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1.   As Is Study – Requirement gathering

Warehouse management: -

It is an additional component in SAP which can be used to locate material exactly up to its final bin location in a big warehouse complex.

Before configuring the warehouse component it is necessary to understand

- Existing enterprise structure
- Which materials are handled in warehouse?
- How the materials are stored?
- What are the different types of storage?
- How many storage sections are in use?
- Existing bin numbering system
- Existing stock Placement and removal methods
- Need to restrict any bins for placement or withdrawal
- Communication between inventory and WM persons

Let us recap the warehouse management concepts before we go ahead.

Movement in the warehouse is triggered by the inventory management movement.

Stock is placed in the intermediate storage area with transfer order (TO).

After physically moving the material into the appropriate bin, TO has to be confirmed which moves material from intermediate location to the final bin.

2.   Enterprise structure

Refer below to the Enterprise Structure diagram for an overview of the entire organisation in SAP. For the purposes of understanding we are only concerned with one plant and storage locations where warehouse management is required.

Only the Finished Goods warehouse at Mumbai (IND6) will be managed by the SAP Warehouse Management module. Due to planning and stock segregation requirements this warehouse will be divided into several logical storage locations.

The storage locations (SF01 and SF03) will continue to be managed simply by SAP Inventory Management.

Enterprise Structure in SAP

Plant - IND6 - Mumbai

Storage Locations → RM01   RM02   FG01   SF01   SF02

Warehouse IN5

Storage Type →

High Rack-001   Bulk - 002   Open - OPN
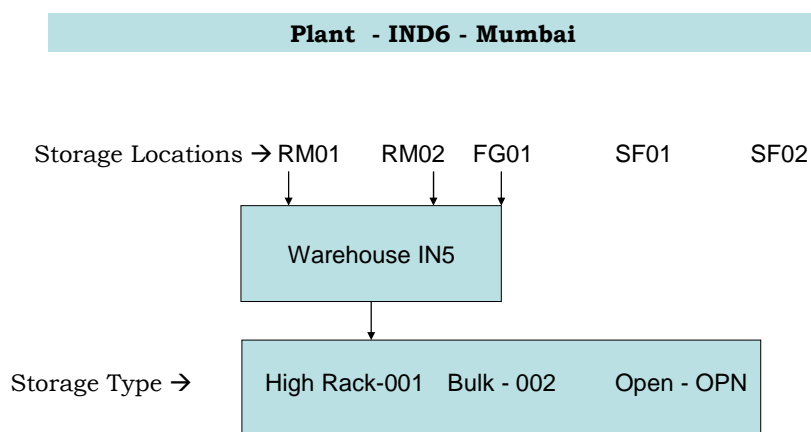
The major elements in warehouse are shown in the following diagram.

```
                    Warehouse number
         ┌─────┬─────┬─────┬─────┬─────┐
       ┌───┐ ┌───┐ ┌──────────┐ ┌───┐ ┌───┐
       │   │ │   │ │Storage Type│ │   │ │   │
       └───┘ └───┘ └──────────┘ └───┘ └───┘
                ┌──────┼──────┐
              ┌───┐ ┌──────────────┐ ┌───┐
              │   │ │Storage Section│ │   │
              └───┘ └──────────────┘ └───┘
                   ┌──────┼──────┐
                 ┌───┐ ┌──────────┐ ┌───┐
                 │   │ │Storage Bin│ │   │
                 └───┘ └──────────┘ └───┘
                      ┌─────┴─────┐
                   ┌──────┐ ┌──────┐
                   │Quant │ │      │
                   └──────┘ └──────┘
```
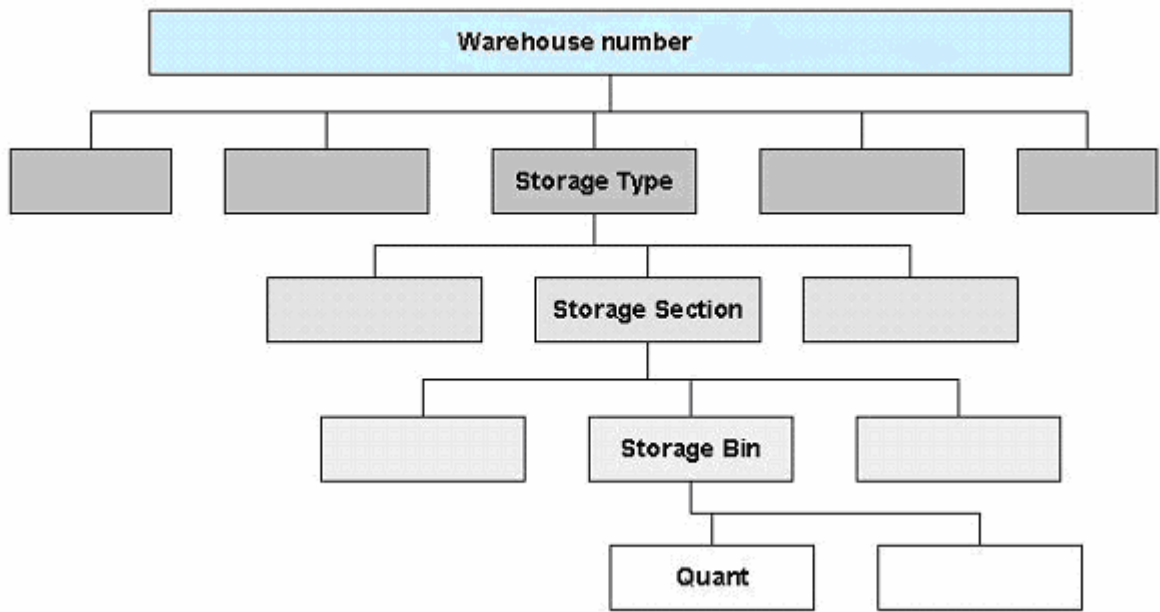
2.1. <u>Storage Types</u>

Presently Liquid materials are stored in a high rack and others are stored in a regular rack. Customer returned materials are stored in open area storage. After proper analyse of customer returns, it will be placed in a respective bin.

The above storage types will be represented as below in SAP.

There are three static storage types have been identified to represent the different organisational breakdowns that exist in the warehouse.

001 – High rack storage

002 – Regular Racks (levels 3 to 6)

003 – Stands for FG

OPN – Returns from customer

In addition several interim storage types have been defined. An interim bin is only a logical representation, or a temporary holding area, for stock that is mapped to a physical process.

<u>Example</u>: - The process of receipt from a purchase order results in stock is being placed in a particular interim storage type, and the process of issuing stock for a customer delivery results in stock being placed in another interim storage type.

2.2. <u>Storage Sections</u>

Storage section is further physical or logical division in the storage type of warehouse. Presently in the storage type, chemical items, Bleaching items, Paints, oils and General items are stored in different sections in the storage type. Each section is identified by the sign board.

Presently 5 storage sections have been defined to represent above physical area within a storage type.

CHL – Chemical
BLH – Bleaching
PTS – Paints
OLS – Oils
GLN – General (applies to RTN storage type)

These map closely to the current physical breakdown of the warehouse, so that there should be no need for a physical reorganisation.

2.3. Storage Bins

There are basically three rooms in the present warehouse. Different items are stored in certain set of bins. However owing to the difficulty in maintaining the number manually, racks are numbered in sequence from 001 to 200.

Items are stored in different bins. Mixing of two items in a bin is not allowed. Rack numbering is presently maintained in a sequence from 001 to 200.

Items are stored in a following manner: -

General item sand chemical are stored in certain sequence of bin numbers

Pain and bleaching items are Items are stored in certain sequence of bin numbers

Oils are stored in different bins.

Bin numbering in WM is a master data. But bin numbering structure has to be defined in the customizing. The new numbering structure will be as below.

The SAP numbering scheme follows:

W-XX-YY-ZZ
Where   W = Room (there are 3 rooms, so we have 1, 2 and 3)
         XX = Row/Line (6 rows per room)
         YY = Column (maximum of 28 columns per row of racks)
         ZZ = Level (5 levels in each row of racks). Pick face bins are on level 1.

Examples:

Bin 1-01-01-01 is a pick face bin, currently containing General items and chemicals

Bin 3-02-11-04 is a high rack bin, containing a full pallet of paints and bleaching items

Bin 3-06-05-02 is a high rack bin, containing oils

3.   Putaway Strategies

The below table shows the sequence of storage types invoked on the putaway of stock. Regular stock received into the warehouse will be putaway to storage type 001, within it's relevant storage section. If every bin within storage type 001 is used then it will putaway stock to the dock block storage area.

Mat master Indicator	Stock status	Storage Location	Storage sequence	Type
001 – regular stock			001	
001 – regular stock		RM01	001	
003 – bulk stock		RM02	003	

Within each of these storage types the specific bin into which the goods are placed depends on the strategy configured. The below table summarizes the strategies will be configured.

Storage Type	Putaway Strategy	Storage Section check	Capacity check
001 - Pick Face	Next empty bin	Active	Active
002 - Rack Storage	Next empty bin	Active	Active
003 - Block Stack (Dock)	Open storage	Inactive	Inactive
OPN – Returns	Next empty bin	Inactive	Active

There is no mixed storage in any of the bins. This means each batch of each material must be placed in a separate bin.

The system has been configured so that every putaway requires a manual confirmation. This has been done to ensure that the physical process matches the SAP "logical" process.

4.   Picking Strategies

The below table shows the sequence of storage types invoked on the picking of stock. As an example, you can see regular saleable stock picked for a sales order delivery will be picked from bins contained within storage type 001 (i.e. the pickface) within the material's relevant storage section. If the stock is not found within any relevant bins in storage type 001, then SAP searches for the material in storage type 002 bins. Finally it searches for material sitting in storage type 003 (the lock stock dock).

Mat master Indicator	Stock status	Storage Location	Storage sequence		Type
001 – regular stock			001	002	003
001 – regular stock		RM01	001		
001 – regular stock		RM01	002		
003 – bulk stock		RM02	003		

In the same way to putaways, within each of these storage types the specific bin into which the goods are picked depends on the strategy configured. The below table summarizes the strategies will be configured.

| Storage Type	Picking Strategy	Full stock removal
001 - Pick Face	Shelf life expiration date	Inactive
002 - Rack Storage	Shelf life expiration date	Active
003 - Block Stack (Dock)	Shelf life expiration date	Inactive
OPN - Returns	Shelf life expiration date	Inactive

Storage type 002 requires complete removal of the quant contained in the pick bin. That is, everything contained in the bin must be picked. Any excess stock will be automatically returned/putaway to the next empty bin within storage type 001 (within it's storage section). This way we can maintain stock (with the shortest expiration date) in the lower pick face racks.

5. Business processes

5.1. Goods receipt to Process Order (really a sloc to sloc transfer)

The business process currently proposed involves only saleable finished goods being transferred to the finished goods warehouse. That is, the entire manufacturing process, including quality inspection, will occur within the manufacturing area. As such the goods will be received into the finished goods warehouse via a storage location to storage location transfer.

Manufacture to stock (receipt into Sloc 0002 QI)
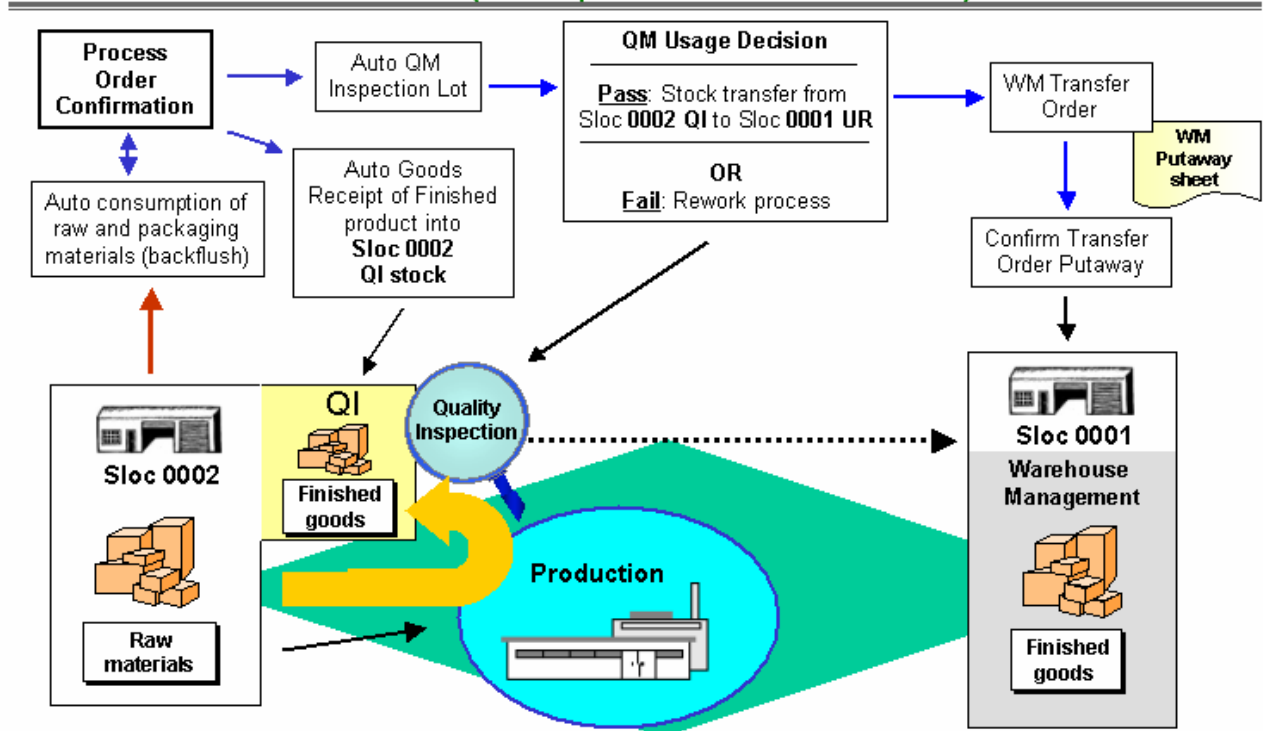
As shown in the above diagram, the QM Usage Decision will post the storage location to storage location transfer (assuming a Pass result). This will automatically create a WM Transfer Order (putaway sheet), which will print on the designated printer within the warehouse.

A warehouse worker will then collect the specified goods from manufacturing and will putaway the stock in the bins specified on the Transfer Order (putaway sheet). He will sign the sheet and will then directly perform a Confirm Transfer Order transaction within SAP, or will hand the sheet to the office for timely processing by the office staff. It is important that the Confirmation is processed in a timely manner, as subsequent picks of the stock can cause problems if the transactions are processed out of order.

If the warehouse worker finds that he is unable to place the stock in the SAP nominated bin he will write the actual bin used on the sheet. Similarly if the physical quantity differs from that specified on the sheet he would record it. The error correction procedures will be covered in detail during training.

Putaway strategy

Manufactured goods that have passed QC inspection will be putaway to storage type 002 racks.

5.2. <u>Goods receipt to Purchase Order</u>

The receipt of purchased stock into storage location 0001 will automatically create a WM Transfer Order, invoking the above-mentioned putaway strategies. The below diagram illustrates the normal flow where the goods do not require QC inspection:
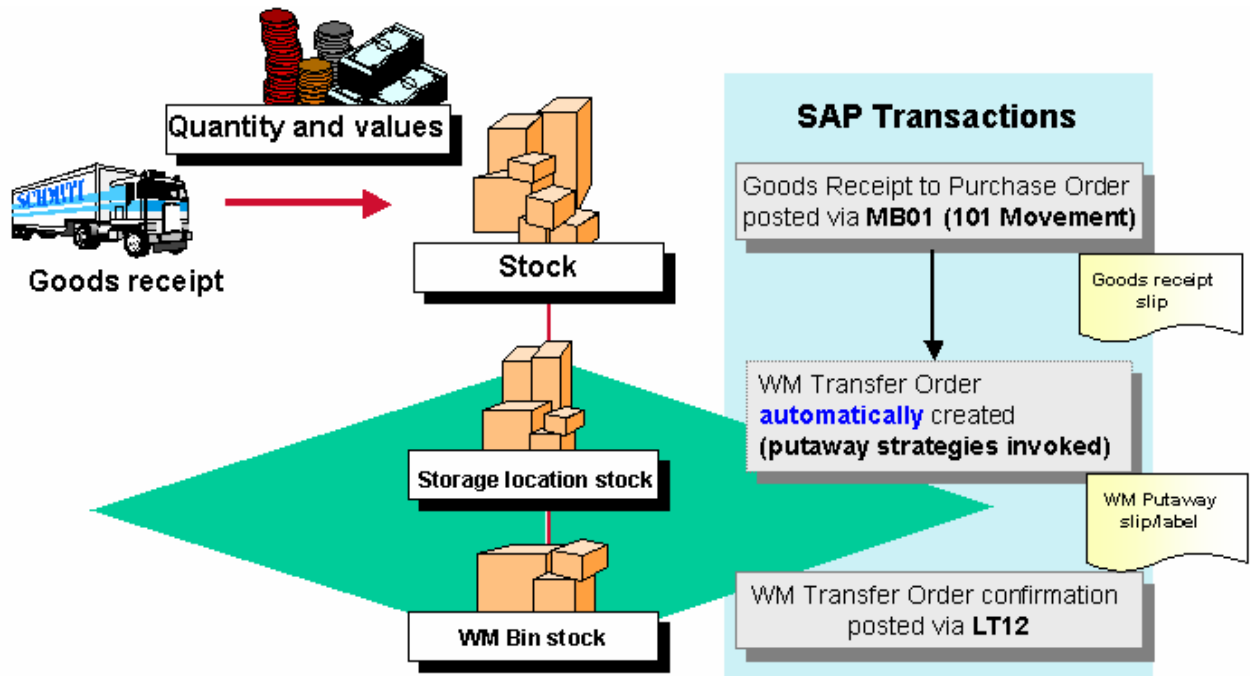
If it is decided that the stock does require QC inspection upon receipt, the material master setup will automatically cause the receipt to be posted to Quality Inspection status within SAP. Some analysis of material handling effort versus the time taken to inspect the stock is required before the best process can be determined. As this would be a new process for the Philippines this will be discussed in detail in the January workshop.

Putaway strategy

Purchased goods received into the finished goods warehouse will be putaway to storage type 002 racks.

The strategy of "Next Empty Bin" therefore applies.

Once again a manual confirmation step is also required.

5.3. Transfer posting from Stock to Stock

There will be several business processes that may result in a stock-to-stock transfer posting within SAP. The list includes:

Customer returns receipts
Deadline monitoring (expiration date recurring inspections)
Manual Warehouse activities

In each case stock may need to be transferred from Unrestricted to Quality Inspection or Blocked and perhaps back again.

In SAP warehouse management terminology the trigger for this process is called a Posting Change. This Posting Change is still executed via a Transfer Order. This will be covered in detail during training – the key point being that SAP differentiates between a regular goods movement (issues and receipts) that involves physical movement of stock to or from a bin, and a "logical" posting change that usually results in the stock remaining in the same bin.

SAP has been configured so that WM (and Inventory Management) movements:

321 (and 322) – QI to Unrestricted (and reversal)
343 (and 344) – Blocked to Unrestricted (and reversal)
349 (and 350) – Blocked to QI (and reversal)

all result in the stock staying in the same bin. In other words the normal putaway strategy is not invoked for these particular goods movements.

Posting Changes caused by Deadline Monitoring

The process of Deadline Monitoring involves periodically running a job (transaction QA07) to monitor warehouse stock approaching its shelf life expiration date. Any stock found to be expiring within the chosen range of days would automatically be subject to QC inspection. An inspection lot will be automatically created and the stock will be moved from Unrestricted to QI status (via a posting change transfer order).

For the same reasons already mentioned above the stock will physically remain in the same bin (i.e. a bin in storage type 002). Once again this may cause some manual work by the warehouse if the subsequent usage decision results in a posting change to Blocked stock, as a manual transfer order would be required to move the stock from saleable (002 storage type) to the returns (storage type RTN) part of the warehouse.

Posting Changes caused by Manual Warehouse activities

Finally there are likely to be situations where manual posting changes will need to be initiated directly by warehouse workers, on the basis of damaged stock for instance. Under these circumstances it is important that the stock is physically moved quickly to prevent picking - the SAP transaction may be posted subsequently. For this reason this particular type of posting change is initiated from Warehouse Management, rather than the usual

situation where the transaction starts at an Inventory Management level and then flows down to the Warehouse Management bin level.

If the entire bin quantity is to be changed then transaction LQ02 is probably the easiest and most convenient to use. Alternatively LU01 must be used. This then gives you the ability to post the damaged stock to another bin.

Transfer Posting – Posting Change

```
┌──────────────────┐          ┌──────────────────┐
│       LU01       │          │       LT05       │
│  Create Posting  │ ───────▶ │    Create WM     │
│  Change Notice   │          │  Transfer Order  │
└──────────────────┘          │  with ref to Posting │
                              │     Change       │ ┌──────────┐
                              └──────────────────┘ │ Putaway  │
                                      │            │ slip/label│
                              ┌──────────────────┐ └──────────┘
                              │ Confirmation auto posted │
                              └──────────────────┘
```
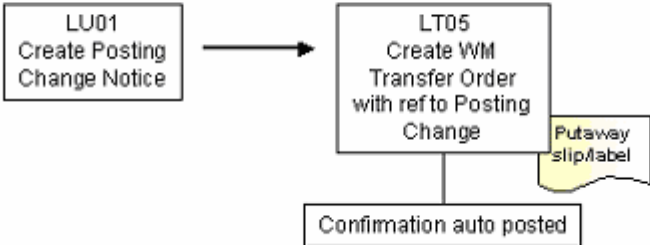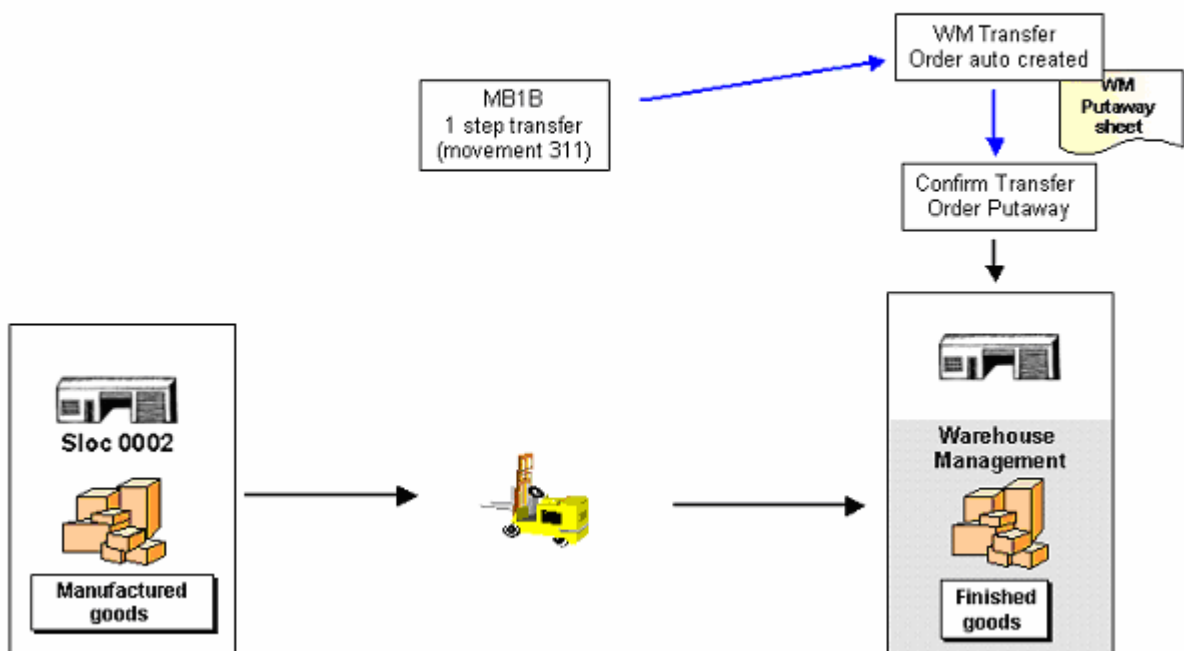
5.4. Transfer from Storage Location to Storage Location

Transferring stock from 1 storage location to another is an integral part of several of the business processes already discussed.
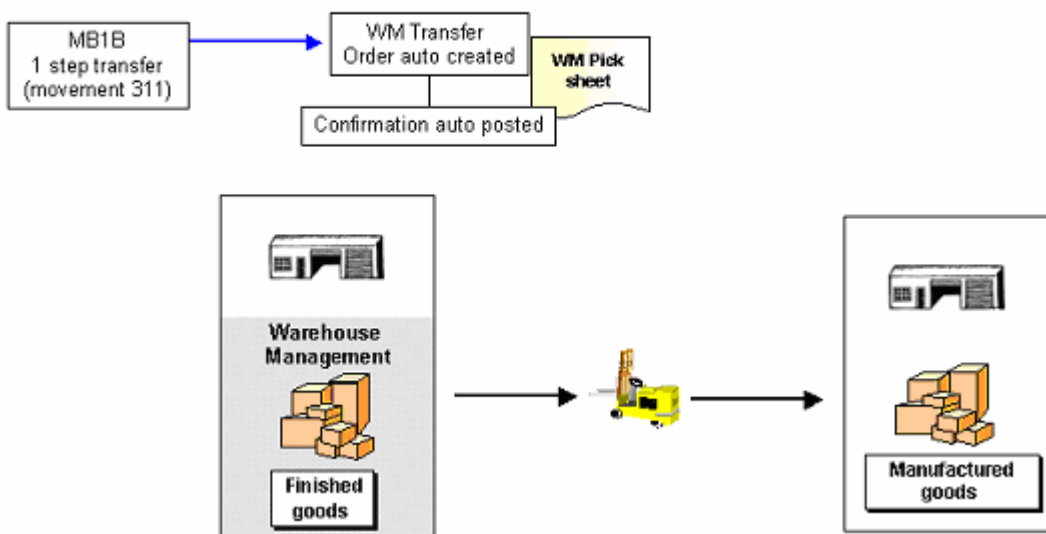
As discussed in previous sections a sloc to sloc transfer is usually initiated via a QM Usage Decision. A manual MB1B inventory transfer is also possible however, and works in exactly the same way.

From a WM perspective the process will be the same regardless of whether the transfer is physical or the transfer is only logical. In both cases the putaway strategy will be invoked.

Example Sloc to Sloc transfer – into FG warehouse

```
                                                    ┌────────────────────┐
                                                    │    WM Transfer     │
                                                    │ Order auto created │─────┐
                                                    └────────────────────┘     │ WM
  ┌────────────────────┐                                      │              Putaway
  │       MB1B         │──────────────────────────────────────┘               sheet
  │  1 step transfer   │                                      │
  │  (movement 311)    │                            ┌────────────────────┐
  └────────────────────┘                            │  Confirm Transfer  │
                                                    │   Order Putaway    │
                                                    └────────────────────┘
                                                              │
  ┌──────────────┐                                  ┌──────────────────┐
  │  Sloc 0002   │                                  │    Warehouse     │
  │              │   ───────►    [forklift]  ──────►│   Management     │
  │ Manufactured │                                  │  Finished goods  │
  │    goods     │                                  └──────────────────┘
  └──────────────┘
```

Example Sloc to Sloc transfer – out of FG warehouse

```
  ┌────────────────────┐      ┌────────────────────┐
  │       MB1B         │─────►│    WM Transfer     │  WM Pick
  │  1 step transfer   │      │ Order auto created │   sheet
  │  (movement 311)    │      └────────────────────┘
  └────────────────────┘      ┌────────────────────┐
                              │ Confirmation auto posted │
                              └────────────────────┘

  ┌──────────────────┐                              ┌──────────────┐
  │    Warehouse     │                              │              │
  │   Management     │   ──────►  [forklift]  ─────►│ Manufactured │
  │  Finished goods  │                              │    goods     │
  └──────────────────┘                              └──────────────┘
```

5.5. Transfer from Material to Material

The warehouse management process required to perform a material-to-material conversion is basically the same as an automatic posting change. It will be initiated by an inventory transfer (movement 309), as is the current process. The difference is that an automatic transfer order is not created by SAP. It has been configured this way because it cannot be predetermined where the stock is to be picked from. This must be manually specified.

As such, at the completion of the 309 material to material posting the user will be immediately thrown into transaction LT06 – Create Transfer Order from Material Document. From here the user will need to specify the storage type and bin the stock is to be picked from. SAP by default will try to return the stock to the same bin, though this can be changed.
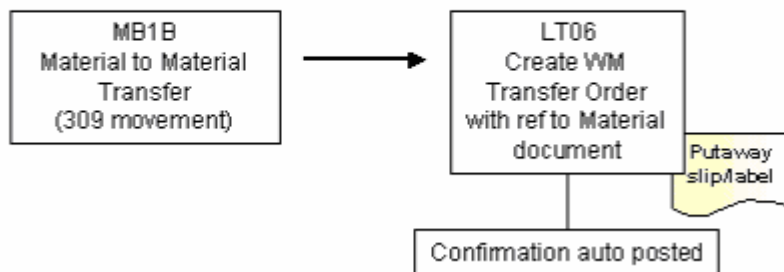
5.6. Transfer from GR Blocked Stock to Own

It has been proposed that Goods Receipt Blocked Stock is used to represent consigned imported goods in the new system. A function of Goods Receipt Blocked Stock is that it must be transferred to own stock within the warehouse in order to consume and financially account for the stock. As such the transfer from Goods Receipt Blocked Stock to Own will have warehouse management implications.

The process is shown in the below illustration.

Transfer of Goods Receipt Blocked Stock to Own
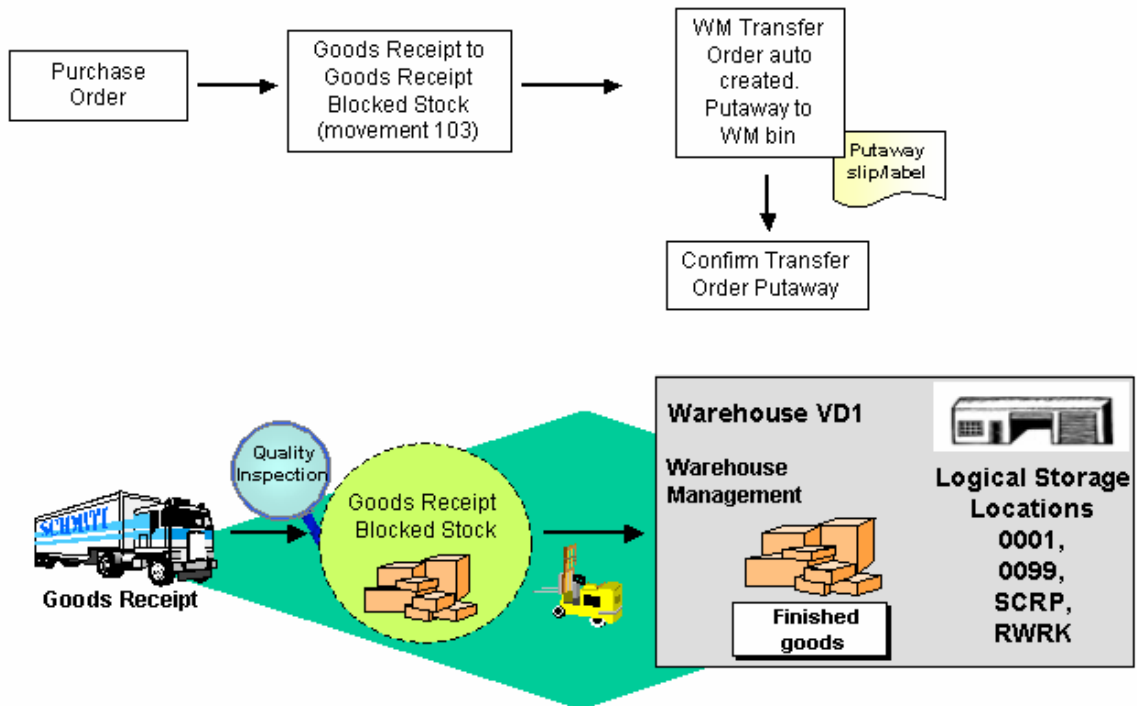
Putaway strategy

Purchased goods received into the finished goods warehouse will be putaway to storage type 002 racks.

The strategy of "Next Empty Bin" therefore applies.

Once again a manual confirmation step is also required.

5.7. Goods Issue to Stock Transport Order Delivery

The business process involved in transporting stock from one plant to another will largely remain the same as it is today. The SD functionality of Delivery creation will remain key to the warehouse activities. In fact the steps of Delivery creation, pick, pack and ship are

identical in the Stock Transport Order Delivery process to that of a regular Sales Order Delivery process. The below diagram illustrates the flow.
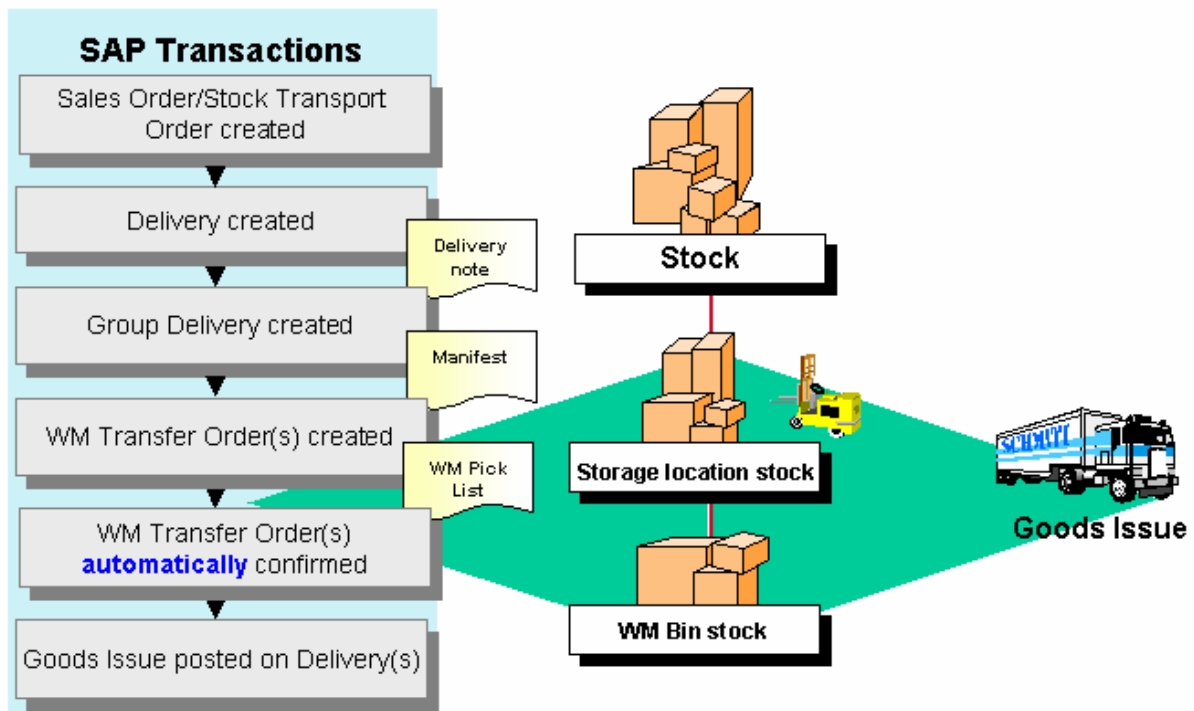
Picking strategy

As explained in an early chapter, goods will be picked in the sequence:
Pick face - bottom level of rack (storage type 001)
Regular rack storage (storage type 002)

There has been no allowance to pick from storage type OPN, as this should never be shipped via a sales delivery or stock transport order.

Within the particular storage type goods will be picked based on a FIFO Expiration Date basis. That is the stock that is closest to expiry will be picked.

Full bin quantity picking has been set for storage type 002. This means that the entire bin quantity will be removed, even if only part is required for the particular pick. If there is some quantity left over that Transfer Order will specify which bin to place this left over quantity of stock. In all cases this putaway bin will be in the pickface (i.e. storage type 001). This therefore ensures that the stock sitting in the pickface is the first that should be picked (FIFO basis), and also acts as a means to replenish the pickface.

As with all picks the transfer order confirmation is automatic. It is assumed that the stock accuracy, and willingness to pick as directed by SAP is near perfect. Similarly as with all putaways, the putaway of any leftover stock to the pickface will require a manual confirmation. This manual confirmation is the primary means of correcting any warehouse stocking inaccuracies.

5.8. Goods Issue to Subcontract stock

The new process for the transfer of components to a subcontract vendor ties in closely with the above process of picking and issuing to a Delivery. SD delivery note will be created so that the process of picking and shipping will be identical for the warehouse regardless of whether it is a sales order, a stock transport order, or a transfer of components to a subcontract vendor.

The below diagram illustrates the flow.
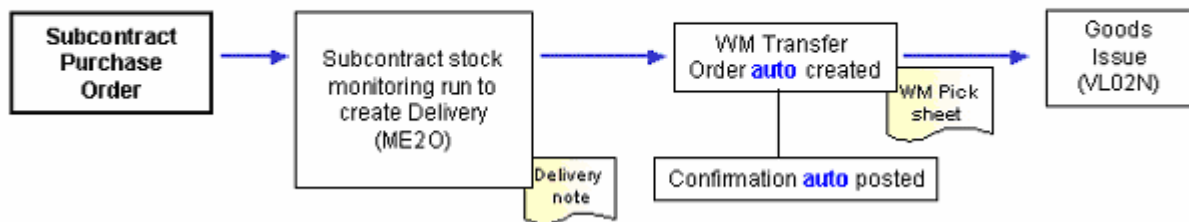
The only significant difference between this and other deliveries is that the Transfer Order is automatically created. This is simply controlled by an output condition. If it is decided that the warehouse needs to group these deliveries, as they do with customer sales, then they can proceed with the same process of creating a group, and then manually creating the corresponding Transfer Orders.

Picking strategy

Stock is picked using the same strategy as all other deliveries.

5.9. Goods Issue to Sales Order Delivery

Please refer to the above sections on Deliveries, as the stock transport and subcontract vendor stocking deliveries use exactly the same process from a WM perspective.

5.10. Goods Issue to Production

It is understood that goods (components) required in the manufacturing process, including rework manufacture would be consumed from storage locations RM01 or RM02. As such any stock required for manufacture will first be transferred to production storage location via a storage location to storage location transfer.

Note if in it is required to manually issue goods to a order, direct from the raw materials goods warehouse there will be no problems raised. A WM Transfer Order will be auto created as normal, advising which bin to pick the stock from. This will print in the warehouse at the designated printer.

5.11. Return to Vendor

A slight modification will be made to the existing "Return to Vendor" process employed in the Philippines. Instead of the 102 movement, the more correct 122 inventory movement will be used. For more details on the Return to Vendor process please refer to the MM DWB on the subject.

From a WM perspective the pick process will be identical to any other pick. The below diagram illustrates the simple flow:
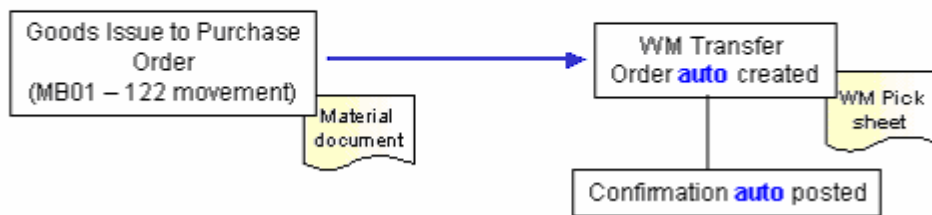
5.12. Goods Issue to Consumption (scrap or cost centre)

The consumption of stock from the warehouse for scrap or goods issue to a cost centre utilises the same picking strategy as other picks previously discussed. In the case of scrapping it is likely that a posting change would have been posted at the bin level first, moving the stock from Unrestricted to Blocked.

The simple flow is illustrated below.