Critical manufacturing
an ASM PT company

Line Verification

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Line Verification

The Line Verification feature addresses the need for systematic verification activities while a **Material** is being processed. These verifications are particularly relevant in high-sensitivity production environments, where any changes in conditions, such as operator shifts, can impact product quality.

Info

- Maintenance Management is a separately licensed module required to access this feature.
- This feature is part one of a two-part process that pairs seamlessly with the Setup and Line Clearance feature. Check out the Setup and Line Clearance tutorial.

Overview

In this tutorial, we will explore expand the following sections:

- Feature Overview – explaining how Line Verification works
- Scenario – presenting a simplified example to understand the logic
- Configuration – showing a step-by-step guide to trigger verifications on in-process **Materials**, after shift breaks and shift changes
- Execution – triggering in-process **Material** verification using the feature
- Final Notes – pointing out some additional insights and considerations

Feature Overview

This feature is event-based and is triggered after a **Material** is tracked, ensuring that critical verification occurs while the **Material** is in-process.

The feature is implemented within the Maintenance Management module and is driven by a **Maintenance Plan** assigned dynamically through a context resolution of the Smart Table MaterialInProcessVerificationContext, creating a **Maintenance Plan** Instance when a **Material** is tracked in. This plan outlines the specific verification activities required for each **Material** during processing. In this tutorial, we will explore the time based activities, triggered on shift change events.

Once a **Material** is tracked in, a **Maintenance Plan** Instance is created and remains active throughout the time the **Material** is in-process, until it is tracked out. During this window, there is the need to execute verification activities, such as inspecting equipment, recalibrating scales, and checking environmental conditions (for example, temperature or humidity).

Scenario

To assess how this industry and production requirement is addressed by Critical Manufacturing MES, let's consider a simplified model:

- **Shift Definition**: 6 shifts covering 24 hours.
- **Facility**: General Facility

- **Area**: Area 1
- **Flow** and **Step**: General Flow with Step 1
- **Products**: Product A
- **Resources**: Resource 1
- **Service**: Service A, required by Step 1 and Provided by Resource 1
- Role

Suppose that the process at Step 1 requires the operator with the Process Verification Role to monitor the temperature and humidity of the environment whenever a **Material** is in-process, at two specific moments: when the next shift employees return from their mid-shift break, and after a shift change. There is a scheduled and automatically triggered verification requested for the material that was left in-process.

Additionally, during shift changes, the new operators are required to:

- Confirm that all necessary durables are in the correct position
- Acknowledge the materials that are currently in line for processing at Step 1.

Configuration

Basic entities like **Facility**, **Area**, **Services**, **Products**, **Parameters**, **Resources** and **Roles** won't be detailed.

Useful Documentation

There are some entities whose configurations require closer attention:

- **Calendar** and **Shift Definition**
- **Step**
- **Data Collection** and **Checklist**
- **Maintenance Plan**

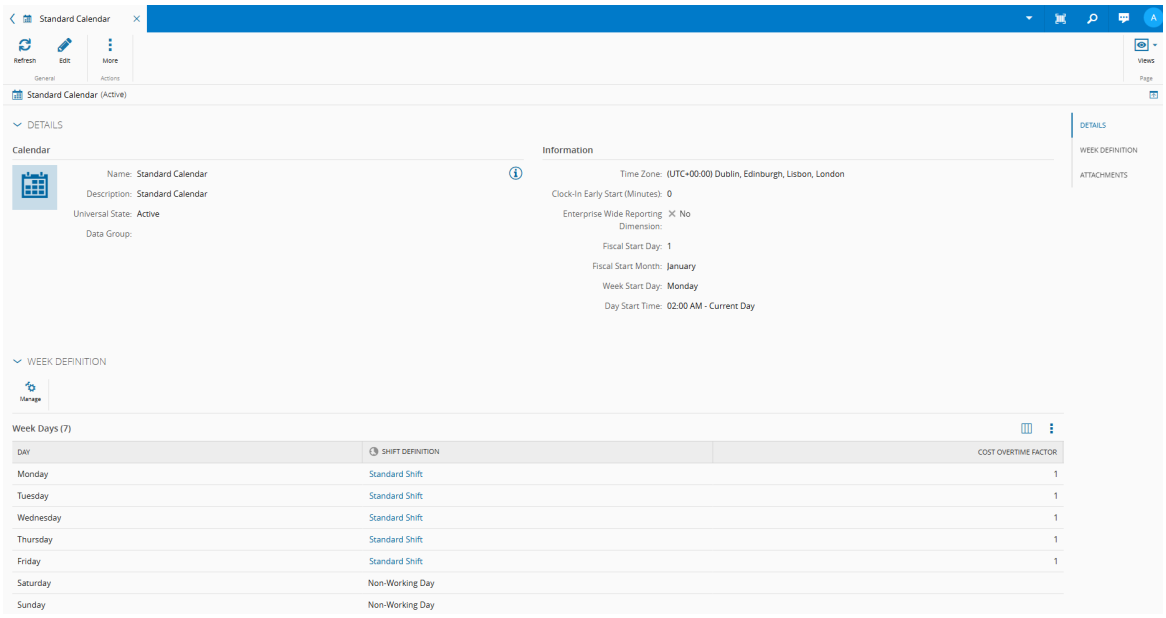
Calendar and Shift Definition

This scenario assumes the existence of a **Calendar** with a **Shift Definition** that includes six shifts, covering the full 24-hour day.

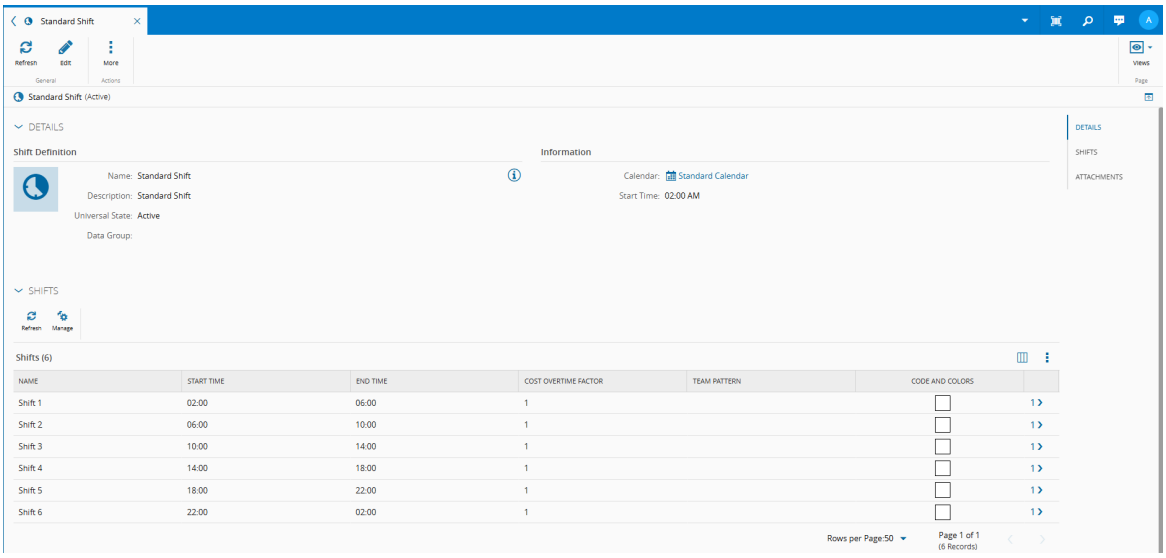
Keep in mind the correct sequence when setting this up:

- First, create the Calendar.
- Then, define the Shift Definition.
- Finally, associate the Shift Definition with the Calendar.

The following images display the general configuration settings of the **Calendar** and **Shift Definition**:



Shift Definition



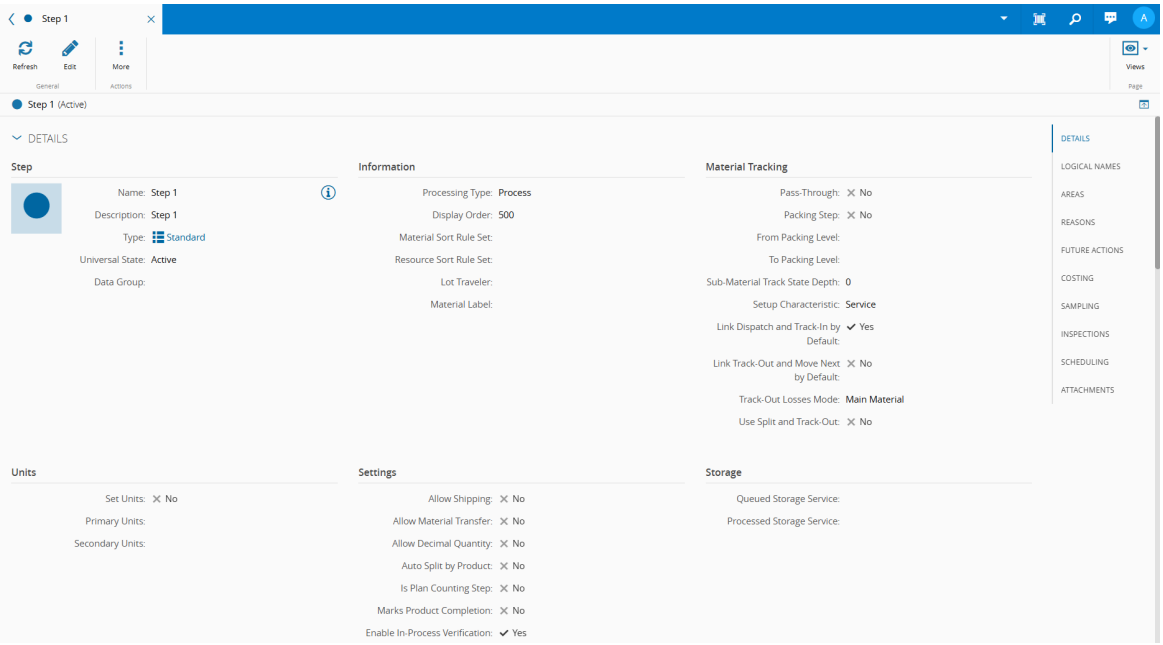
Useful Documentation

- Create Calendar
- How to: Create a Calendar
- Create Shift Definition
- How to: Create a Shift Definition

Step

For a **Step** to support in-process verification, the property `Enable In-Process Verification` must be set to true under the Settings section in the details of the **Step**.

The following images display the general configuration of the **Step**.



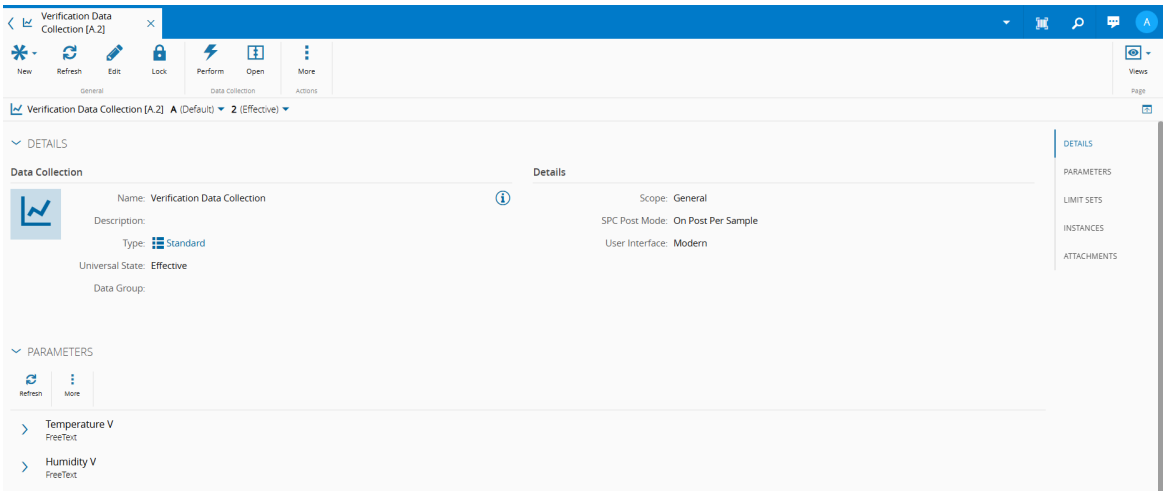
Useful Documentation

- Create Step
- How to: Create a Step

Data Collection and Checklist

The Data Collection consists of gathering a sample and recording two key **Parameters**: Temperature and Humidity.

The following image displays the general configuration of the **Data Collection**.

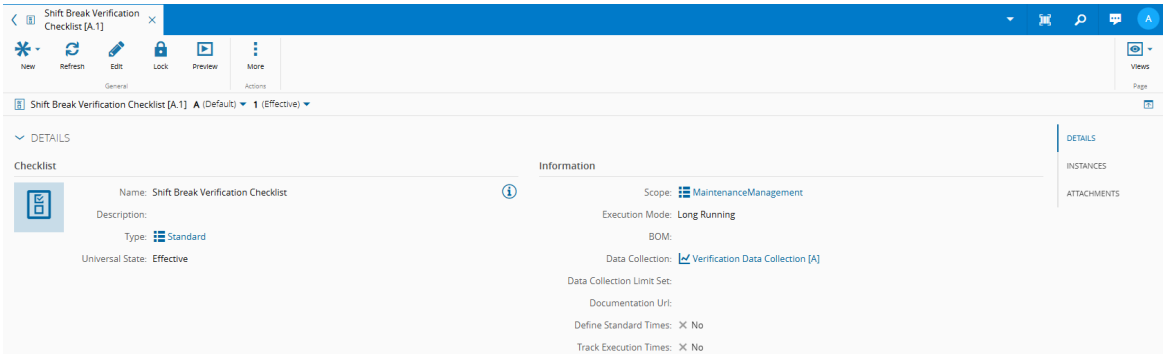


The **Checklist** is scoped under Maintenance Management and incorporates the **Data Collection**. Since the requirements differ for each scenario, there are two distinct **Checklists**.

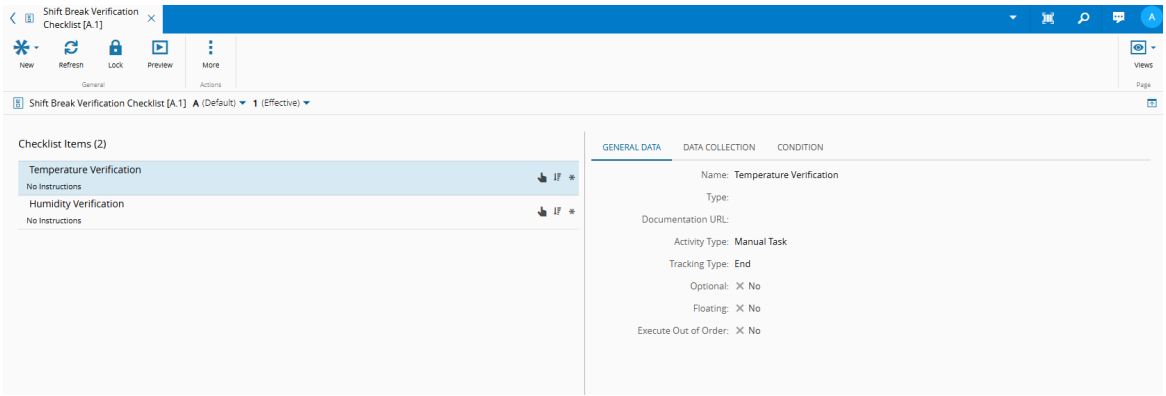
The Shift Break **Checklist** includes two items, each corresponding to the collection of one **Parameter**: temperature and humidity.

The following images display the configuration of the Shift Break **Checklist**.

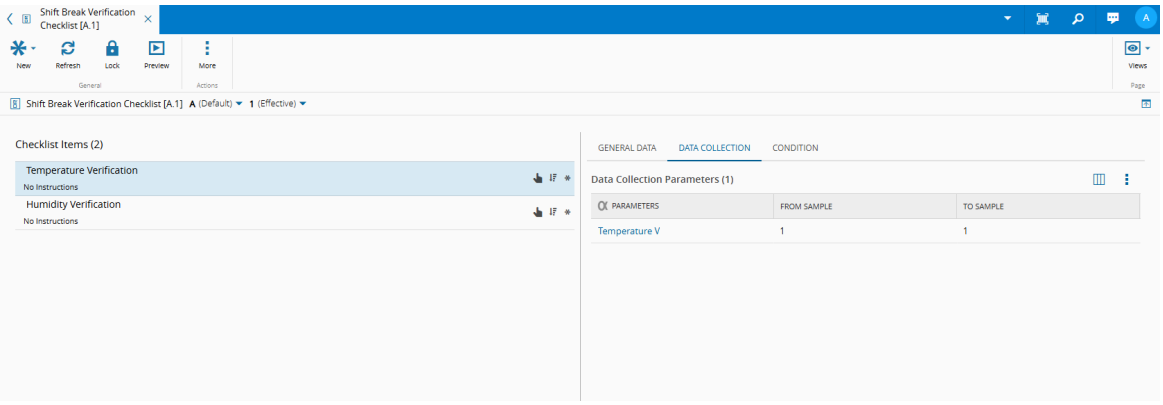
Shift Break



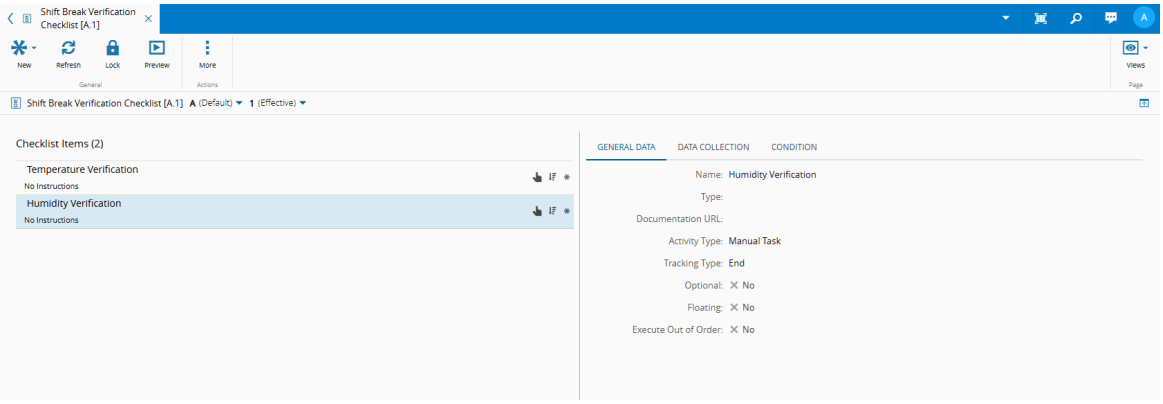
Item 1 - General Data



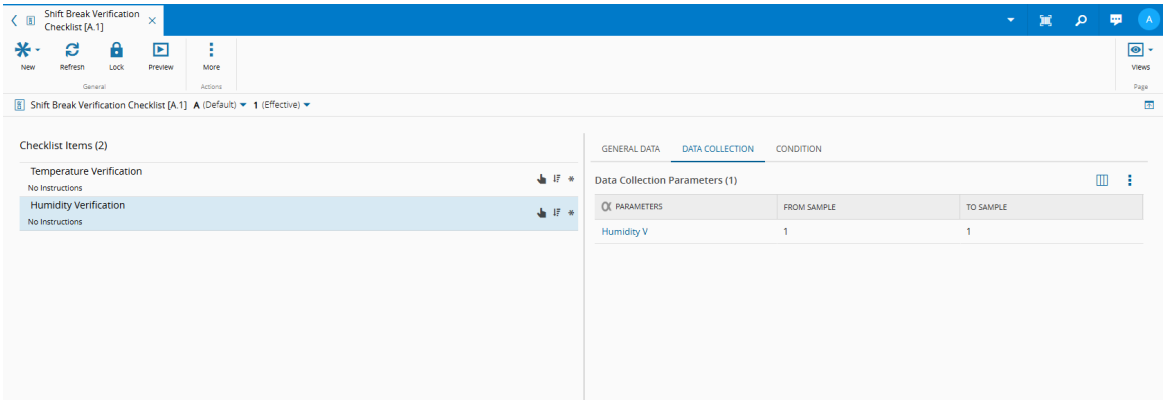
Item 1 - Data Collection



Item 2 - General Data



Item 2 - Data Collection

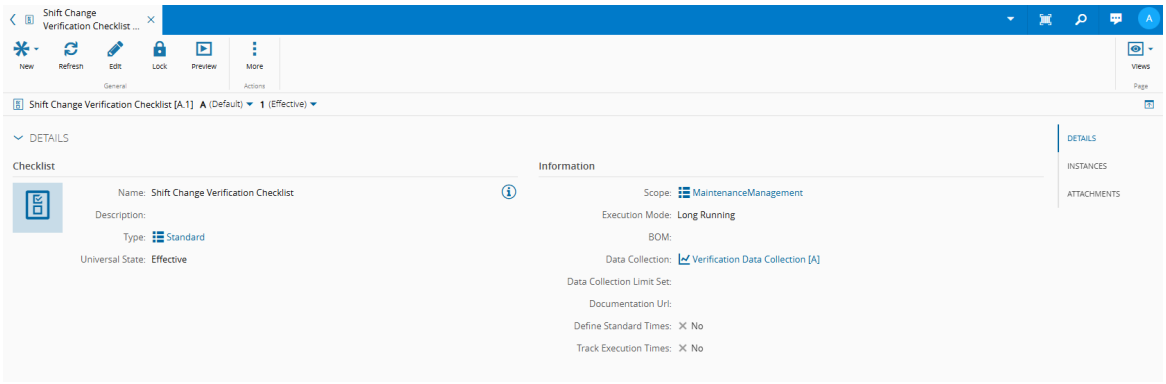


The Shift Change **Checklist** contains four items:

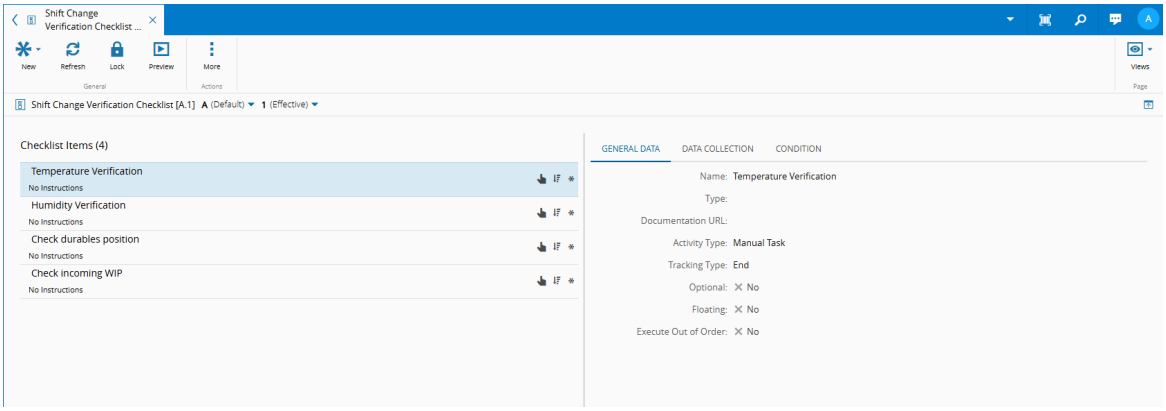
- The first two are the same as in the shift break case, capturing Temperature and Humidity data.
- The remaining two require the operator to verify:
  - That Durables are in the correct position.
  - The status and acknowledgment of Work In Progress materials queued at the step.

The following images display the configuration of the Shift Change **Checklist**.

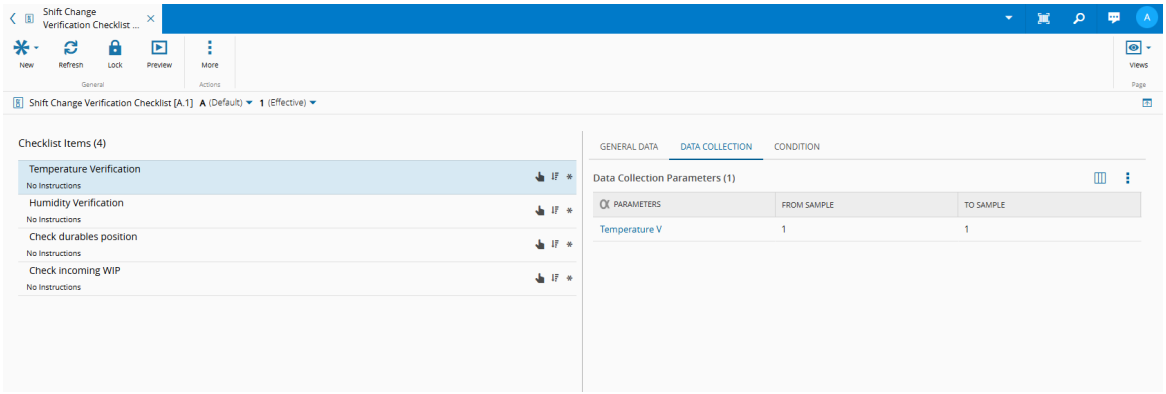
Shift Change



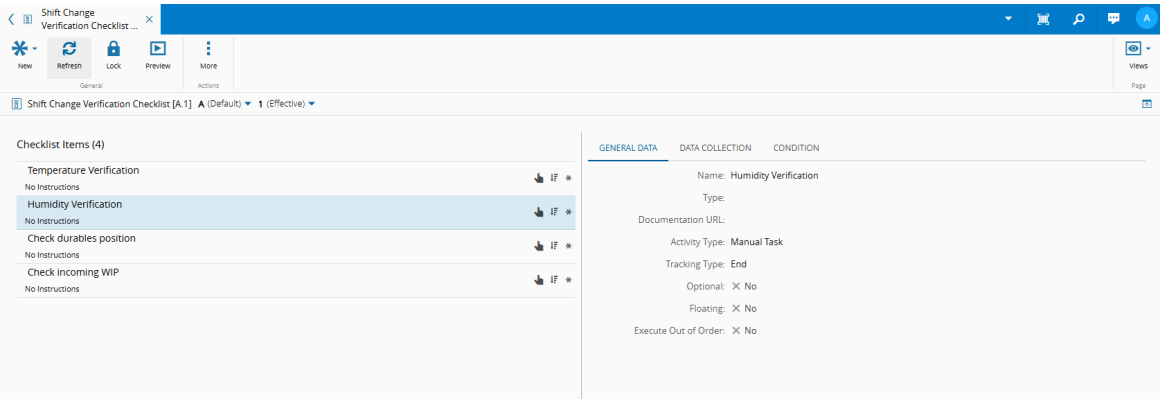
Item 1 - General Data



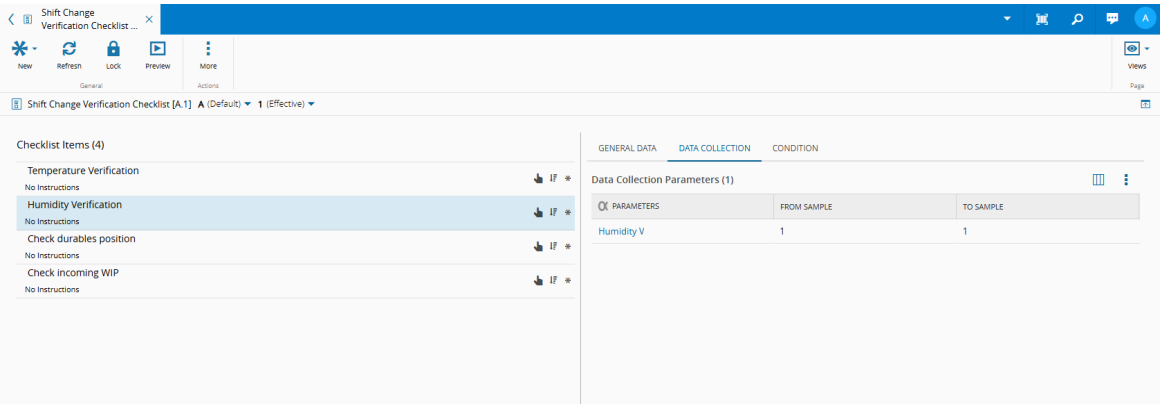
Item 1 - Data Collection



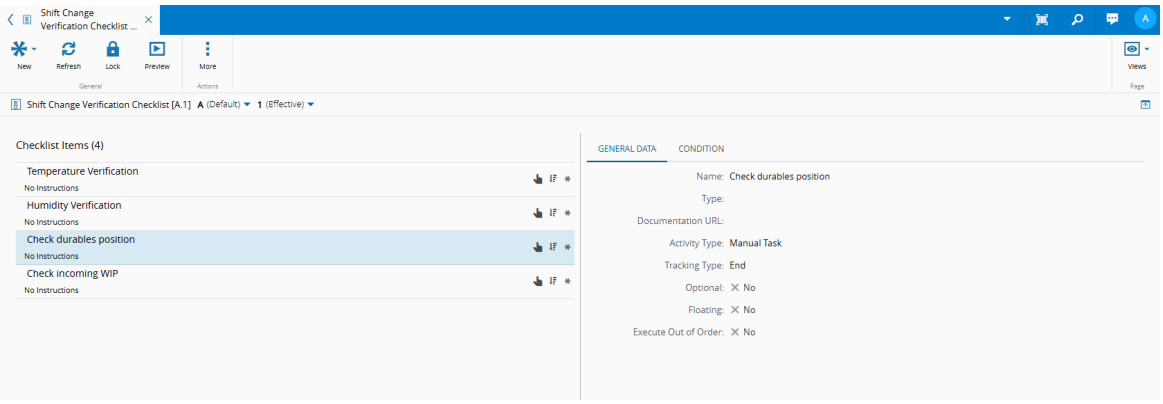
Item 2 - General Data



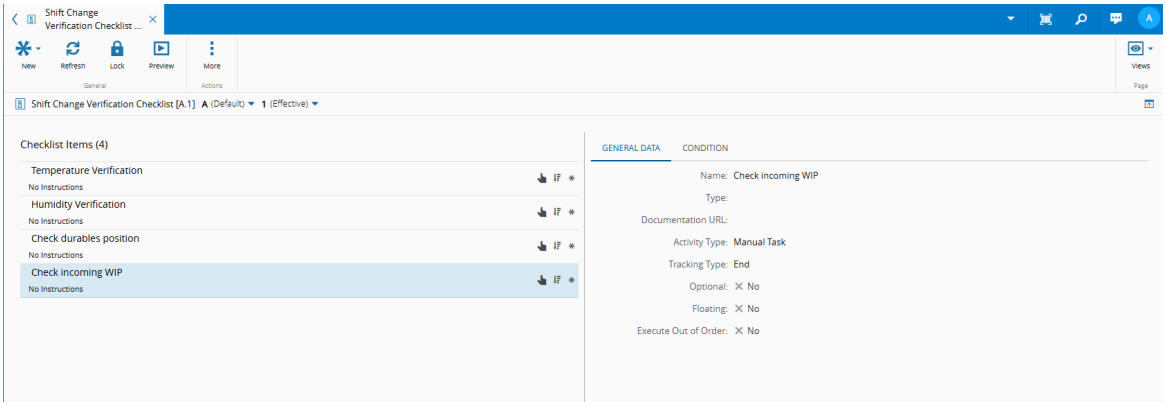
Item 2 - Data Collection



Item 3 - General Data



Item 4 - General Data



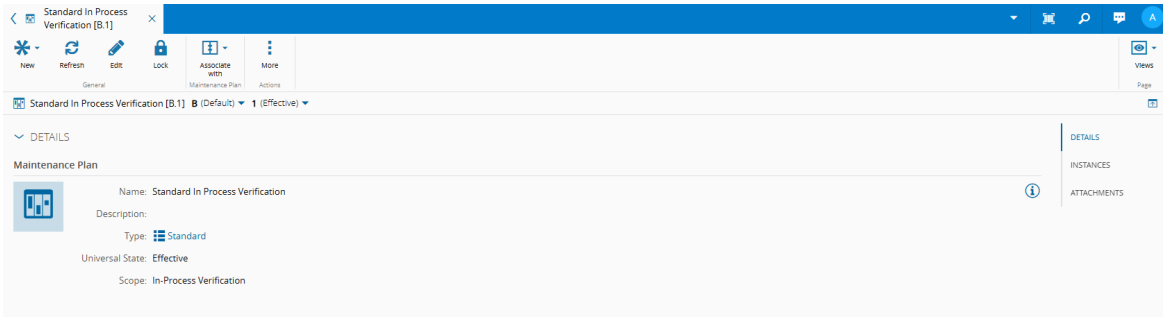
Useful Documentation

- Create Data Collection
- How to: Create a Data Collection
- Create Checklist
- How to: Create a Checklist

Maintenance Plan

For this scenario, we will define a single **Maintenance Plan** of scope In-Process Verification. The associated maintenance activities must use a time based schedule type, allowing us to leverage the "On Shift Change" time due scale to implement the intended logic.

The following image displays the configuration of the **Maintenance Plan**.



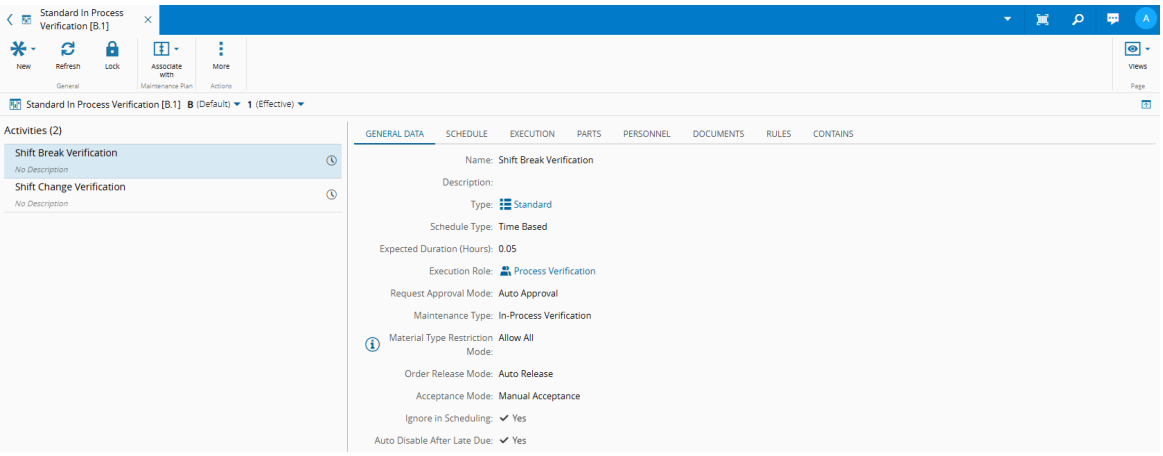
Maintenance Activities Overview:

Maintenance Activity Order	Trigger	Duration	Due Window	Tolerance	Activity

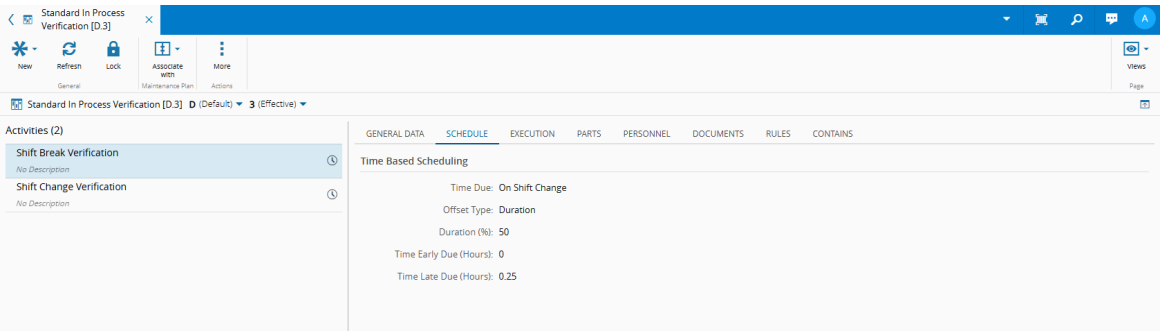
Maintenance Activity Order	Trigger	Duration	Due Window	Tolerance	Activity
Shift Break Verification	Halfway through the shift (offset of 50%)	3 minutes (0.05 hours)	Must be completed 15 minutes (0.25 hours) after the mid-shift break	Cannot be performed before the halfway point of the shift, but can be completed anytime within the 15-minute window	Perform Shift Break Checklist and Data Collection
Shift Change Verification	When the shift changes	6 minutes (0.1 hours)	Must be completed 15 minutes (0.25 hours) after the shift change	Early or late completion allowed within a 15-minute window	Perform Shift Change Checklist and Data Collection

The following image displays the configuration of the Shift Break Verification maintenance activity.

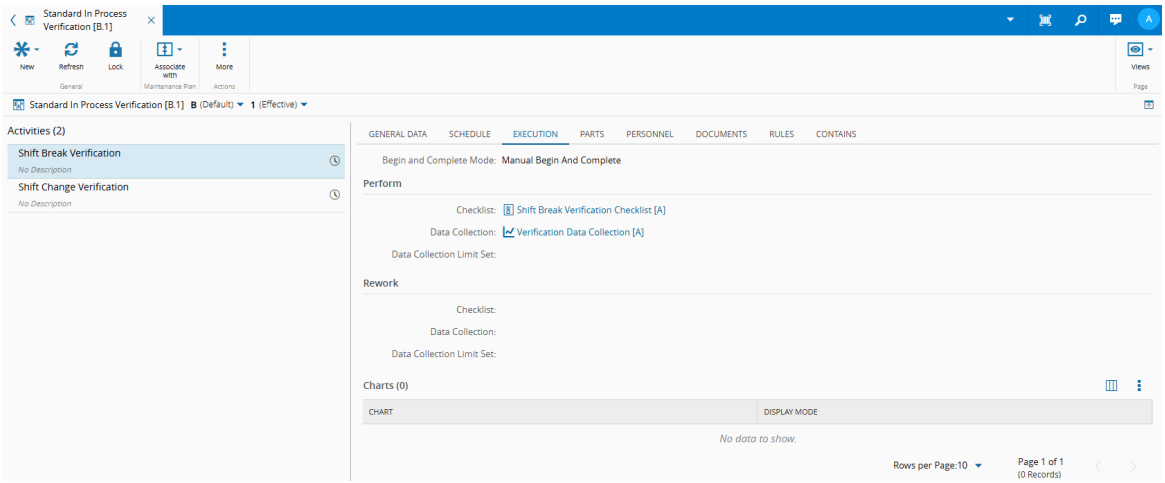
General



Schedule

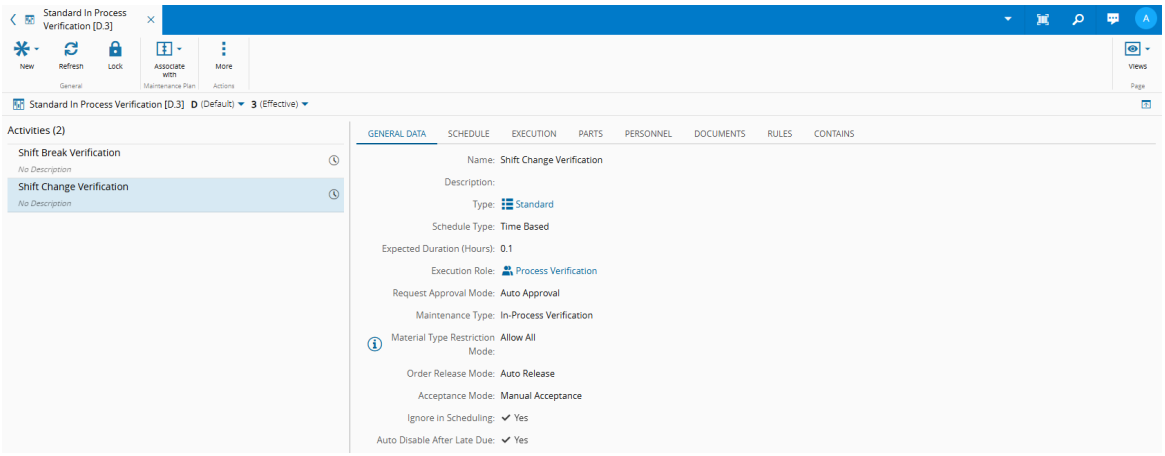


Execution

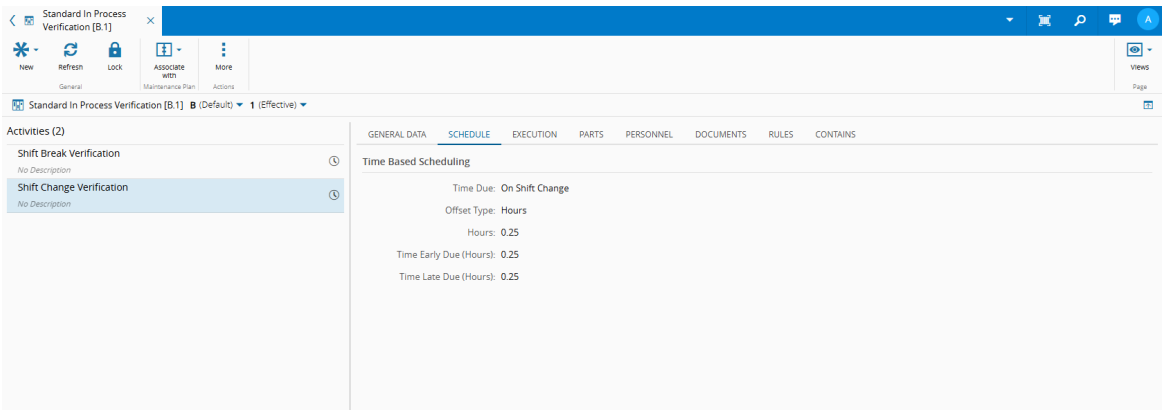


The following image displays the configuration of the Shift Change Verification maintenance activity.

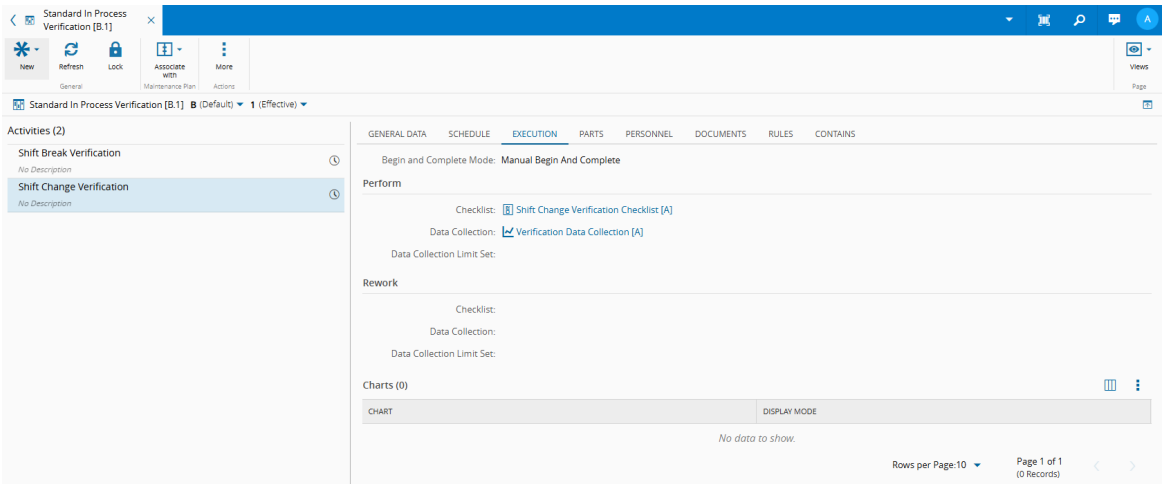
General



Schedule



Execution



To connect all elements of the configuration, the system uses the Smart Table MaterialInProcessVerificationContext. In this table, it is defined:

- The **Step** (which must have In-Process Verification enabled)
- Optional context variables to refine applicability
- The corresponding **Maintenance Plan** to be triggered when the **Material** is tracked-in at that **Step**

The following table displays the Smart Table configuration.

Step	Maintenance Plan	Owner Role
Step 1	Standard In Process Verification	Process Verification

Useful Documentation

- How to: Assign Roles to a User
- How to: Add Value to Smart Table for assigning a **Maintenance Plan** to a **Step** on the MaterialInProcessVerificationContext Smart Table
- Create Maintenance Plan

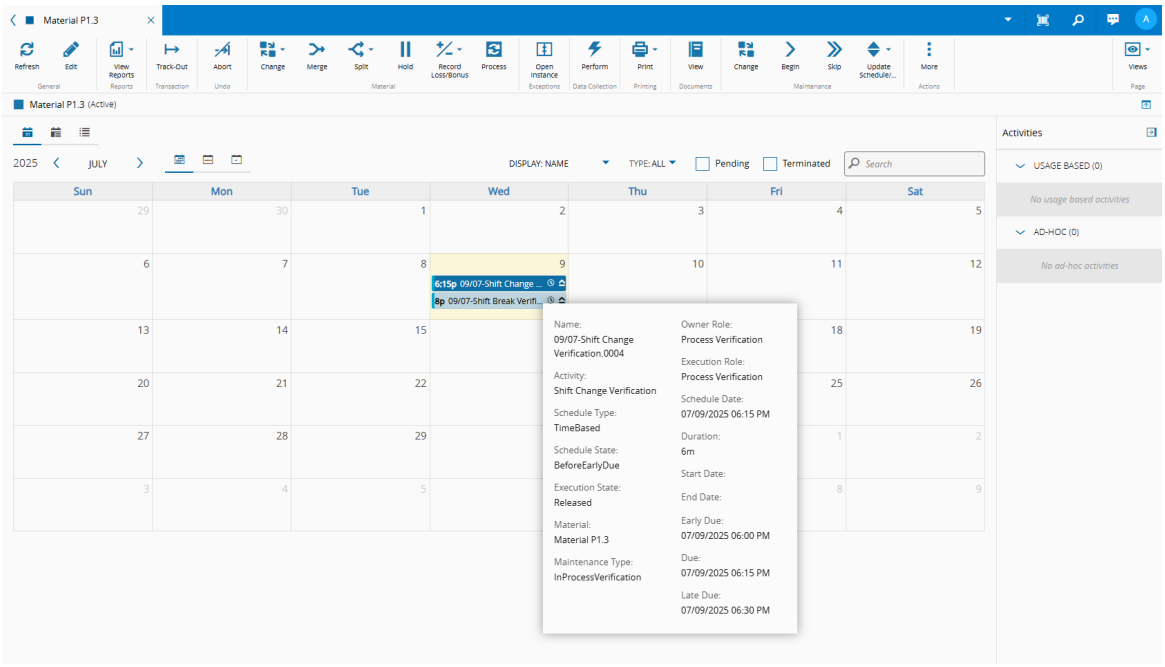
This is the Master Data file used to create this model.

Execution

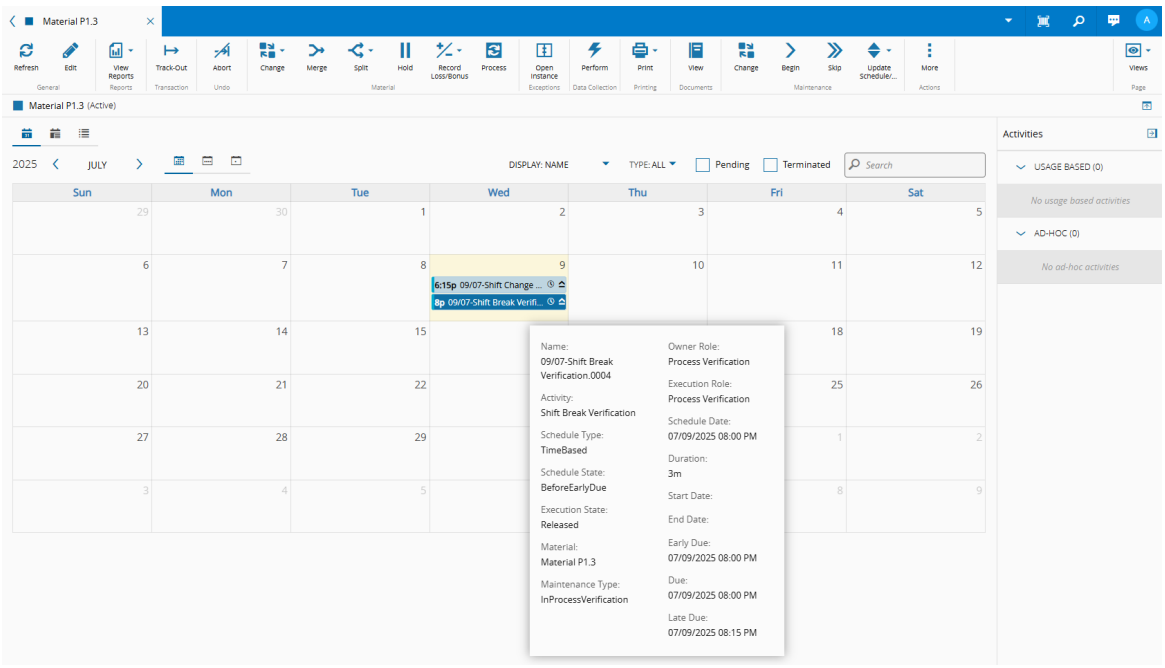
After all configurations are completed, the operation that sets everything in motion is the Track-In of a **Material** at a **Step** where in-process verification is enabled.

Once the **Material** is tracked in, navigating to the Material Maintenance View will display its Maintenance Plan Instances, as illustrated in the image below.

Shift Change


Material P1.3
Refresh
Edit
View Reports
Track-Out
Abort
Change
Merge
Split
Hold
Record Loss/Bonus
Process
Open instance
Perform
Print
View
Change
Begin
Skip
Update Schedule/...
More
Views
Material P1.3 (Active)
2025
JULY
DISPLAY: NAME
TYPE: ALL
Pending
Terminated
Search
Sun
Mon
Tue
Wed
Thu
Fri
Sat
6:15p 09/07-Shift Change ...
8p 09/07-Shift Break Verifi...
Name:
09/07-Shift Change Verification.0004
Activity:
Shift Change Verification
Schedule Type:
TimeBased
Schedule State:
BeforeEarlyDue
Execution State:
Released
Material:
Material P1.3
Maintenance Type:
InProcessVerification
Owner Role:
Process Verification
Execution Role:
Process Verification
Schedule Date:
07/09/2025 06:15 PM
Duration:
6m
Start Date:
End Date:
Early Due:
07/09/2025 06:00 PM
Due:
07/09/2025 06:15 PM
Late Due:
07/09/2025 06:30 PM
Activities
USAGE BASED (0)
No usage based activities
AD-HOC (0)
No ad-hoc activities

Shift Break


Material P1.3
Refresh
Edit
View Reports
Track-Out
Abort
Change
Merge
Split
Hold
Record Loss/Bonus
Process
Open instance
Perform
Print
View
Change
Begin
Skip
Update Schedule/...
More
Views
Material P1.3 (Active)
2025
JULY
DISPLAY: NAME
TYPE: ALL
Pending
Terminated
Search
Sun
Mon
Tue
Wed
Thu
Fri
Sat
6:15p 09/07-Shift Change ...
8p 09/07-Shift Break Verifi...
Name:
09/07-Shift Break Verification.0004
Activity:
Shift Break Verification
Schedule Type:
TimeBased
Schedule State:
BeforeEarlyDue
Execution State:
Released
Material:
Material P1.3
Maintenance Type:
InProcessVerification
Owner Role:
Process Verification
Execution Role:
Process Verification
Schedule Date:
07/09/2025 08:00 PM
Duration:
3m
Start Date:
End Date:
Early Due:
07/09/2025 08:00 PM
Due:
07/09/2025 08:00 PM
Late Due:
07/09/2025 08:15 PM
Activities
USAGE BASED (0)
No usage based activities
AD-HOC (0)
No ad-hoc activities

In the example, the **Material** was tracked in at 04:55 PM.

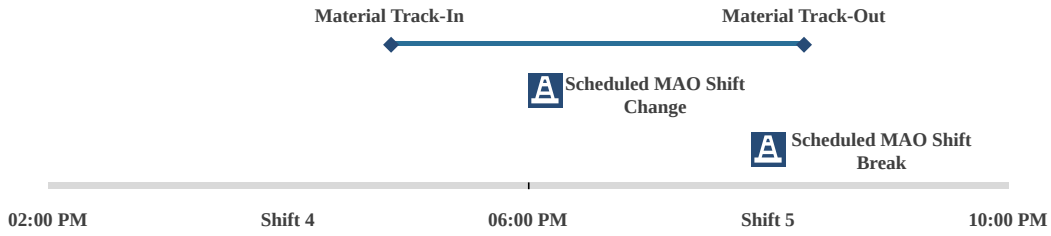
The next shift begins at 06:00 PM, so two Maintenance Activity Orders are created:

- One with a due date at 06:15 PM PM, for the Shift Change Verification
- Another with a due date at 08:00 PM, for the Shift Break Verification

If the due time arrives and the **Material** is still in process, the verification must be performed.

If a user attempts to Track-Out the **Material** without completing the required verification, the system will notify them about the pending In-Process Verification Maintenance Plan Instance.

Refer to the diagram below for a clear, visual timeline of these events.



The operations required to carry out these verifications follow the standard Maintenance Activity Order flow: Begin, Perform, and Complete.

The video below illustrates the execution of this scenario.

Useful Documentation

- For a more in-depth understanding of this module, please refer to the [[tutorials-maintenancemanagement]] tutorial.

Note

- The Material Traceability View includes a dedicated section to accommodate In-Process Verifications.
- The **Material** `In-Process Verification Maintenance Plan Instance` the reference to the associated instance.

Final Considerations

Keep in mind the following behaviors and consequences related to the In-Process Verification Maintenance Plan Instance:

- Terminate / Abort **Material** - Terminates the instance and clears the associated property
- Split / Expand **Material** - Resets the instance in the resulting child materials
- Merge **Material** - Merge is blocked if any of the Materials involved have an active instance
- Track-In **Material** - Creates a new Maintenance Plan Instance based on the resolved **Maintenance Plan** from the In-Process Verification context of the **Material**; sets the In Process Verification Maintenance Plan Instance accordingly
- Track-Out **Material** - Validates the Maintenance Activity Orders associated with the instance; if validation passes, terminates the instance and clears the property

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