An Ounce of Prevention is Worth a Pound of Cure

Michael Webb - TMA Systems

TMASYSTEMS

Topics

- Purpose of PMs
- Keeping up with increasing demands
- Identifying PM items
- PM prerequisites
- Task functions
  - Task Sheets
  - Master Checks
  - Failure Codes
- PM Compliance
- PM Schedules
- Load Balancing

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Purpose of PMs

- Maintain the life expectancy of key equipment
- Ensure mission critical equipment or areas are operational
- Reduce corrective / reactive maintenance
- Reduce repair / replacement cost
- Manage routine / renewal tasks

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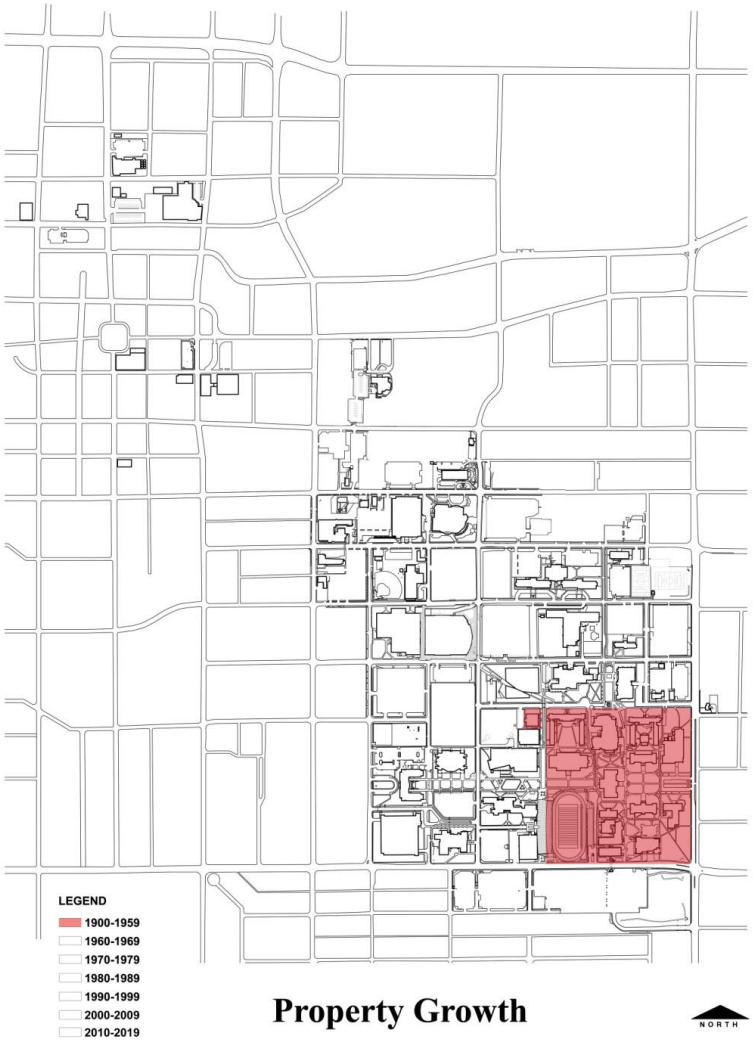
Property Growth through the 1950's

The problems we faced:

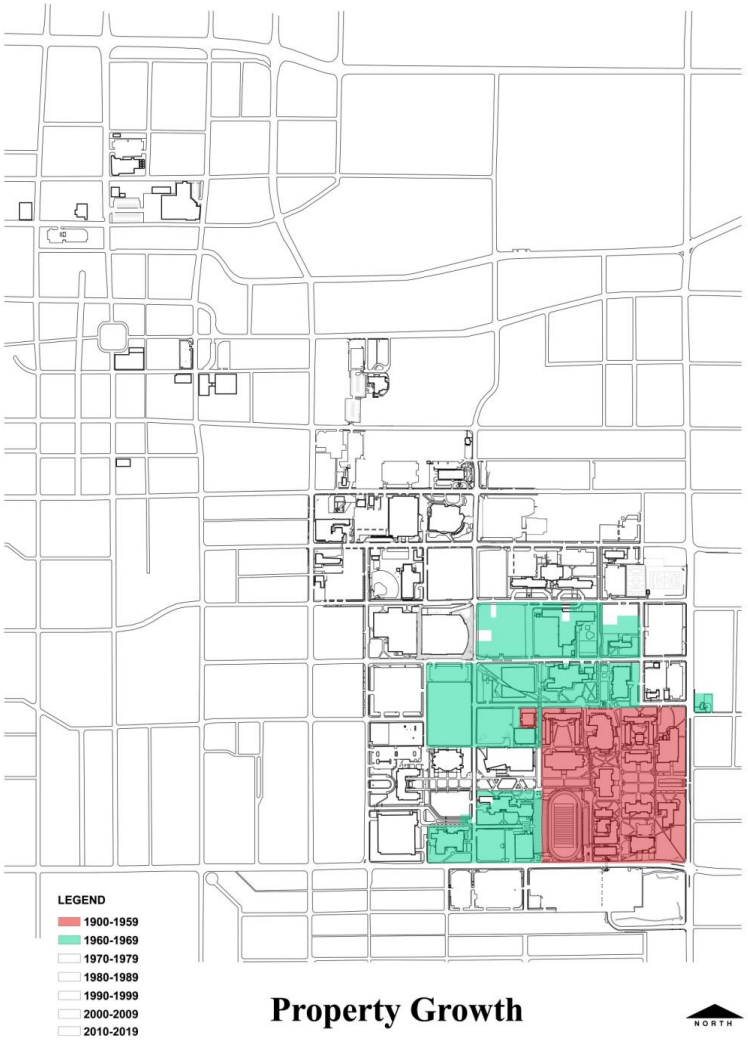
- Campus growth



Property Growth through the 1960's

The problems we faced:

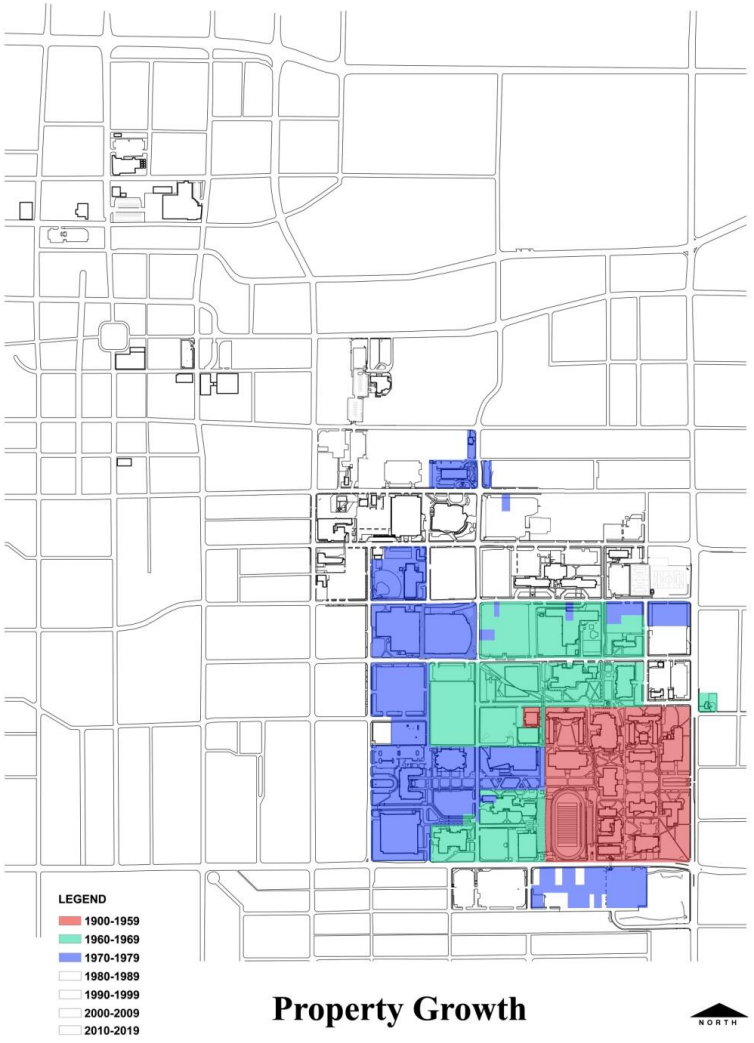
- Campus growth
- Additional equipment



Property Growth through the 1970's

The problems we faced:

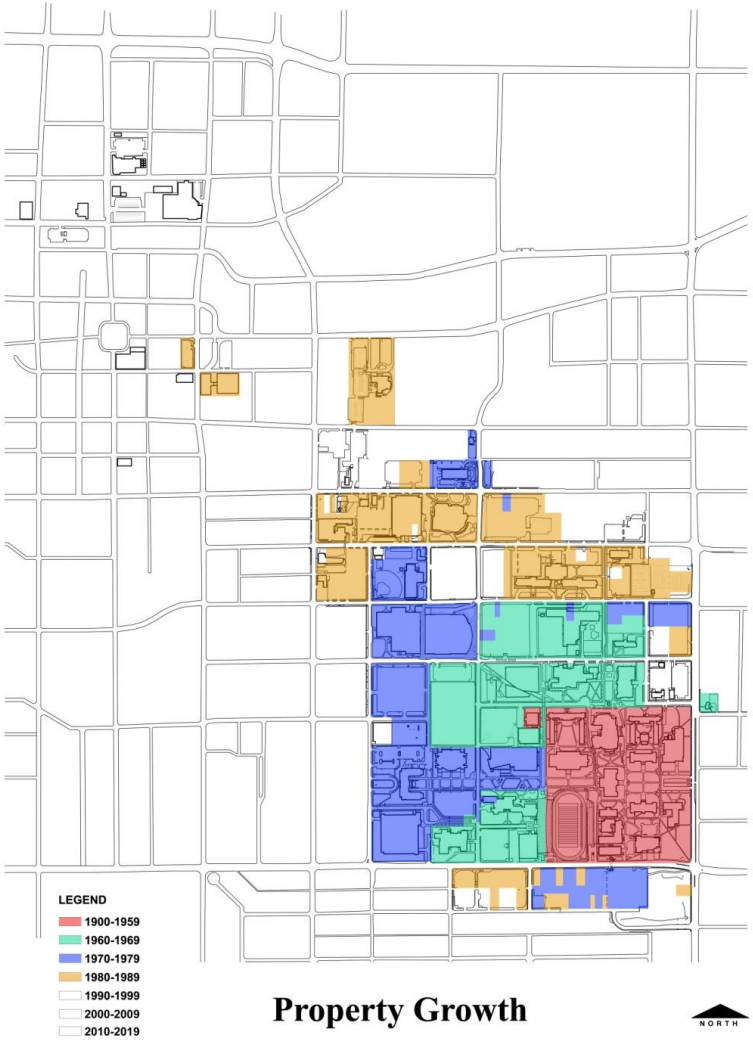
- Campus growth
- Additional equipment
- Staff not keeping pace with maintenance demand



Property Growth through the 1980's

The problems we faced:

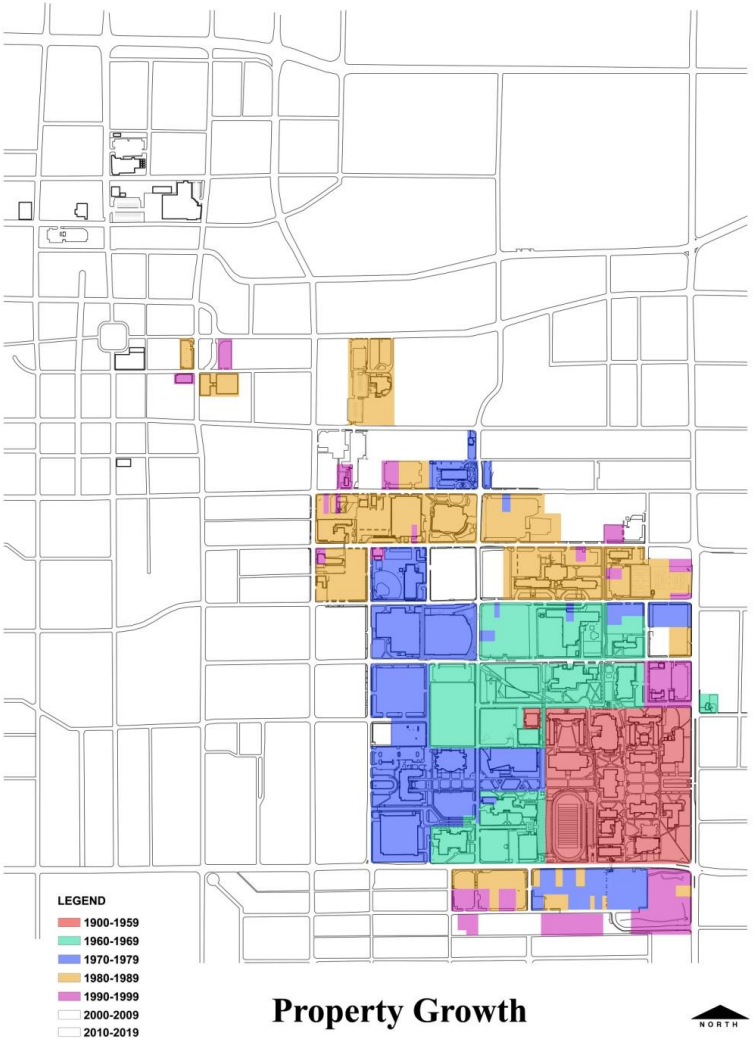
- Campus growth
- Additional equipment
- Staff not keeping pace with maintenance demand
- Reactive Maintenance supersedes quality Preventative Maintenance



Property Growth through the 1990's

The problems we faced:

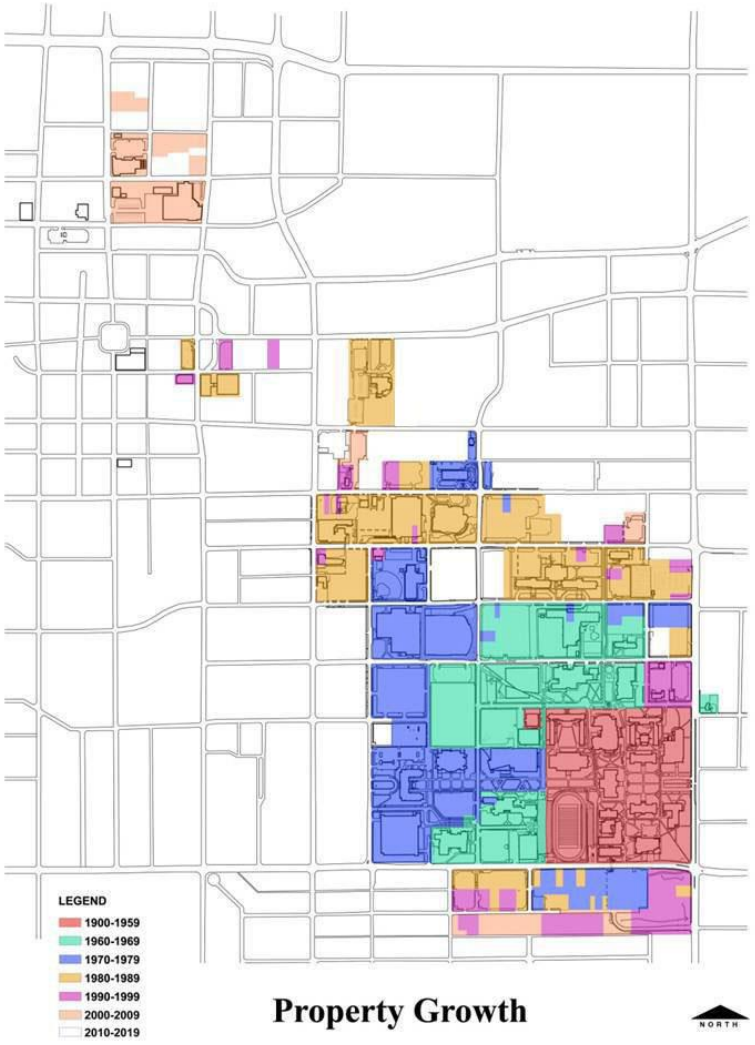
- Campus growth
- Additional equipment
- Staff not keeping pace with maintenance demand
- Reactive Maintenance supersedes quality Preventative Maintenance
- Suspect poor fiscal decisions are being made



Property Growth between 2000-2009

The problems we faced:

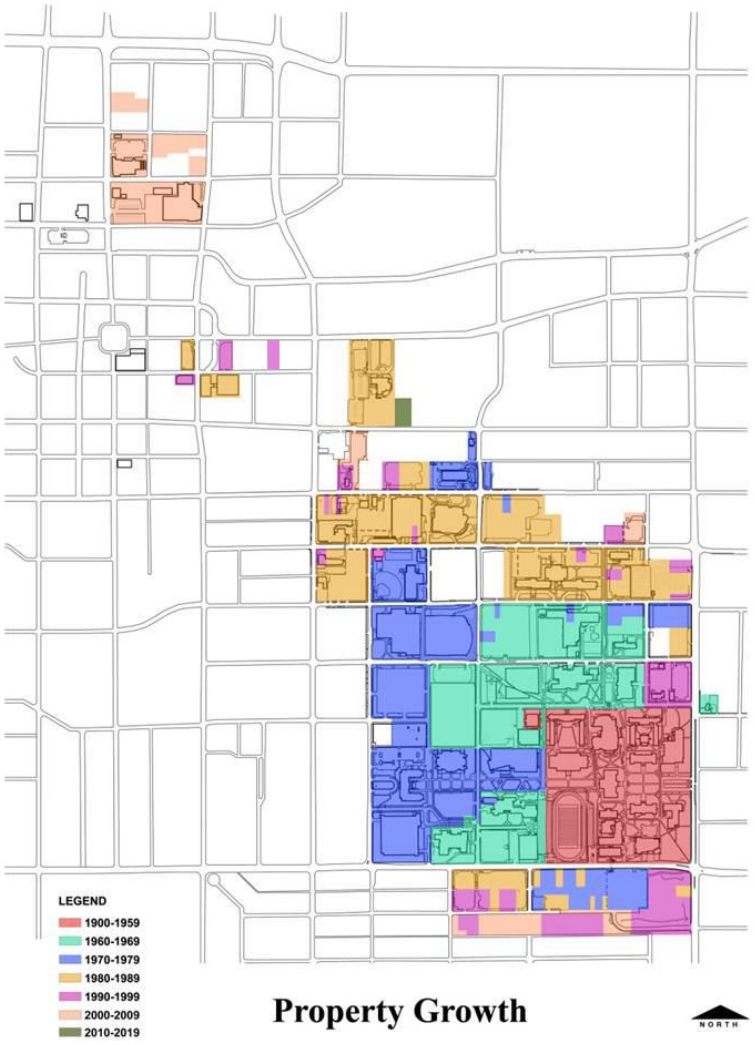
- Campus growth
- Additional equipment
- Staff not keeping pace with maintenance demand
- Reactive Maintenance supersedes quality Preventative Maintenance
- Suspect poor fiscal decisions are being made
- Institutional knowledge leaves with retirees



Property Growth between 2010-Current

The problems we faced:

- Campus growth
- Additional equipment
- Staff not keeping pace with maintenance demand
- Reactive Maintenance supersedes quality Preventative Maintenance
- Suspect poor fiscal decisions are being made
- Institutional knowledge leaves with retirees



Damage Control

- How do we solve this

  multi-faceted problem of maintaining growing facilities?

- How do we get away from Reactive Maintenance?

- How do we develop a Preventative Maintenance Program to get stay out in front of this?

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Identifying PM Items - Priorities

- Life safety
- Mission critical items
- Expense items
- Focus on anything that will keep down operational cost

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TMA Data Priorities

Priority		Information Collected	Information Entered	PM Tasks Reviewed	PM Tasks Assigned	PM's Activated
1	Generators					
2	Chillers					
3	Cooling Towers					
4	Heating Boilers					
5	Major Air Moving Equipment (AHU,MUA,MZU, RTU)					
6	Split System Air Cooled Condensers (7.5 >Tons)					
7	Domestic Water Heaters					
8	Liebert Units					
9	Pumps (Chilled Water/Hydronic)					
10	Pumps (Recirculating/Booster/Sump)					
11	Fire Panels					
12	Heat Exchangers (Domestic/Hydronic)					
13	Exhaust Systems (Building/Fume Hood)					
14	Air Compressors, Refrigerated Air Driers					
15	UPS Systems					
16	Condensate Recovery Systems					
17	Variable Speed/Frequency Drives					
18	Fan Coil/Cabinet Heaters					
19	Variable Air Volume Systems					
20	Split System Air Cooled Condensers (<5.0 Tons)					
	*Additional priorities to be determined					

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Challenges

- Collecting equipment data
  - Data collections sheets
  - Mobile device
  - Photographs
- How to enter it into CMMS
  - Standardized procedure
  - Created template

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Data Collection

- Editable PDF
- Editable Word Document
- Mobile Device

EQUIPMENT DATA COLLECTION SHEET

Tag #: (If replacing existing equipment)

Description: (Water heater, AHU, FCU, etc)
WATER SOURCE HEAT PUMP, CONSOLE

Type: (Gas, electric, 20 ton, 4500 BTU, etc)
3/4 TON CONSOLE

Model #:

Serial #:

Location ID: (Room number)
ROOM 404

Building / Area: (KEMP, HAMM fountain, Bear Village, etc)
GLASS

Department: (Only if service is paid for by a dept other than maintenance)

System: (DCWS, Steam, etc)

Manufacturer: (Of equipment)
TRANE EQUIPMENT

Install Date: (For warranty purposes)

Work Order #: (Work order that the new equipment was charged against)
FM 459433

Comments: (Provide any additional info you think is useful)
PURCHASED ON 10/4/16
$2,065.00

STORES PO# M17-9810

Teamwork

Fri 9/16/2016 12:00 PM

Long, Philip C

Equipment to set up for PM

To Webb, Michael C

Cc Quinn, Justin A

You replied to this message on 9/20/2016 10:12 AM.

Message | BLSH comp 1 a.jpg (3 MB) | BLSH comp 1 b.jpg (3 MB) | BLSH comp 1.jpg (4 MB) | BLSH comp 2 a.jpg (3 MB) | BLSH comp 2 b.jpg (3 MB) | BLSH comp 2 c.jpg (4 MB) | BLSH comp 2.jpg (3 MB)

Action Items

Mike

I have attached photos of the air compressors in the Blair-Shannon basement. Please label them 1 & 2 according to the pictures as this matches the control panel labels. The location for #1 is bottom of stairs and #2 is under the stairs.

Please set them up for monthly PM's as follows;
Check and add oil as needed
Clean air intake filter
Check auto drain
Check belts
Check safety guards and anchors

Then quarterly;
Change oil and filter
Change intake filter

Thank you

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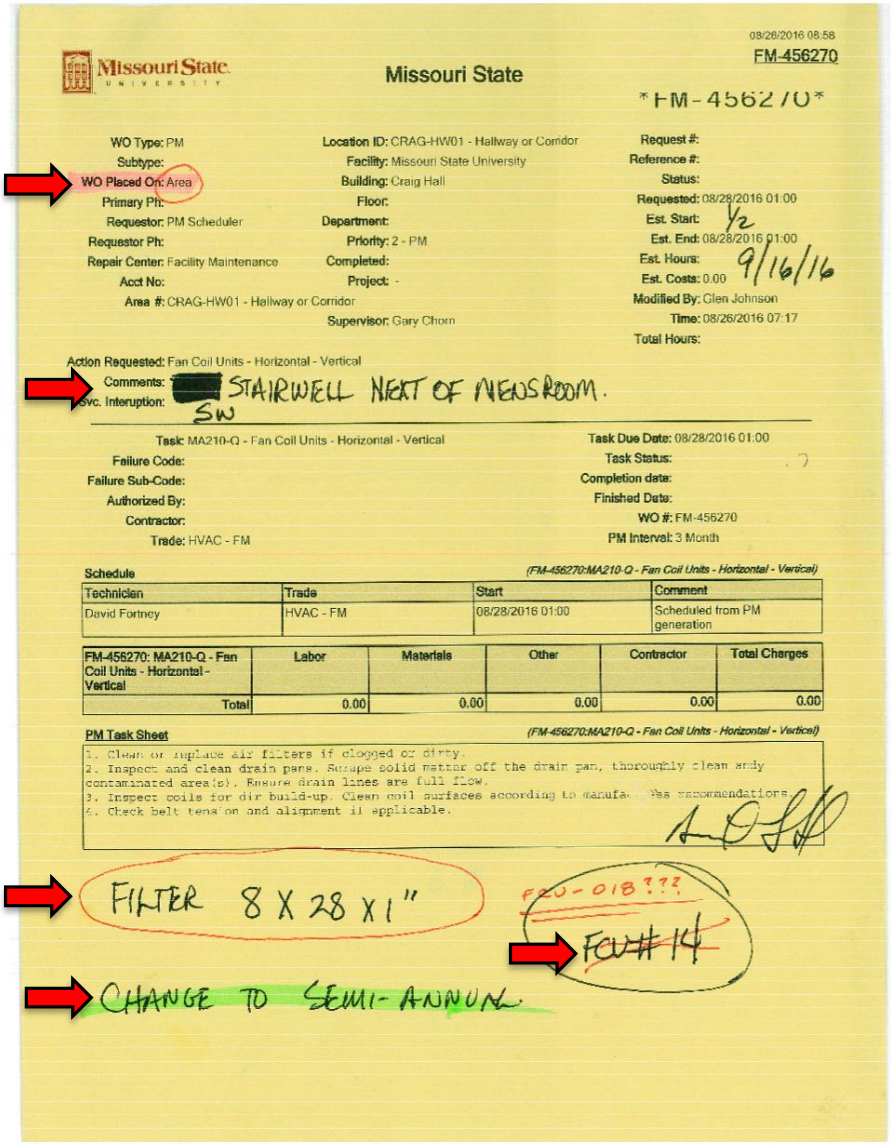
WO Note Taking

- Informs me that the PM is on an area as opposed to an equipment record
- Gives me a detailed comment on location
- Shares the filter size with me
- Asks me to change it to a semi-annual
- Attempts to identify unit



08/26/2016 08:58
FM-456270

Missouri State University

Missouri State

FM-456270

WO Type: PM
Subtype:
WO Placed On: Area
Primary Ph:
Requestor: PM Scheduler
Requestor Ph:
Repair Center: Facility Maintenance
Acct No:
Area #: CRAG-HW01 - Hallway or Corridor

Location ID: CRAG-HW01 - Hallway or Corridor
Facility: Missouri State University
Building: Craig Hall
Floor:
Department:
Priority: 2 - PM
Completed:
Project: -
Supervisor: Gary Chorn

Request #:
Reference #:
Status:
Requested: 08/28/2016 01:00
Est. Start: 1/2
Est. End: 08/28/2016 01:00
Est. Hours:
Est. Costs: 0.00
Modified By: Glen Johnson
Time: 08/26/2016 07:17
Total Hours:

9/16/16

Action Requested: Fan Coil Units - Horizontal - Vertical
Comments: [redacted] STAIRWELL NEXT OF NEWSROOM. SW
Svc. Interuption:

Task: MA210-Q - Fan Coil Units - Horizontal - Vertical
Failure Code:
Failure Sub-Code:
Authorized By:
Contractor:
Trade: HVAC - FM

Task Due Date: 08/28/2016 01:00
Task Status:
Completion date:
Finished Date:
WO #: FM-456270
PM Interval: 3 Month

Schedule (FM-456270:MA210-Q - Fan Coil Units - Horizontal - Vertical)

Technician	Trade	Start	Comment
David Fortney	HVAC - FM	08/28/2016 01:00	Scheduled from PM generation

FM-456270: MA210-Q - Fan Coil Units - Horizontal - Vertical	Labor	Materials	Other	Contractor	Total Charges
Total	0.00	0.00	0.00	0.00	0.00

PM Task Sheet (FM-456270:MA210-Q - Fan Coil Units - Horizontal - Vertical)

1. Clean or replace air filters if clogged or dirty.
2. Inspect and clean drain pans. Scrape solid matter off the drain pan, thoroughly clean and contaminated area(s). Ensure drain lines are full flow.
3. Inspect coils for dirt build-up. Clean coil surfaces according to manufa[illegible]s recommendations.
4. Check belt tension and alignment if applicable.

FILTER 8 X 28 X 1"

FCU-018???
FCU#14

CHANGE TO SEMI-ANNUAL

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PM Prerequisites

- Work Order Type
- Priority
- Trade
- Maintenance-Worthy Item (MWI)
- Meter (if meter based)
- Task Codes

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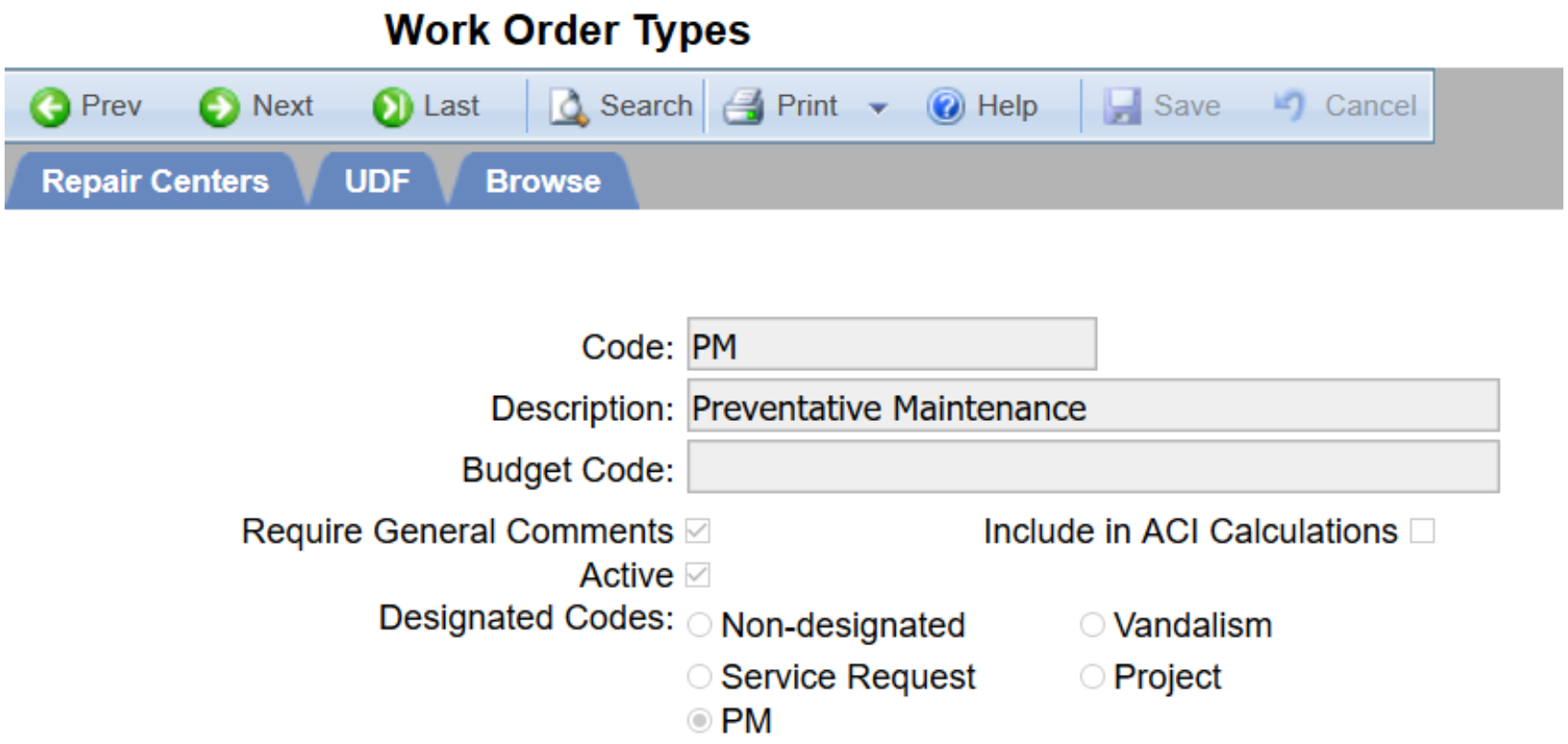
Work Order Types



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Priorities for PMs

Code:	1	Description:	Crucial
Color:	Red		
Due Every:	4 Hour		
Active	☑		

Code:	2	Description:	Urgent
Color:	Orange		
Due Every:	2 Day		
Active	☑		

Code:	3	Description:	Regular
Color:	Green		
Due Every:	5 Day		
Active	☑		

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Basic Load Balancing

- Spring PMs
  - cooling systems
- Fall PMs
  - heating systems
- Pre-fall PMs
  - residential / housing buildings and areas

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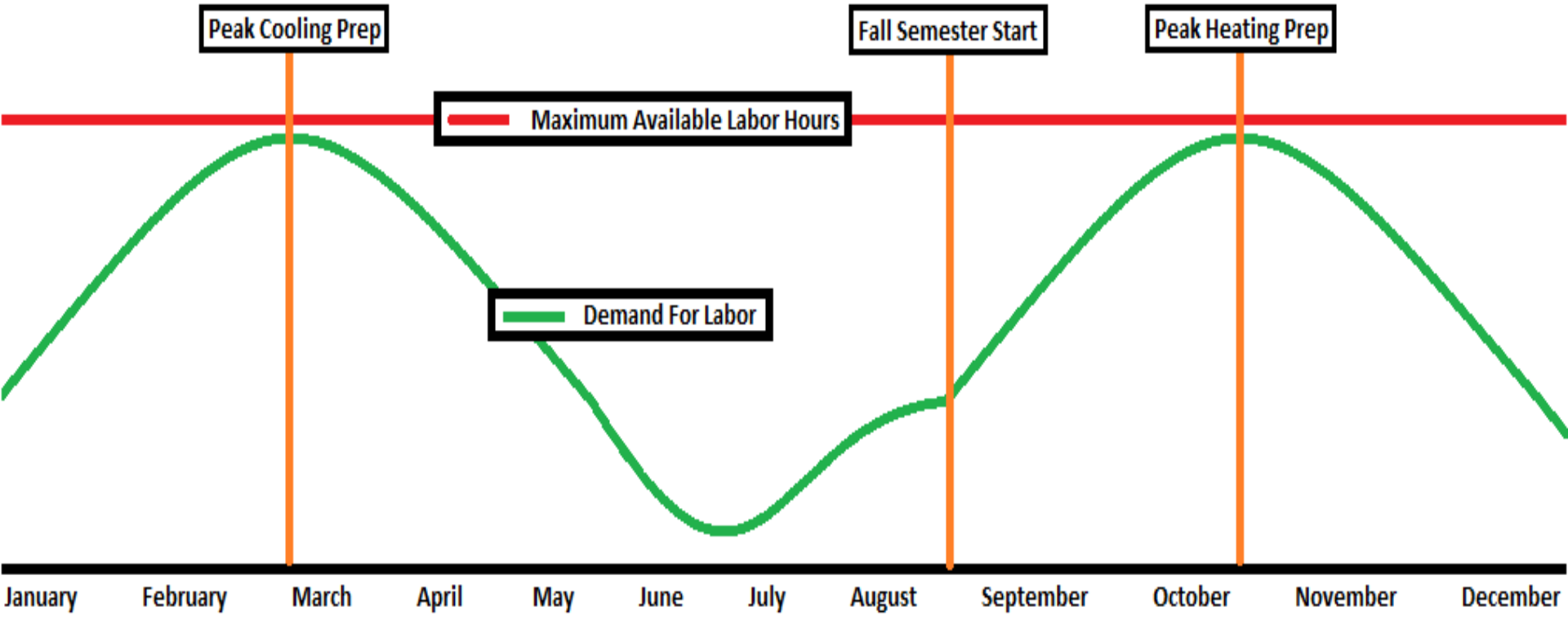
Prioritize by season



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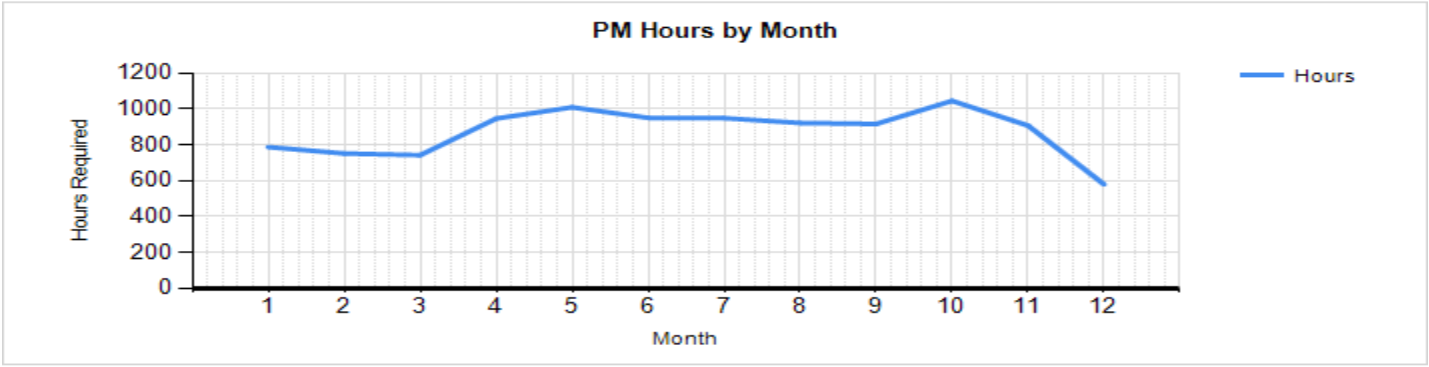
Load Balancing

PM Load Balance Summary by Trade



HVAC	Month	Hours
	1	787.00
	2	751.00
	3	742.00
	4	946.50
	5	1,009.00
	6	950.00
	7	948.50
	8	921.50
	9	916.00
	10	1,045.00
	11	907.00
	12	578.75

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Fixed vs Floating

- Floating PMs
  - Meters
  - Mowing
- Fixed PMs
  - Everything else

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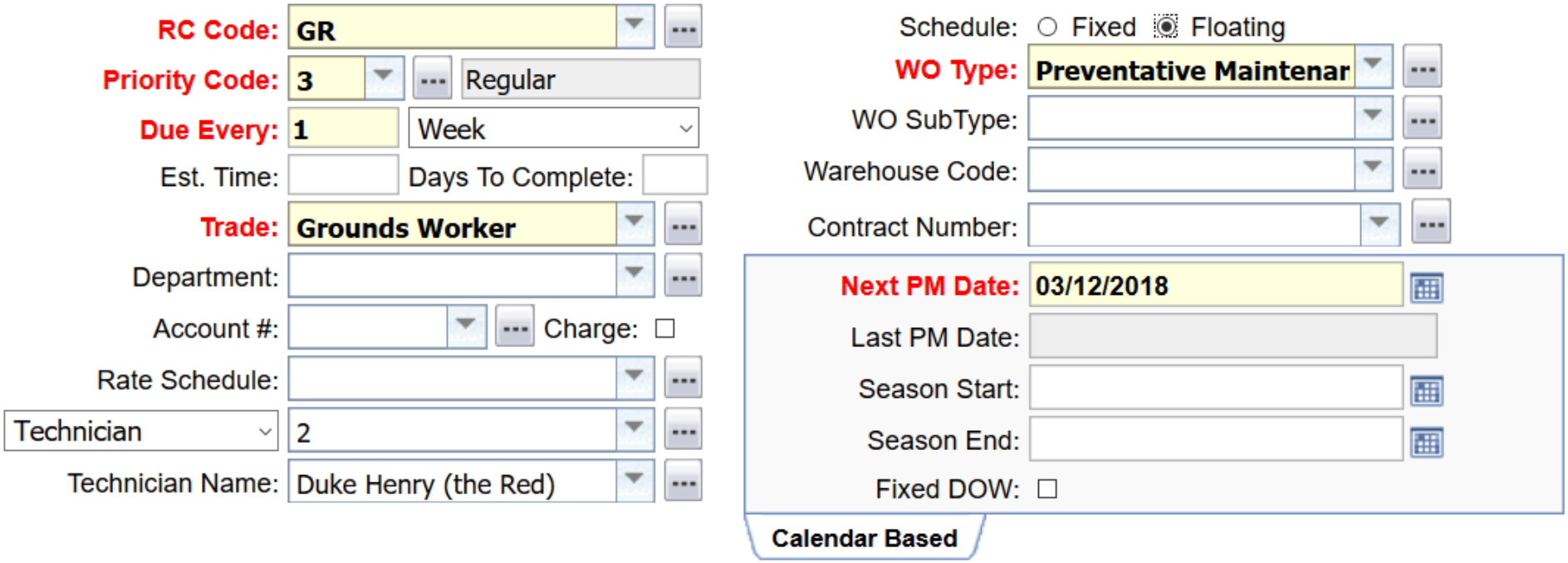
Meters & Mowing



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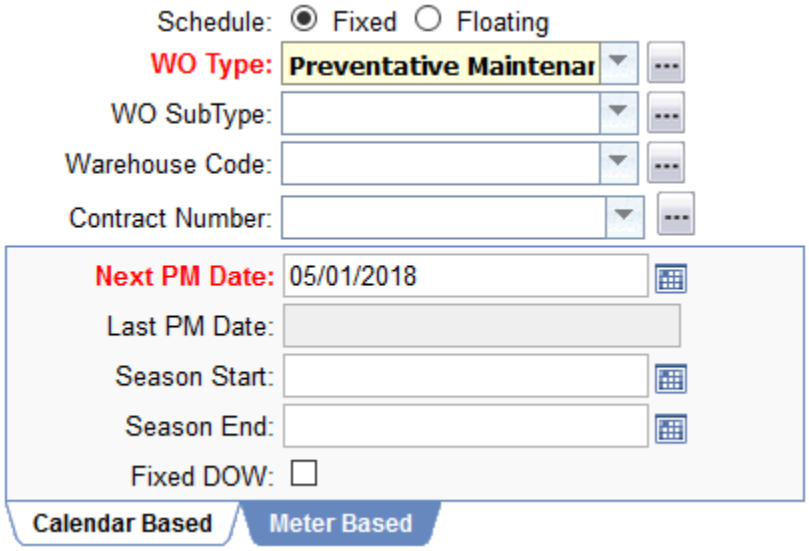
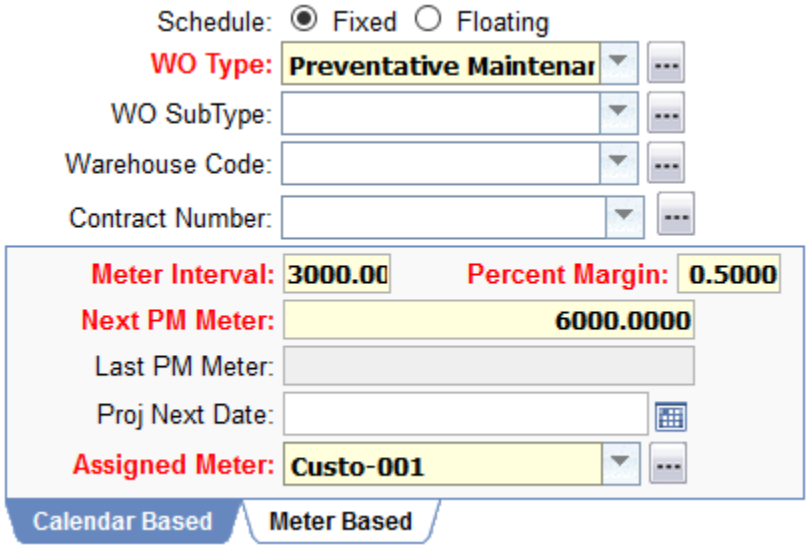
Calendar vs Metered

- Dual schedule
  - For metered PMs, consider using both fixed and floating to prevent unexpected overload





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Task Functions

- Task Sheets
- Master Checks
- Failure Codes

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Task Sheet vs Task Check List

- Task sheets are created at the Task record level

- Task lists are imported over from Inspection Form in relation to a Master Check record

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Task Sheets

- Convenient for copying OEM specifications
- Simple to create
- Easily editable
- Basic

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Task Sheet

Emergency and Exit Light inspection and testing:

1) Walk the ground floor to each exit.
2) Visually inspect for any physical damage.
3) Press and hold the TEST button on each light until the light comes on.
4) Hold the button with the light on for 10 seconds.
5) Release the TEST button and make certain the light returns to normal operation.
6) Report the location of any light that does not function properly during test.

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Task Check List

- Allows creation of Master Checks
- Can be set with a Pass or Fail grading system
- Failing an item on the Master Check can automatically prompt you to generate a PM Repair work order
- Master Checks can be reviewed and reported on

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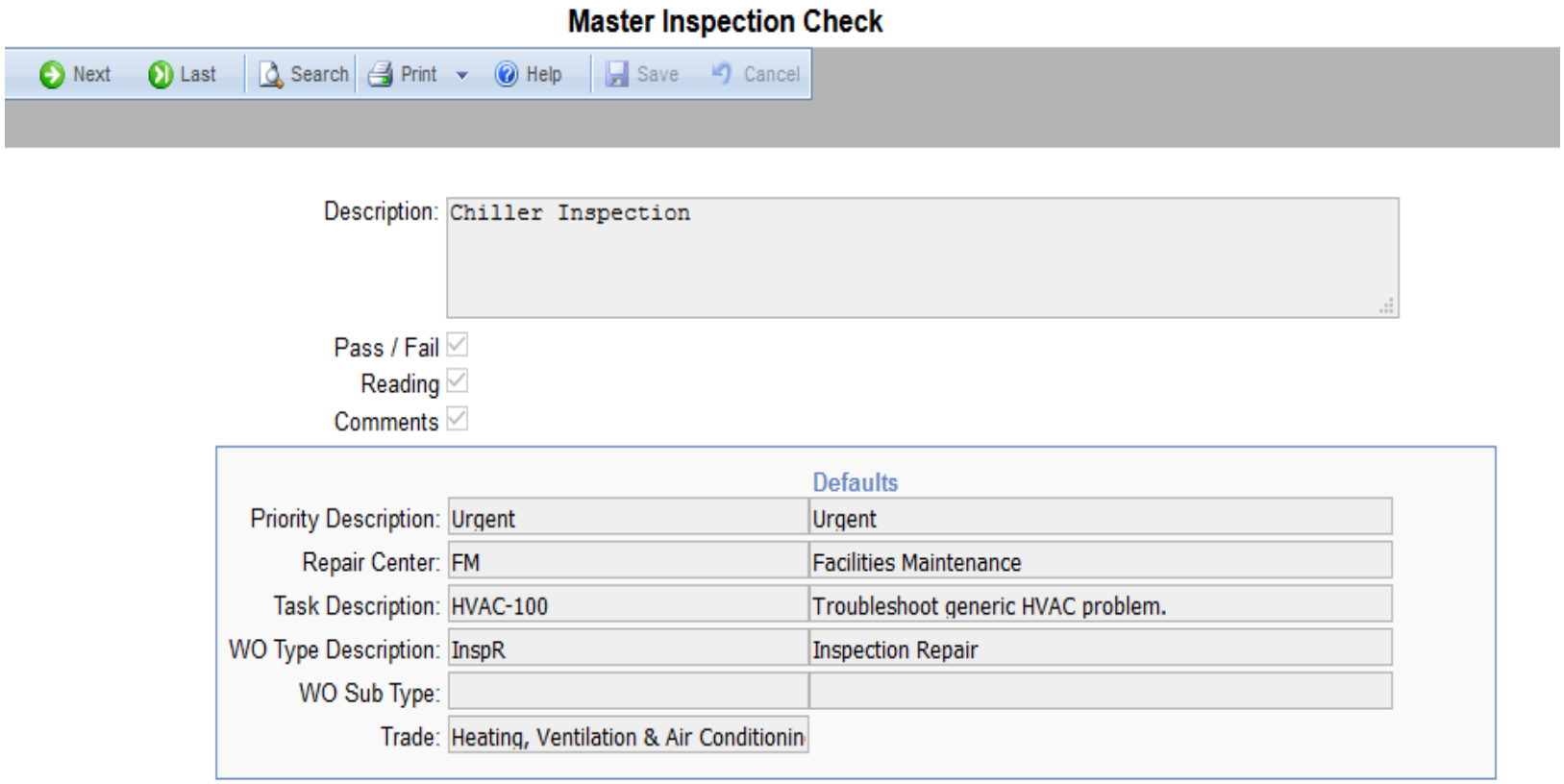
Task Check List



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Master Inspection Form

Order	Check	Pass/Fail	Reading	Comments
1	Drop heads of chiller unit.	☐	☐	☑
2	Brush tubes. Cleaning tubes ensures better heat transfer. Heat transfer is directly related to chiller efficiency.	☐	☐	☑
3	Take oil sample. While Chiller is Operating. Oil analysis will indicate whether the oil needs to be changed or not.	☑	☑	☑
4	Take refrigerant sample. Refrigerant can tell a lot about the operation of the chiller. If the refrigerant is charged correctly, it ensures a leak free unit. Too much or too little refrigerant can cause possible damage to the compressor impeller, refrigerant carryover, reduced capacity, an overloaded motor, and excess power consumption.	☑	☑	☑
5	Perform Eddy Current Testing. Eddy current analysis is an electromagnetic technique and is completely non-destructive. It works on the principles of electromagnetic induction. There is no dangerous radiation or hazardous chemicals involved with this technique.	☐	☑	☑
6	Document Performance. Chiller operators should document chiller performance daily with an accurate and detailed log, comparing this performance with design and start-up data to detect problems or inefficient control set points	☐	☑	☑
7	Stay on Top of Water Treatment. Monthly water analysis reports are done to check the quality of water, and help to indicate if any adjustments are needed.	☑	☑	☑
8	Prepare for Winter. To avoid freeze ups, maintain a 40 degree set on heat trace systems. Also check the status of dampers and building controls, and protect mechanical rooms (room is heated, sprinkler head is heat traced and insulated).	☑	☑	☑

PM Item vs PM Task

- Assign a PM task to an Item such as a piece of equipment
  - Simple, functional, limited
- Assign a piece of equipment to a PM task
  - Simple, functional, efficient, informative, load balanced

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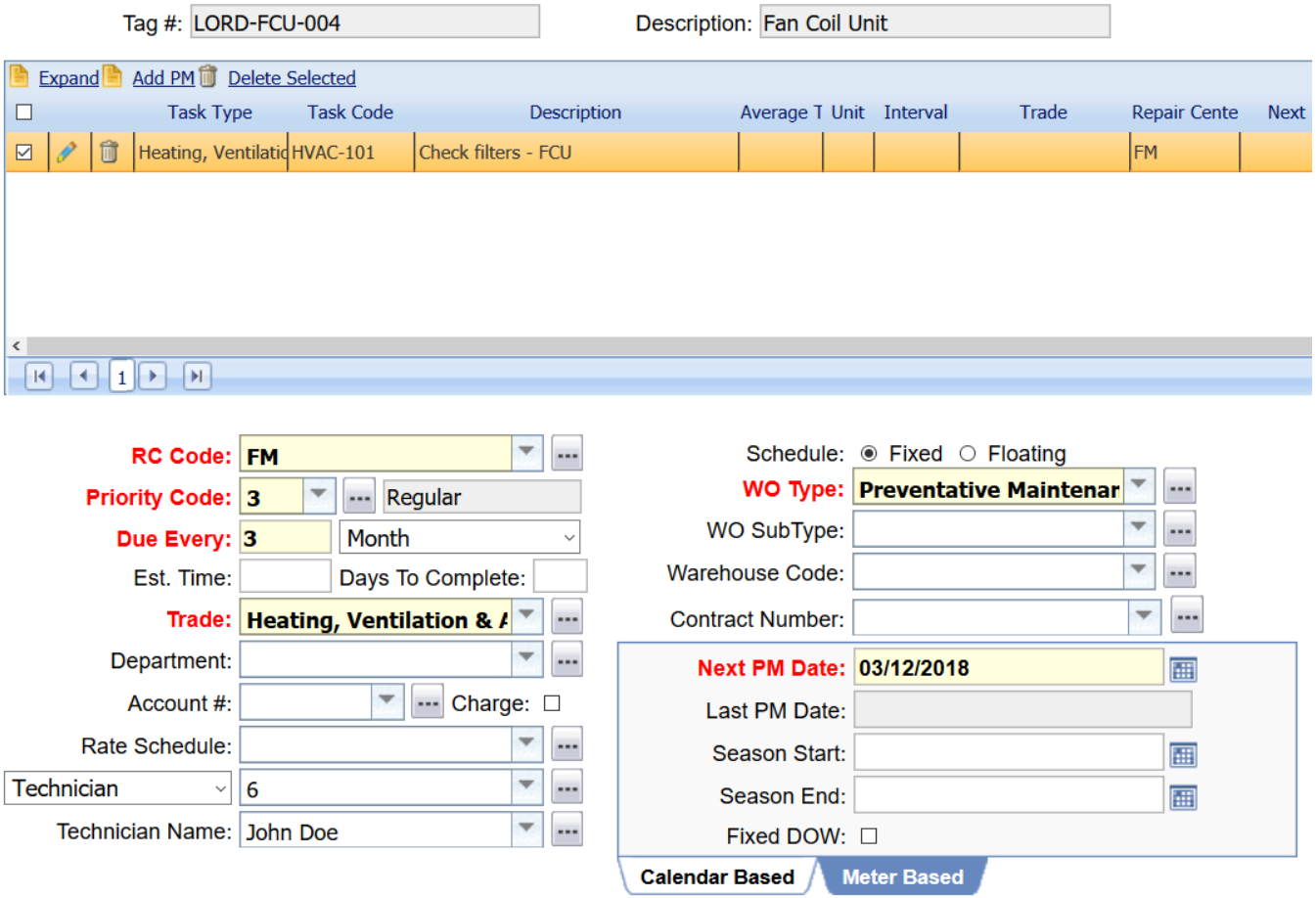
PM scheduling one item *with* the Task



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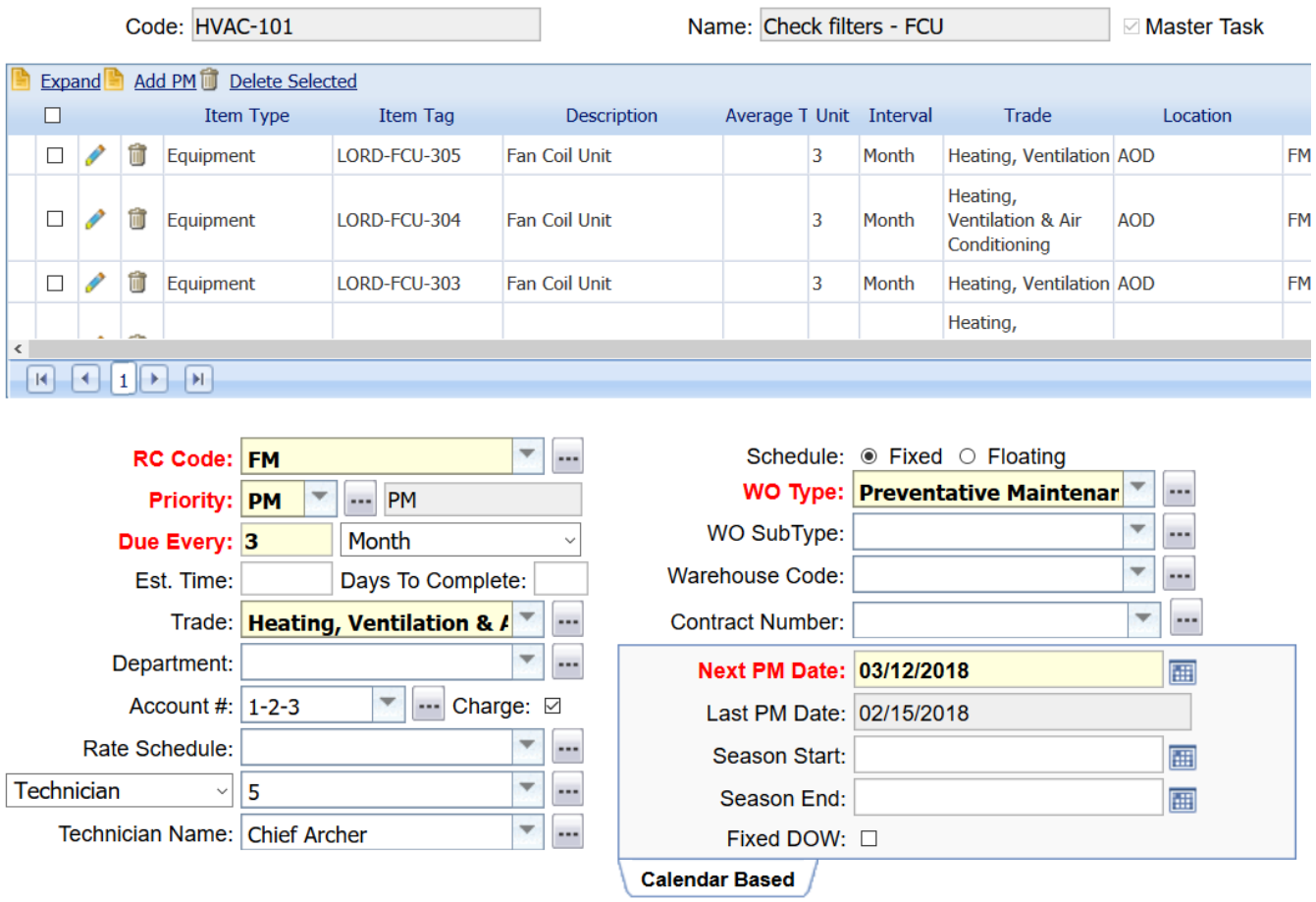
PM scheduling many items *on* the Task



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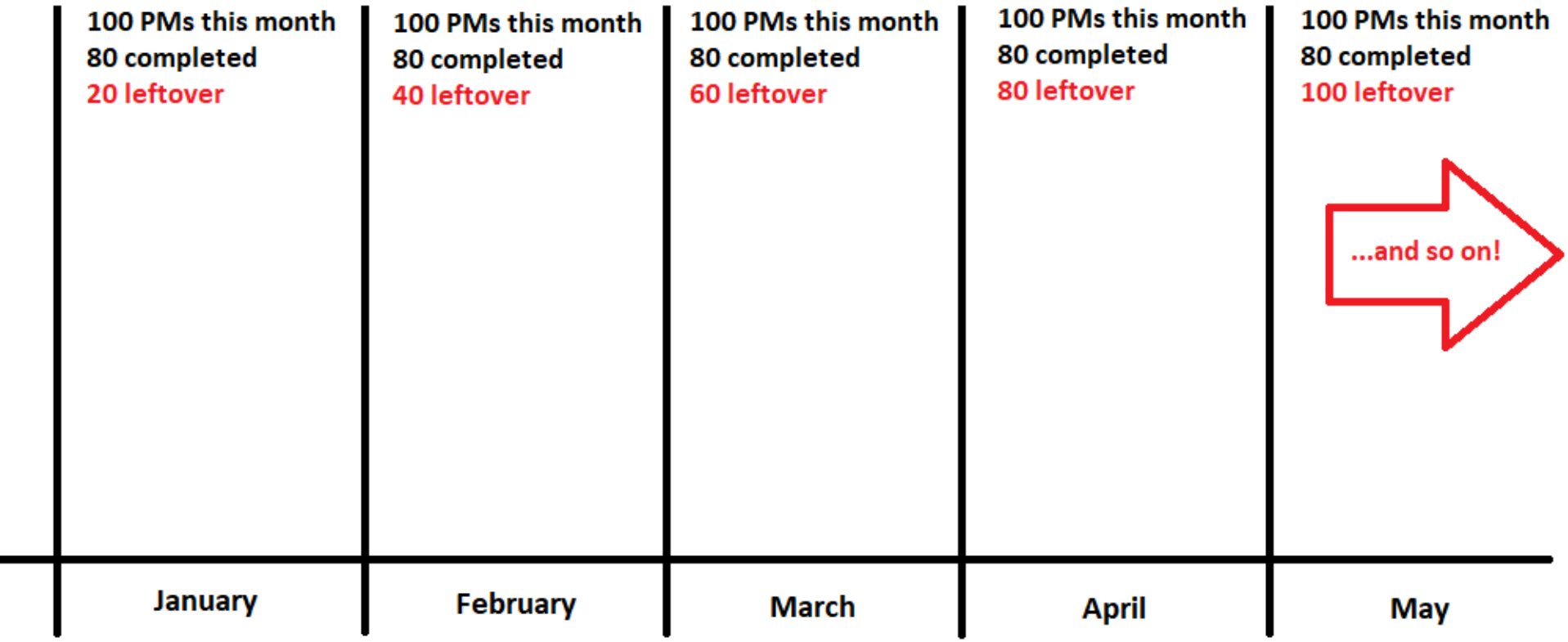
Over PMing



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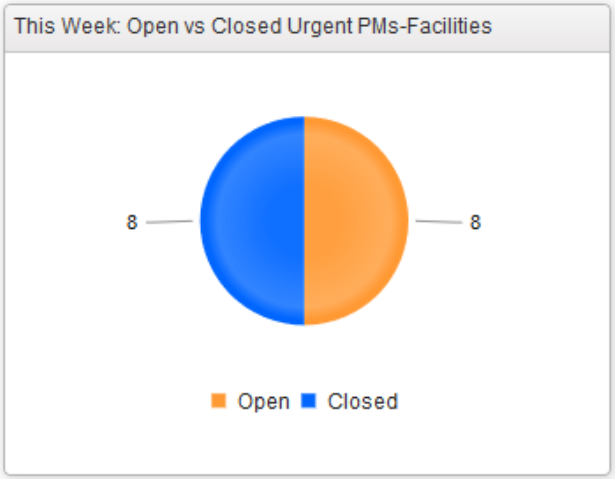
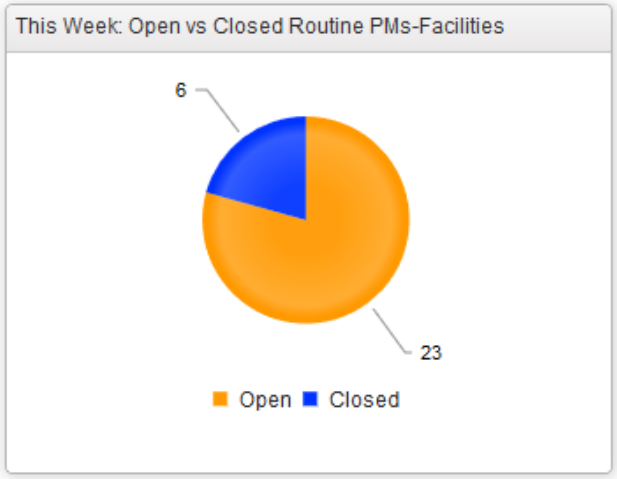
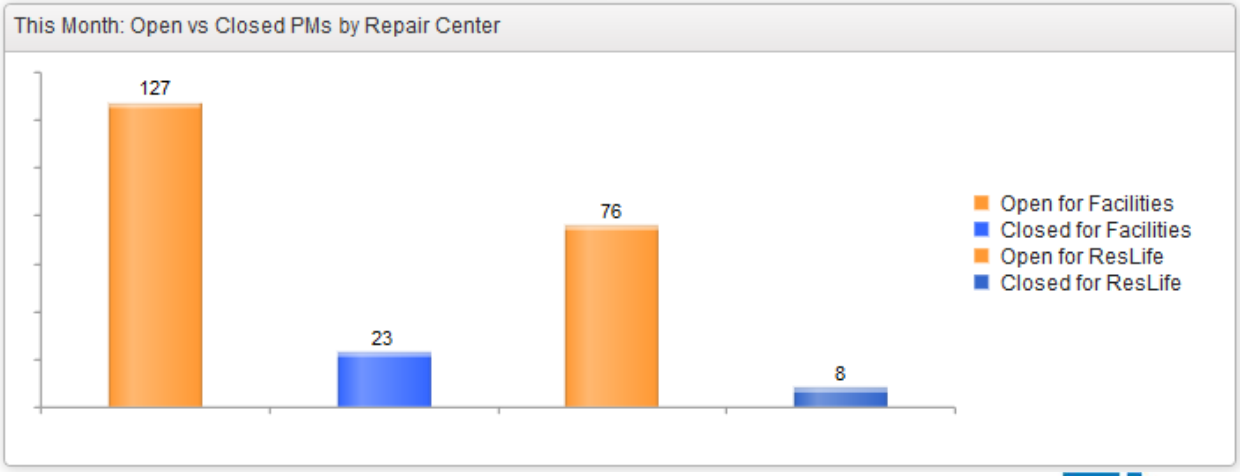
PM Compliance







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An Ounce of Prevention is Worth a Pound of Cure

Questions?

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