



# VHInterior<sup>TM</sup>

## Technical Paper



# VHInterior™

## 1 Executive Summary

The building time for fitting out work is usually shorter than other construction works but instead, with characteristics of larger number of jobs, sizable building area and variable design conditions. When there are frequent changes of design that are based on different construction states, the cost budget will be eventually varied over the whole design process. Such kind of projects usually involve many work units and workers in each job, hence it will not be easy to manage the construction time, cost and quality.

Common hurdles in managing maintenance works:

- Progress of work is not easy to trace
- Allocation of works to the subcontractors is not clear
- Material supply does not match the demand
- Client can not get the most up-to-date project information
- Project payment is not traceable
- Final account takes a long time to be closed

With achieving better management of time and cost as the prime objectives, **VHSoft Technologies Co., Ltd** has developed **VHInterior™** to realize a more accurate budgeting, better time control, reduce cost and improve the quality of Building & Fitting Out Works, especially for projects of **Architectural Services Department**.

## 2 System Overview

VHInterior is a Drawings Recognition System for Building & Fitting Out Works. **It carries the cost estimation process and assists Quantity Surveyor to produce cost report. Instead of using traditional checking method by contractor and ASD's Quantity Surveyors, VHSoft proposes to apply our "On-the-drawings" checking to Quantity Surveyors, which means they can simply click items in the drawings and related objects, e.g. door, to blink and show details immediately.**

**Such defining process of schedule on rate items (Architect) and method of measurement (Quantity Surveyor) is the key feature of the entire system. It is similar to a process of knowledge transfer to a new staff, whereby he will know the item meaning thereafter.**

**With VHInterior, Architect and Quantity Surveyor are able to interpret the object in ceiling plan, layout plan and marks shown on finishing schedule and base on the rules and symbol provided by the system to perform pattern tracking and matching, producing preliminary cost estimation report at ease.**

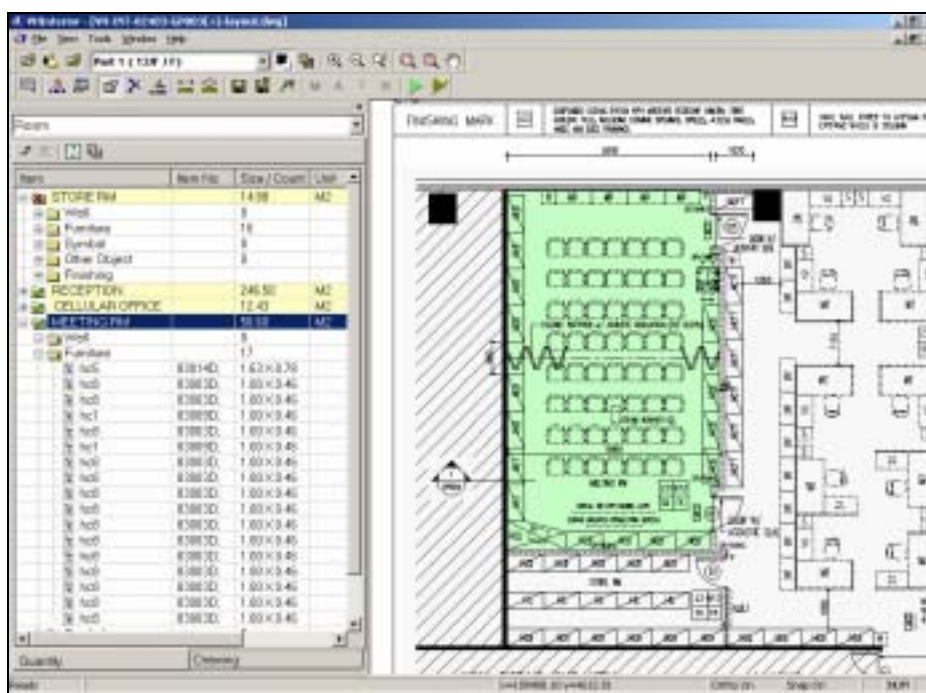
**VHInterior provides 2 forms of output interfaces, including Excel ".xls" and contractor's work flow system "Work Order Management System (WOM)" in order to enable further modification by Quantity Surveyor.**

The processing structure of VHInterior is divided into 2 modes: “Project mode” and “Work Order Mode”. With the sufficient information of project background, Architect and Quantity Surveyor are able to define the rate item in Project mode, normally with 3-year of contract time, or Works Order mode.

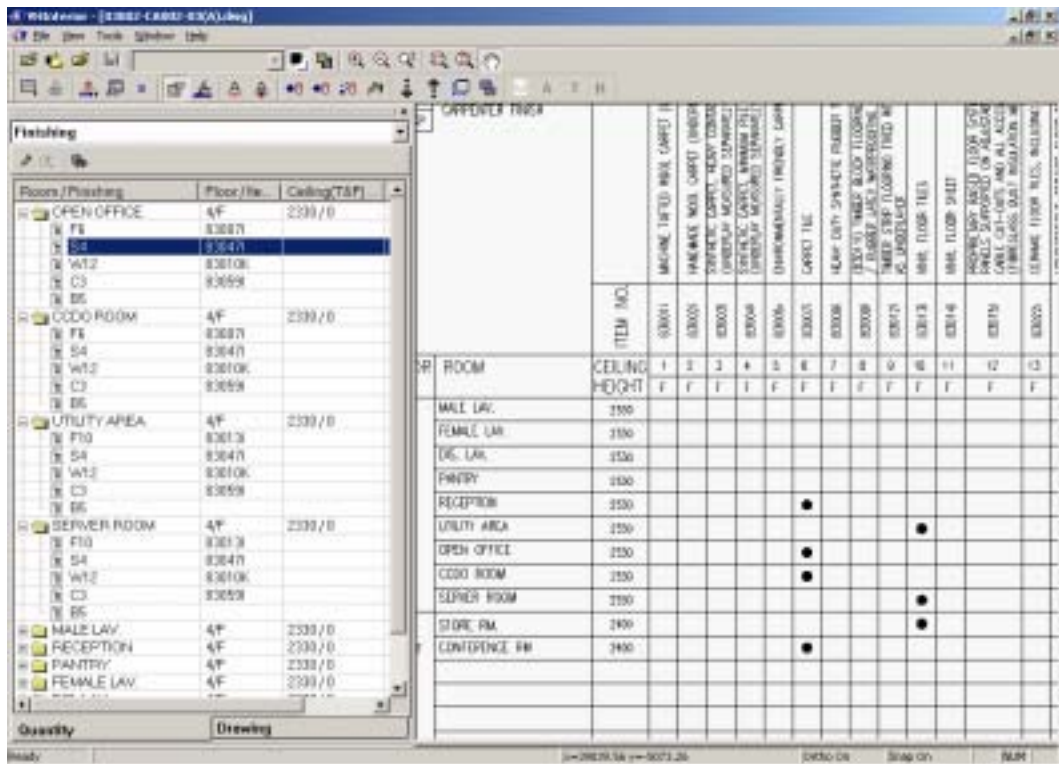
Usually, Architect keeps their commonly use symbols or marks on design drawings and draftsman will use it as references when producing a new drawing. To follow this norm, VHInterior provides a central object definition library and drawing symbol library, whereby drawing recognition can be done through item matching and eventually producing the dimension book.

### 3 Benefits and Advantages

With VHInterior, users are able to speed up measurement time of cost budgeting; obtain consistency with Architect and Quantity Surveyor on design direction; achieving accurate subcontractor payment so that occurrence of overpaid can be avoided, and making drawing dimension equals to site measurement.



VHInterior reconstructs the item into Room, and grouping them into a format like, Wall, Partition, Symbol, Finishing and Other Drawings Object.



Finishing Mark shown on table, would help VHInterior to realize the relationship between objects finishing and room dimension in layout plan.

## 4 Major Features

Base on the rules & symbol provided by Architect & Quantity Surveyor, VHInterior can perform pattern tracking and matching, and finally produced the preliminary cost estimation report with the following producers:

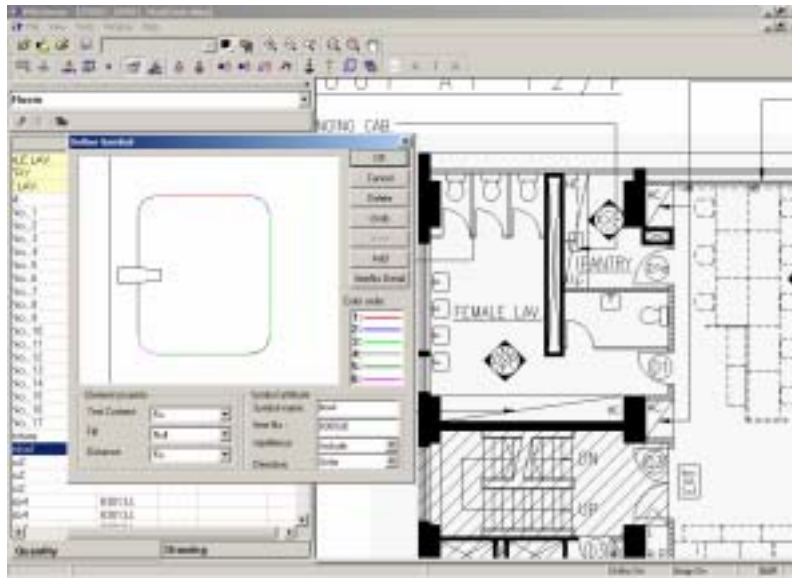
### 4.1 Index Drawings (Common use symbol)

As normal practice, Architect keeping its commonly use symbol or mark on design drawings, draftsman will use it as referencing material. Similarly, VHInterior simulates the same procedure by referencing user defined symbol (already matched with item) which will bring forward to job drawings if it appears on their layout or ceiling drawings.

#### 4.1.1 Define Symbol for Recognition

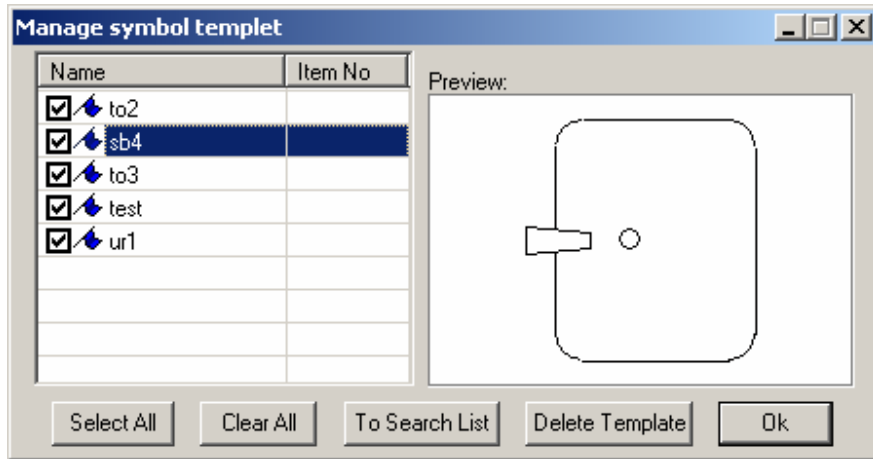
VHInterior allows users to define object libraries for internal reference and for drawing recognition. There is an object library in VHInterior that stores the hatch and text symbol in association with a drawing item, together with another object library that stores the drawing symbol which is defined by user and obtained from the drawing. The items in this symbol library can be added to the search list for recognition.

In order to define symbol and add to the symbol library, users must first open a drawing in the main drawing window. In practice, this would mean open the General Layout Plan that contains the symbols.



#### 4.1.2 Manage Symbol Library and Add Symbol for Recognition

The Manage Symbol Template dialog shows the items (or templates) added to the symbol library. Users may delete template from the library or add selected templates in the search list for recognition.



## 4.2 Finishing Schedule

Finishing Mark shown on schedule, would help VHInterior to realize the relationship between objects' finishing in layout plan, for instance F1 means painting in a wall panel. With VHInterior, the table can be analyzed at ease and the recognized condition will be recorded for using in general layout plan item matching.

As usual, room and ceiling height would also included in this schedule. VHInterior requires details ceiling level, such as structure ceiling, false ceiling and raise floor height. These factors help the realization of room dimension that are not included in 2D layout plan.

### 4.2.1 Finishing Schedule (F.S.) Recognition

VHInterior provides Finishing Schedule Recognition. Finishing Mark in the schedule helps VHInterior to realize the finishing of items in layout plan. This information is used to construct the dimension book.

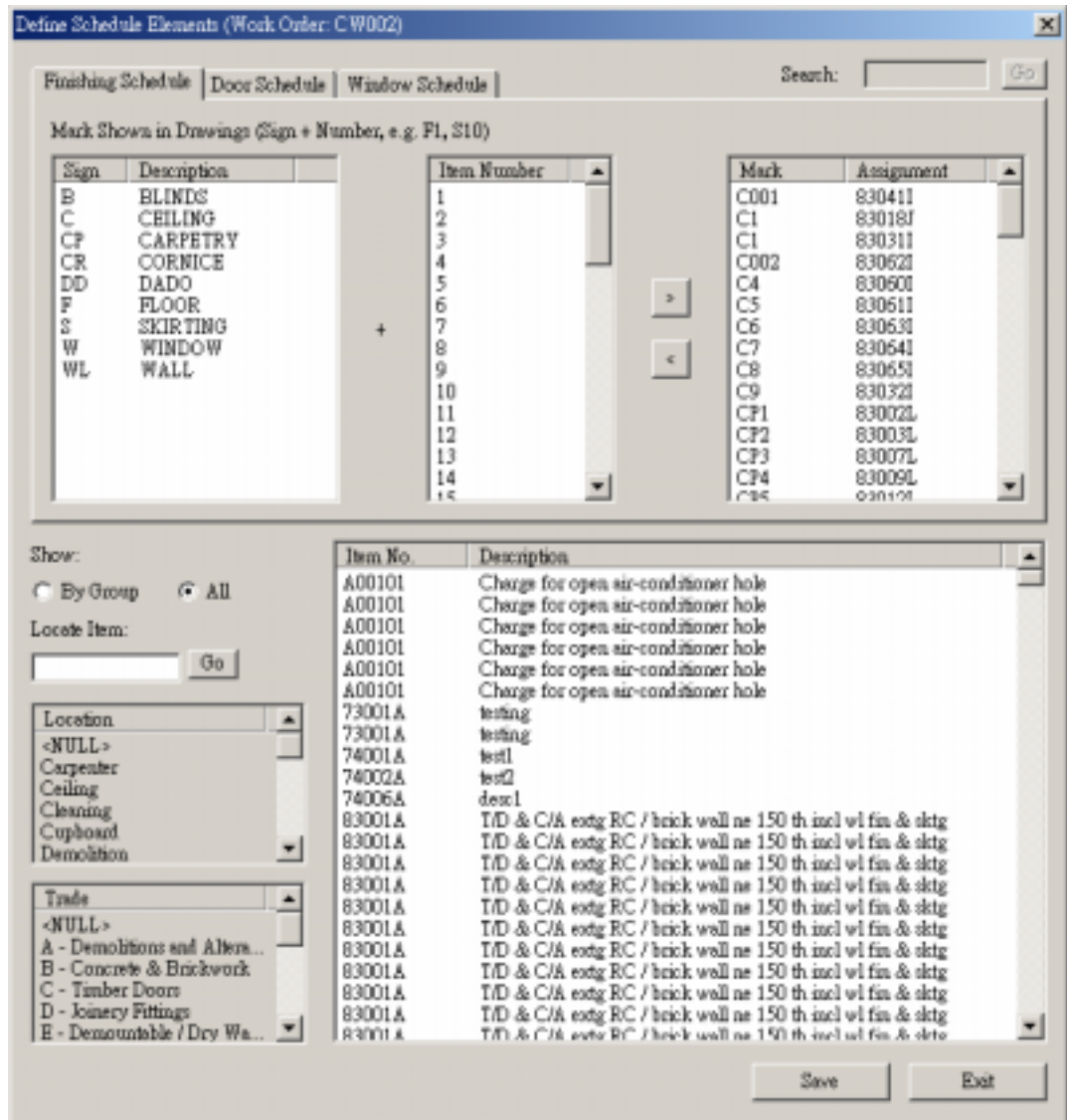
The steps required to perform recognition and analysis are similar to that of Ceiling Plan recognition.

## 4.2.2 Define Schedule Elements

In the Object Definition dialog, users can navigate between items and then associate Symbol or Hatch with each item. Alternatively, users may define the symbols that appear in a particular type of drawings. VHIinterior is equipped with a suite of Define Schedule Elements and thus allows users to define symbols for Finishing Schedule, Door Schedule and Window Schedule.

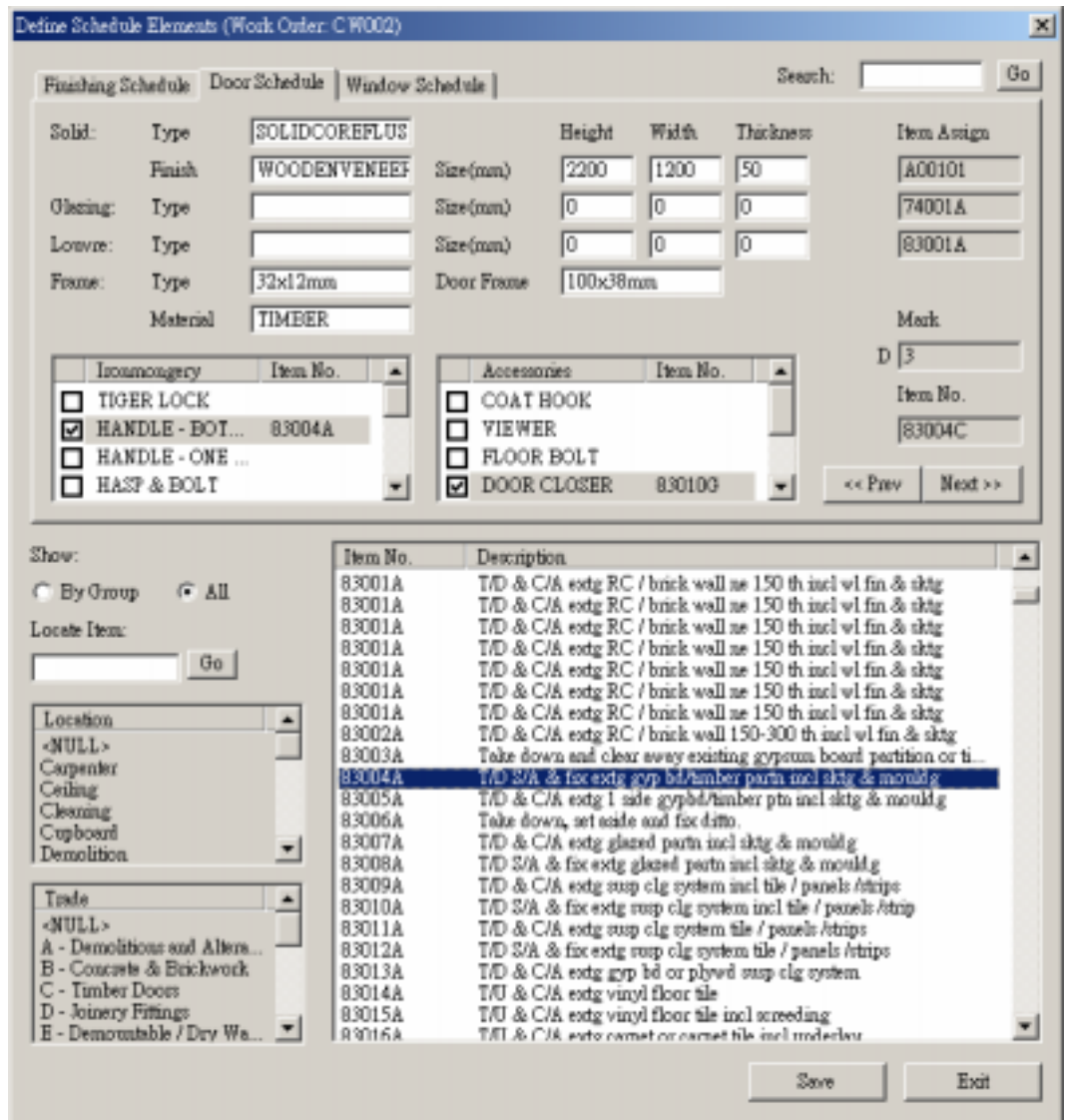
### 4.2.2.a Finishing Schedule

Each symbol (or mark) shown in the Finishing Schedule consists of two parts: a single or two-letter sign and an item number. The symbol (or mark) can then associate with an item in the object library.



#### 4.2.2.b Door Schedule

In the Define Schedule Elements dialog, user can navigate the door records, define the dimensions and the materials (i.e. items) of the Solid, Glazing, Louvre, Frame, Ironmongery and Accessories of each door and enter additional information about each door.



#### 4.2.2.c Window Schedule

Similar to the Door Schedule in the Define Schedule Element dialog, the Window Schedule tab allows users to navigate between different window records and then associate material (item) with the components of a window. Users may specify the material (item) for the Frame and Glazing and enter additional information about the window.

Define Schedule Elements (Work Order: C R002)

Finishing Schedule | Door Schedule | Window Schedule | Search:  Go

Window: Location  Mark W 006 Item No. 83013K  
 No.

Frame: Type  Size(mm) Height Width Thickness Item Assign 83001A  
 Glazing: Type  Size(mm) Height Width Thickness Item Assign 83025K  
 Remark:

<< Prev Next >>

Show:  
 By Group  All  
 Loose Item:  Go

Location:   
 Storage  
 Wall  
 Wall finishing  
 Wall partition  
 Window

Trade:   
 J - Plumbing  
 K - Glazing  
 L - Painting  
 M - External Works  
 N - Star Rate

Item No.	Description
83003F	Timber pelmet for curtains / venetian blind ne 200 wide
83000K	Default
83001K	Clear sheet glass, 6 th incl framing
83002K	Parallel wired polished plate glass, 6 th incl framing
83003K	Obscured wired glass panel, 6 th incl framing
83004K	1 hour fire rated glass incl framing
83005K	Tinted glass/polished plate glass panel, 6 th incl framing
83006K	Tinted glass/polished plate glass panel, 9 th incl framing
83007K	Tinted glass/polished plate glass panel, 12 th incl framing
83008K	Clear tempered glass, 6 th incl framing
83009K	Clear tempered glass, 9 th incl framing
83010K	Clear tempered glass, 12 th incl framing
83011K	Glass microsilver backed, 6th w/without backing
83012K	Reflective glass, 6th incl framing
83013K	One way mirror, 6th tempered glass incl framing
83014K	One way mirror, 12th tempered glass incl framing
83015K	Polycarbonate sheet, 6th incl framing
83016K	Polycarbonate sheet, 9th incl framing
83017K	"LEXAN MR10" polycarbonate, 9th incl framing
83018K	"LEXAN MR10" polycarbonate, 12th incl framing
83019K	Tempered glass dr single leaf w/ steel fr & dr spring
83020K	Tempered glass dr double leaf w/ steel fr & dr spring

Save Exit

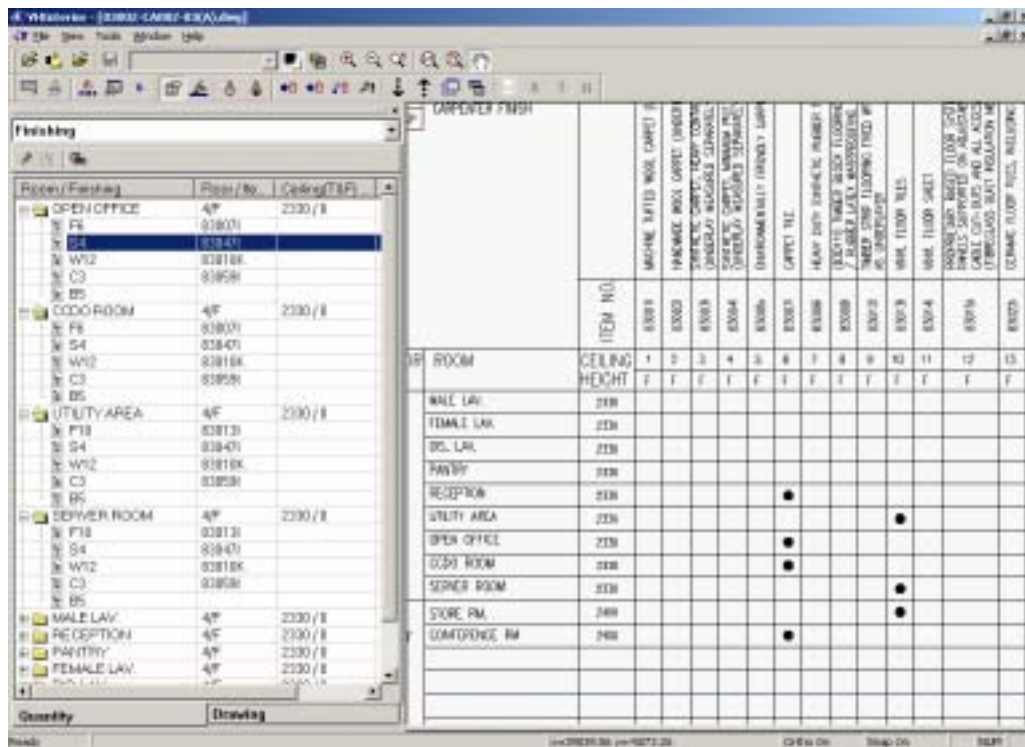
### 4.2.3 Assign Furniture

In the drawing, designers may draw a furniture item which actually represents two or more furniture items. Hence, the designer has to provide this information to VHIinterior in order to provide a more accurate material consumption for this kind of furniture items.

### 4.3 Ceiling Plan

VHInterior recognizes the ceiling area and matches with schedule of rate (SOR) item. By unselecting the unused layer, it will reduce the area that is not related to ceiling, for instance, column is one of the examples.

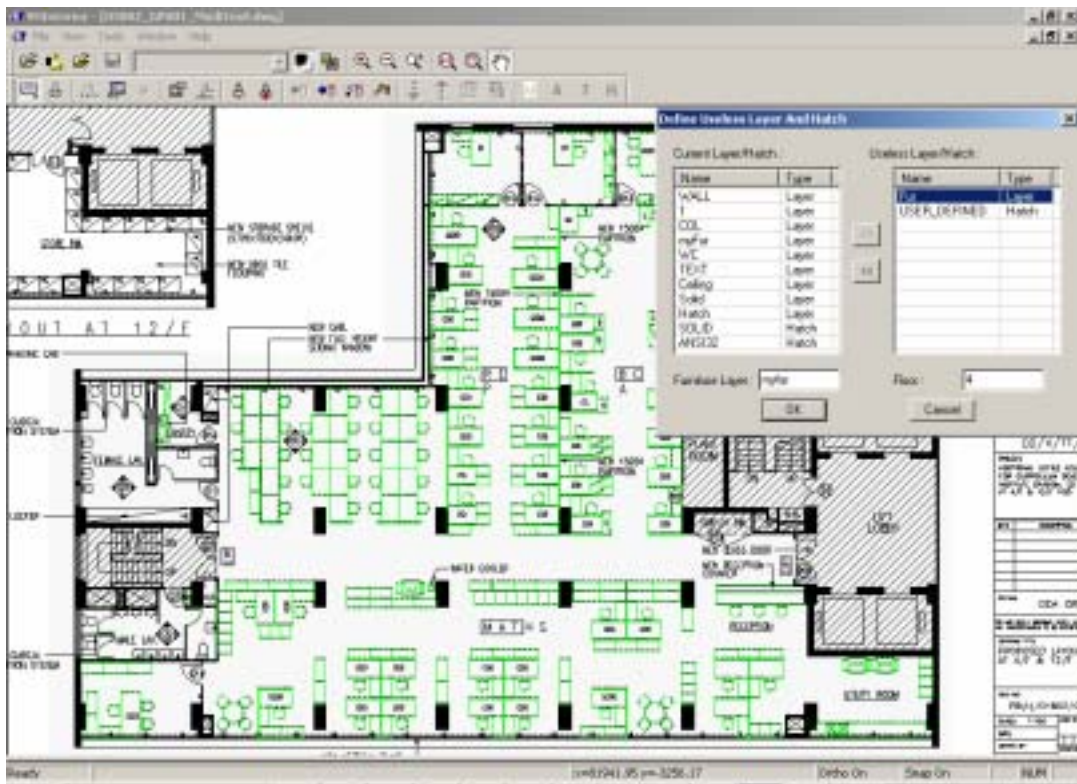
The architect is responsible for specifying the pattern of ceiling used in the drawing of VHInterior. By using VHInterior Object Definition dialog, user can easily relate the SOR item with a hatch, representing a specific ceiling material. For example, Suspension gypsum board ceiling system can be assigned to "NET".



### 4.4 General Layout Plan

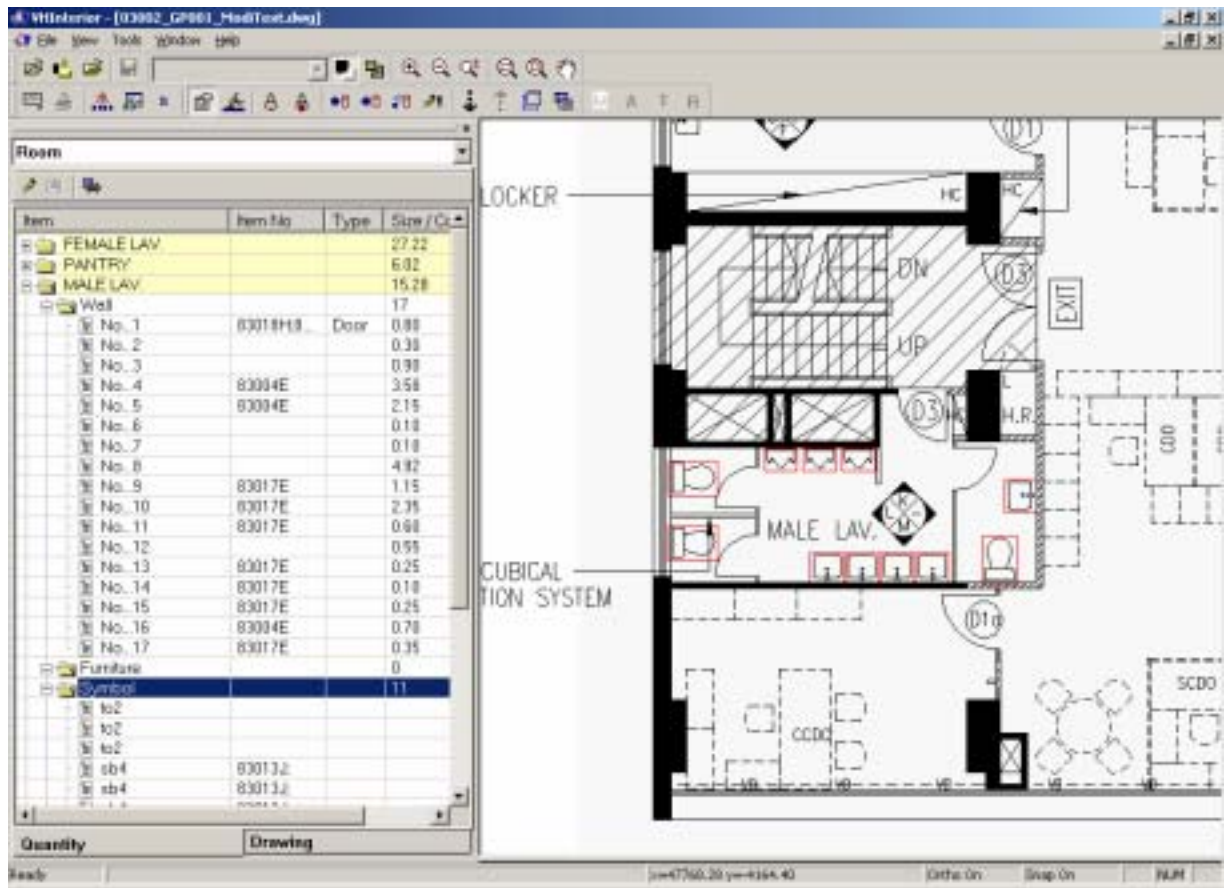
It is the core part of the cost estimation. Information accumulated from ceiling plan, finishing schedule or even door and window schedule can be applied after recognizing the item there. Actually, it is simulating the Quantity Surveyor's processing cycle, that is, taking item trade by trade. For instance, counting the number of door marked as D1, D2, measuring the length of vertical bind, etc. Finally, it will reconstruct the item into Room, and grouping them into a format like, Wall, Partition, Symbol, Finishing and Other Drawings Object.

**The steps required to perform General Layout Plan Recognition are similar to other drawing recognition.**



#### 4.4.1 View General Layout Plan Recognition Results

The result of recognized item list is categorized into categories corresponding to the type of item. This includes Partition (main), Door, Wall (finishing), Room, Furniture, Symbol and each individual Trade categories. The recognized items include parameters like Item No., dimensions (length, height, size), number / size, area, unit and room name wherever applicable.



## 4.5 Generate Cost Estimation

VHInterior produces the preliminary cost estimation report. The system provides 2 forms of output interfaces: Excel “.xls” and common gateway to VHMonsys™ such that Quantity Surveyor can perform further modification and maintain construction site profit & loss.

## 5 Other Features

### 5.1 Construction Item Monitoring

VHInterior provides construction monitoring features. Contractors can use the PDA version of VHInterior to check each recognized and modified result list items against actual construction works. Contractors can mark the item if it is checked without problem or mark the items require extra works. VHInterior allows contractors to mark where the extra works take place and the size of area involved.

## 6 Limitation

### 6.1 Standard Drawing Format and Recognition Accuracy

**In general, the drawing recognition accuracy would be 70% with 10% fault tolerance. However, there are many factors affecting drawing file recognition accuracy. These include:**

- Incompatible drawing format (especially for finishing schedule)
- Drawing that use un-supported drawing structures (e.g. SP Line)
- Drawing that involves designer draft notes surrounding the main drawing area
- Drawing with Xref
- Drawing with layer grouping
- Visibility of drawing objects