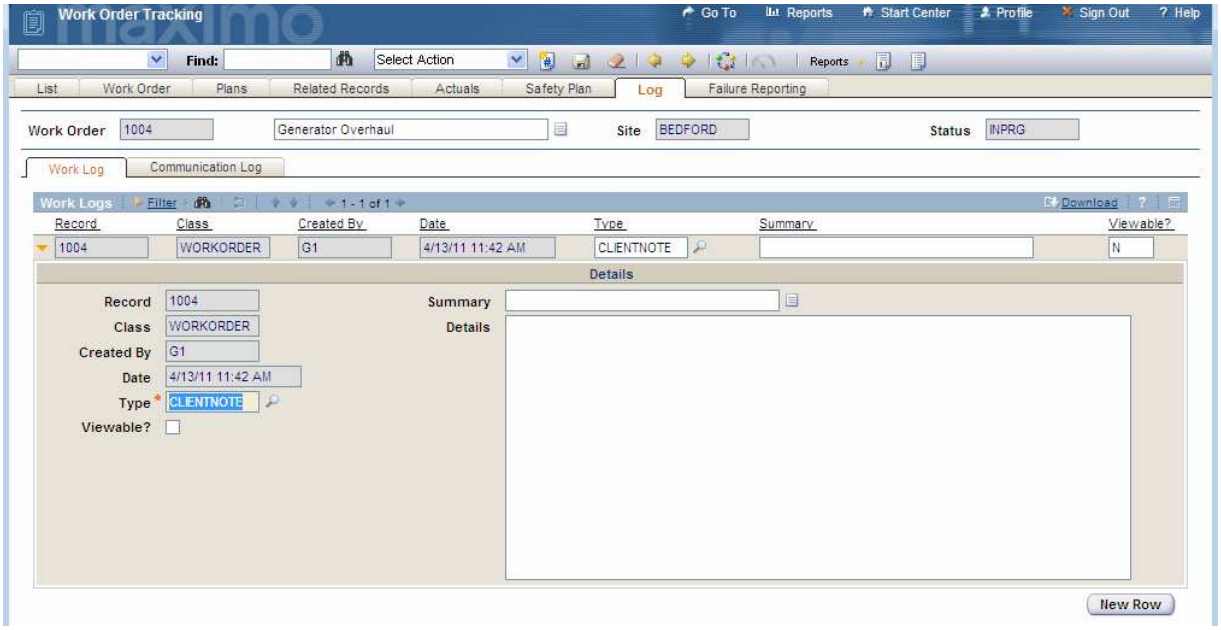
6. Go to "Related Record" Tab → if we want to relate a work order to another.



7. Go to "Actual" Tab →if we want to manage child work orders and task status as well as reporting the actual resources.



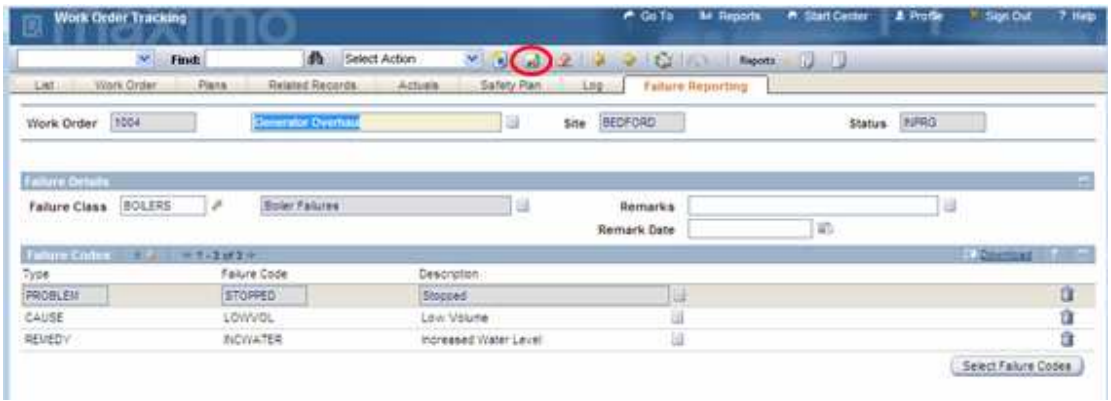
8. Go to “Log” Tab .



- This tab is used to enter work summary and detail

9. Go to “Failure Reporting” tab.

- This tab is used to display Failure Code hierarchy based on the Asset Failure Class.



10. Save the new record.

Lab Session 7: Creating Work Order for PM

Creating Preventive Maintenance (PM) in MAXIMO:

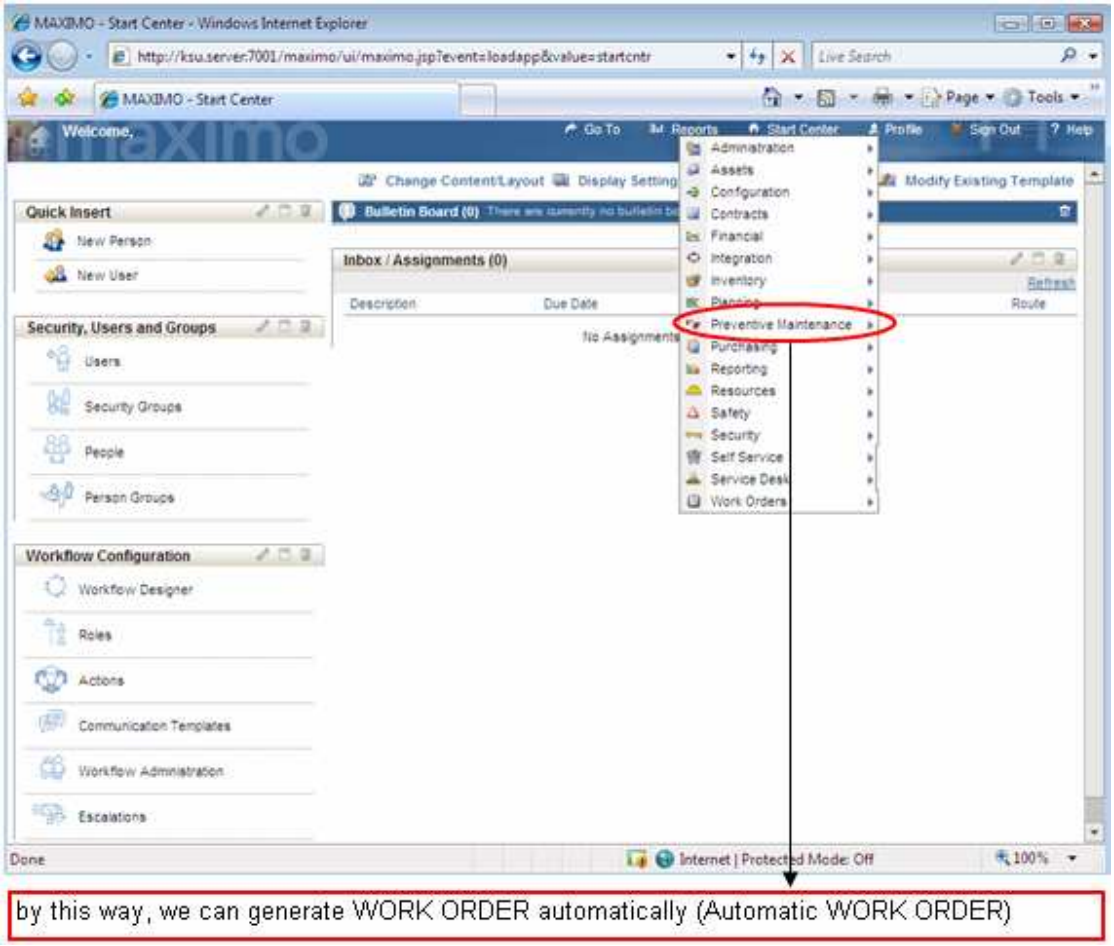
- PM application in MAXIMO can also be used to create and manage work orders. The record in PM is copied to work order module.

- PM can be generated in two ways:

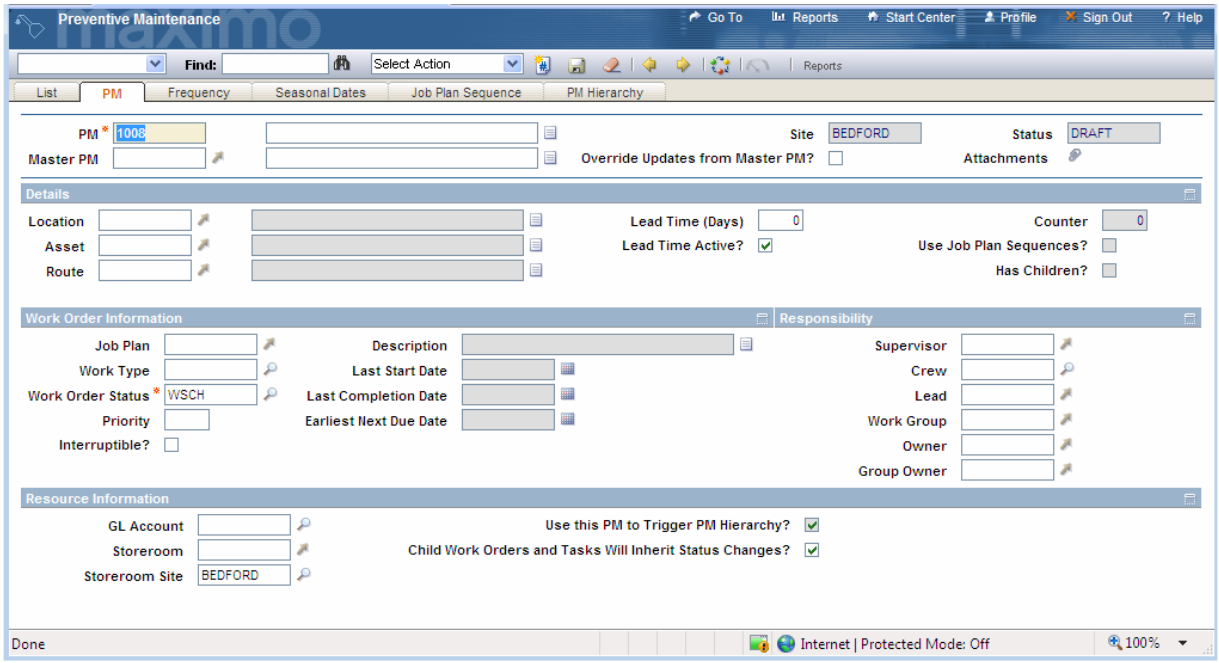
  a. Based on Elapsed time

  b. Based on meter reading (mileage)

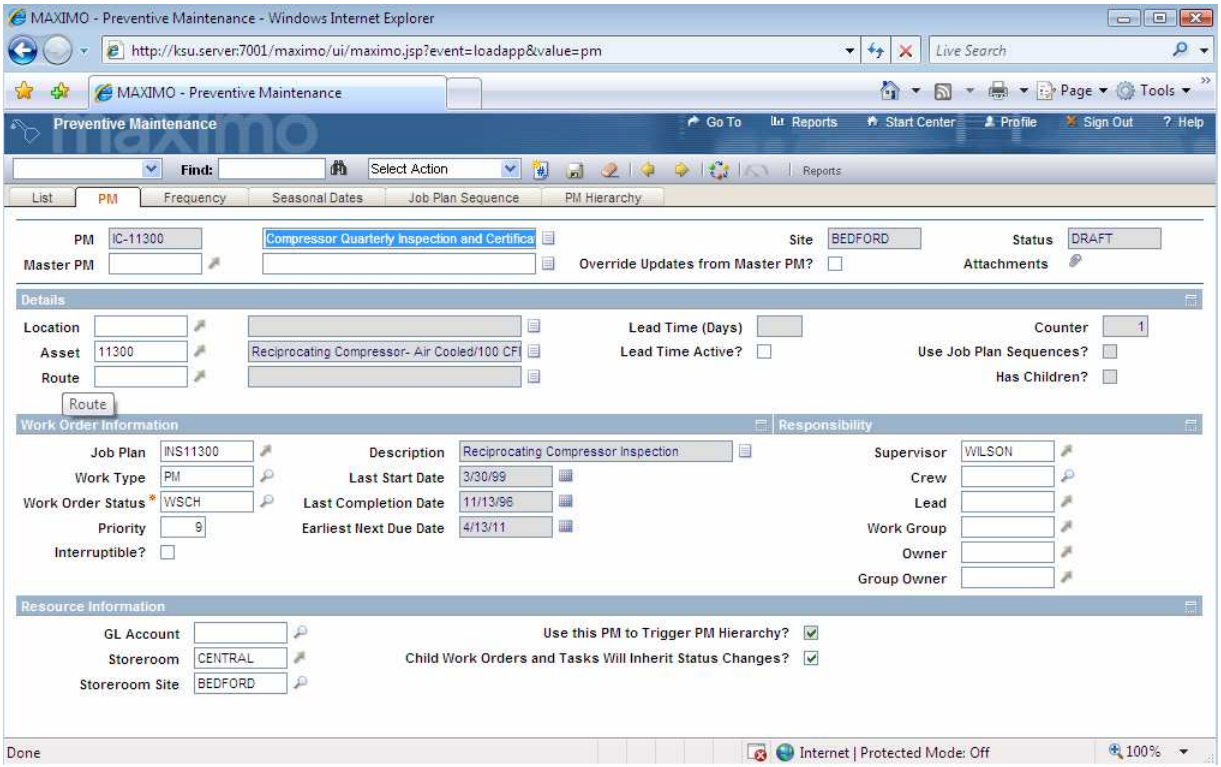
1. Go to "Preventive Maintenance" → Preventive Maintenance.



2. Click new record to enter new data.



3. Enter the necessary data.



4. Go to “Frequency” Tab.

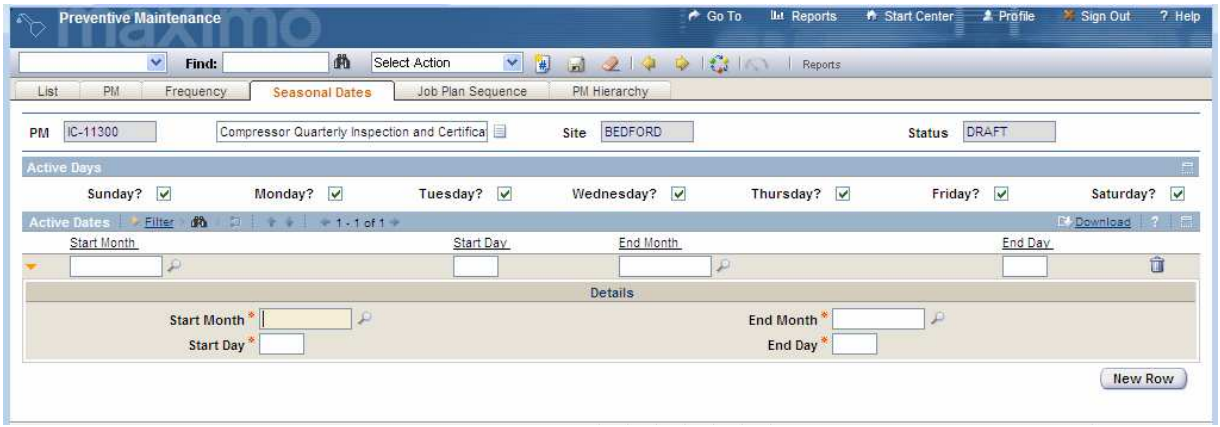
- This tab is to determine PM’s frequency scheduled that related to how often the work orders are generated. It can be time-based (based on elapse time) and meter-based (based on mileage).

5. Go to “Seasonal Dates” Tab.

- We can determine active PM days and dates using “Seasonal” tab.

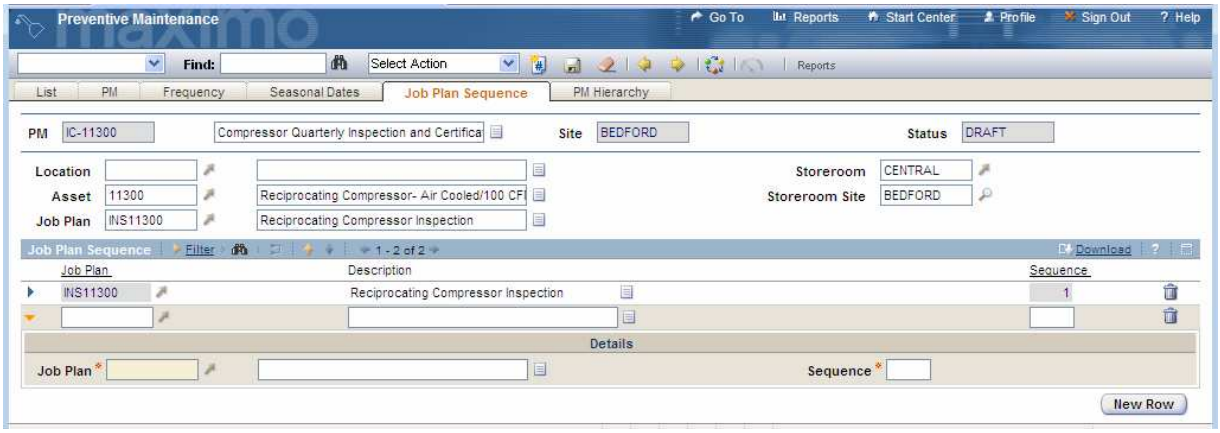
- Active Days section → allow to select the days of the week on work order can be generated.

- Active Dates section → allow numerous time period (seasons) of various durations to be added.



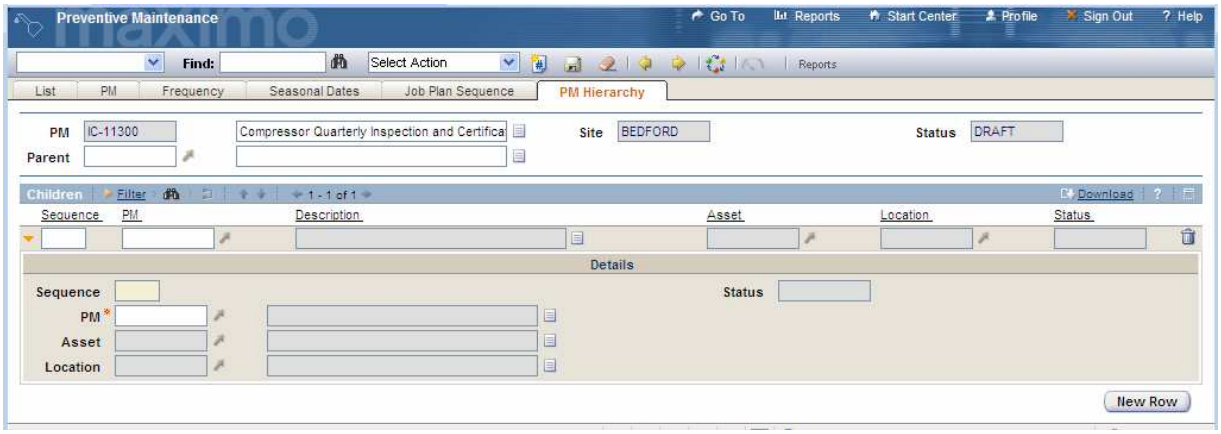
6. Go to “Jon Plan Sequence” Tab.

- More than 1 Job Plans can be used in PM



7. Go to “PM Hierarchy” Tab.

- PM hierarchy is used to schedule a group of work orders for an asset or location hierarchy.



8. Save the new record.