Insulation Unlimited Company

Case Study

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This case provides practice in database and application design. Follow the instructions in the accompanying case study requirements for preparation.

Insulation Unlimited Company

Overview

Insulation Unlimited Company is an insulation subcontracting firm founded in 1985 in Bothell, WA. The original company has expanded into three semi-independent offices in the greater Seattle area providing insulation installation, acoustic engineering and asbestos removal services. The primary services provided to a client (homeowner, general contractor, or government agency) are installation of various types of fiberglass and rockwool insulation blankets ("batts") into the walls, floors, and ceilings of structures, the blown installation of loose-fill fiberglass, rockwool, and cellulose into attics and crawl spaces, and fitting of foam board and other special purpose control and insulation products.

The nature of subcontracting work is significantly different from that of a general contractor. The primary focus of a subcontractor is the handling of material and labor expended on a particular job as compared to the focus on scheduling and project management for a general contractor. Research on existing software has shown that there are a large number of packages for general contractors but not many for subcontractors especially regarding the specific requirements of an insulation subcontractor.

The accounting functions for the Insulation Unlimited Company are similar to those of most retail companies. In particular, inventory quantities must be maintained, payroll calculated for all employees, accounts payable maintained as payment is sent to vendors for material received, accounts receivable maintained as invoices are sent to customers, and a general ledger maintained on all accounts.

The primary difference between any construction subcontractor and other types of service companies lies in the function of job costing: keeping track of the labor and materials attributed to a job. The next section describes the job information flow in detail.

Job Information Flow

A typical contracting job involves submission of a proposal, preparation of work orders, scheduling of work, and preparation of invoices as depicted in Figure 1. The starting point of an insulation contracting job is the job proposal: an estimate of work to be completed and the price quoted by a salesperson to a customer. In the case of a private residence, the proposal is usually based on a walk-through and standard area calculations provided by a salesperson. For a residential contractor, the proposal might be based on a standard specification of a house plan. In most cases, a salesperson would never see the individual property. In the case of a large commercial or government contract, the proposal would be submitted in response to a call for bids from the prime contractor and selected on the basis of cost, quality, and other criteria.

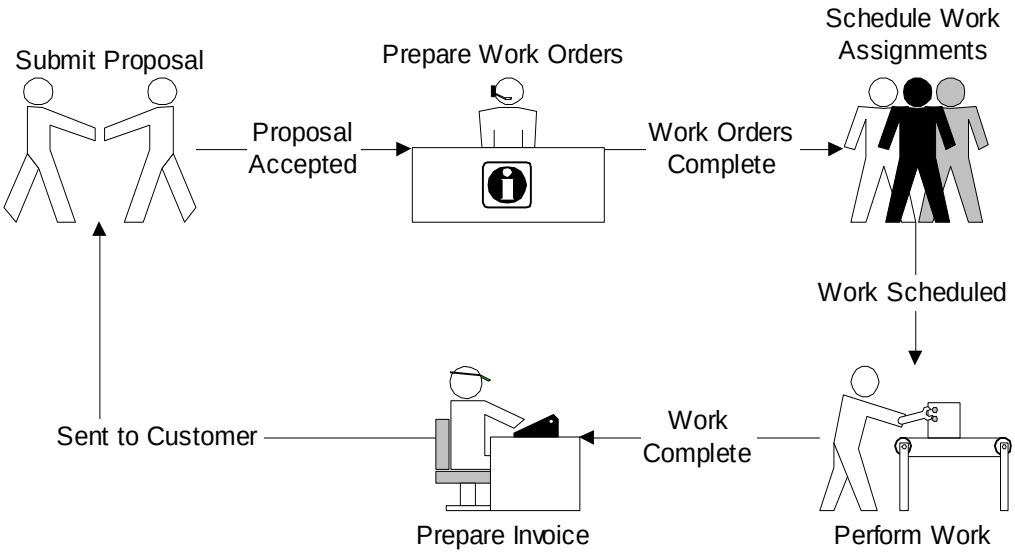

Figure 1: Workflow for a Typical Contracting Job

Figure 2 shows a sample proposal for a commercial customer. The proposal number uniquely identifies a proposal. The *Status* field can take values of "Accepted", "Pending", or "Denied". When a proposal is first written the status is "Pending". The *Decision Date* is the date that the status is changed to accepted or denied. It is null until the customer takes action on the proposal. The estimation method (*Est. Method*) can take a value of "walk through" or "floor

plan". The *Locations* field is the number of locations in which work will be performed. A proposal lists the set of tasks requested by the customer. Tasks may be performed at some or all locations. A work order provides the details of work performed at various locations. The square foot is an estimate of the total task effort (usually measured in square feet) across all locations. The price per square foot for a task includes the internal costs such as labor, material, and overhead as well as a profit level. The amount shown on the form defines the cost to the customer.

Proposal

Proposal No.	P100	**Date Written**	6 June-1995
Customer No.	C100	**Status**	Accepted
Est. Method	Walk-through	**Decision Date**	8 June 1995

Billing Address
Name Pet Store #1
Address 4724 University Ave
Seattle, WA 98107
Locations: 2

Task	**Square Feet**	**Price/SqFt**	**Amount**
Wall Insulation	40	15.00	600.00
Ceiling Acoustics	100	12.00	1200.00
Total Before Tax			1800.00
Tax (8.2%)			147.60
Total			$1947.60

Customer Type General Contractor — Commercial **X**
Government — Residential
Salesperson Sally Supervisor

Figure 2: Sample Proposal

After a proposal is submitted to a customer, it might be acted upon immediately, delayed, or often not accepted. When a customer accepts a proposal, a primary work order is completed. Figure 3 shows a sample work order for a commercial customer. A unique work order number identifies a work order. A work order shows the tasks of a proposal at one location. For each task, the estimated square feet, estimated duration (in hours), status ("Pending", "In Process", or "Completed"), and date completed are shown. The status of a task is initially "Pending". When an assignment is generated, the status changes to "In Process". After all assignments are

completed, the status is changed to "Completed" and the completion date is specified. Although a proposal has been accepted, the work may not be performed for some time in the future. The date required is the date that the customer would like all tasks to be completed. If a job has more than one work location, secondary work orders are also completed. Figure 4 shows a secondary work order for the second location.

Primary Work Order

Work Order No.	W100	**Date**	10 June 1995
Proposal No	P100		

Work Location **Notes**

Name Pet Store #1
Address 4724 University Ave
Seattle, WA 98107

Task	Square Feet	Est. Hours	Status	Date Complete
Wall Insulation	20	4	Pending	--
Ceiling Acoustics	50	8	Pending	--

Manager Mary Manager **Date Required:** 30 June 1995

Figure 3: Sample Primary Work Order Form

Secondary Work Order

Work Order	W101	**Date**	10 June 1995
Proposal No	P100		

Work Location **Notes**

Name Pet Store #2
Address 5302 Lake City Way
Seattle, WA 98117

Task	Square Feet	Est. Hours	Status	Date Complete
Wall Insulation	20	4	Pending	--
Ceiling Acoustics	50	8	Pending	--

Manager Mary Manager **Date Required:** 2 July 1995

Figure 4: Sample Secondary Work Order Form

On the day in which a work order is performed, tasks are assigned to employees. Employees are assigned a specific pay rate (hourly, by the piece, or by the job) for each task based on total allowable labor charges. For each task, a specific quantity and type of material (bags of batt or blown insulation, for example) is sent with the work crew. A crew might perform up to four or five residential work orders in a day or only a small portion of a large

commercial work order. In the latter case, a new assignment would be issued on each day in which work is performed to define the day's labor and material requirements.

When a crew has completed its work for the day, it returns to the home office with any unused material and adjustments for the actual material quantities used on the job and amount of work completed. The employee's pay records are then credited by the hour, piece rate, or contracted amount for the job.

Figure 5 shows a sample assignment form before work begins.. This form is generated when a work order (or part of a work order) is assigned to a crew. The assignment number uniquely identifies an assignment. The supervisor is responsible for inspecting the work at the specified location. The authorizer is responsible for scheduling the work. Usually, the project manager schedules the work but occasionally another employee at the request of the project manager schedules work. After work completes, the quantity used and hours used are noted.

At specified intervals, Insulation Unlimited sends invoices to customers. For a completed job, an invoice is sent immediately. Commercial jobs in progress are billed on a monthly basis using a billing cycle date specific to the customer. An invoice lists the charges for completed tasks in a specified date range. For each task, an invoice lists the date completed and amount. All completed tasks of a customer in the billing period are listed on the invoice even if the tasks span work orders.

Work Assignment

Assignment No	A100	**Start Date:**	14 June 1995
Work Order:	W100	**Finish Date:**	--

Location

Name	Pet Store #1
Address	4724 University Ave Seattle, WA 98107
Supervisor:	Frank Foreman

Vehicle No: --

Material Assignment

Task	Material	Unit Cost	Qty Sent	Qty Used
Wall Insulation	Fiber Glass	$4.00	8	--
Ceiling Acoustics	Rock Wool	$6.30	3	--
Ceiling Acoustics	Foam Board	$2.50	8	--

Labor Assignment

Task	Employee	Rate	Hrs. Est.	Hrs. Used
Wall Insulation	Randy Riveter	$12.50	4	--
Ceiling Acoustics	Beth Blaster	$13.30	3	--
Ceiling Acoustics	Carl Carpenter	$15.50	4	--

Authorized By: Sally Supervisor **Authorization Date:** 13 June 1995

Figure 5: Sample Material Assignment Form

Figure 6 shows a sample invoice. Here the invoice lists all work on proposal "P100". Because this is a small job, this invoice is generated at completion of all tasks in the associated proposal. Note that the invoice lines are taken from work orders of the proposal. Every task completed in the billing period is included as a line on the invoice.

Invoice

Invoice No	I100	**Date**	5 July 1995
Proposal No	P100		
Start Date	1 June 1995	**End Date**	30 June 1995

Task	Location	Amount	Date Complete
Wall Insulation	Pet Store #1	$300.00	14-June 1995
Wall Insulation	Pet Store #2	$300.00	15-June 1995
Ceiling Acoustics	Pet Store #1	$600.00	14-June 1995
Ceiling Acoustics	Pet Store #2	$600.00	15-June 1995
	Total Before Tax	$1800.00	
	Tax	$147.60	
	Total After Tax	$1947.60	

Figure 6: Sample Invoice

Appendix A: Glossary of Form Fields

Appendix A provides a brief description of the fields found on the documents presented in the case. The field names are the captions from the associated document.

Proposal Form

- *Proposal No.*: unique alpha numeric value that identifies a proposal
- *Date Written*: date that the proposal was written
- *Customer No.*: unique alpha numeric value that identifies a customer
- *Est. Method*: method used to compute the estimate
- *Status*: value is one of "Accepted", "Pending", or "Denied".
- *Decision Date*: date that the status is changed to accepted or denied.
- *Billing Address.Name*: name of customer to which a bill will be sent
- *Billing Address.Address*: address to which a bill will be sent
- *Locations*: number of customer locations in which work will be performed
- *Task*: description of task that will be performed
- *Square Feet*: estimated area in square feet in which task will be performed. The square feet estimate includes all locations.
- *Price/SqFt*: proposed price per square foot.
- *Amount*: a computed field (Square Feet * Price/SqFt)
- *Customer Type*: value is one of "General Contractor", "Commercial", "Government", or "Residential".
- *Salesperson*: name of salesperson

Work Order Form (Primary and Secondary)

- *Work Order No.*: unique alpha numeric value that identifies a work order

- *Proposal No.*: unique alpha numeric value that identifies a proposal
- *Date*: date that the work order was generated.
- *Notes*: comments about the unique nature of a work order
- *Work Location.Name*: name of customer in which work will be performed
- *Work Location.Address*: address of customer in which work will be performed
- *Task*: description of task that will be performed
- *Square Feet*: estimated area in square feet in which task will be performed
- *Est. Hours*: estimated hours to complete the task.
- *Status*: value is one of "Pending", "In Process", or "Complete".
- *Date Complete*: date that task was complete.
- *Manager*: name of person who manages the work order
- *Date Required*: date that customer wants work order completed

Work Assignment Form

- *Assignment No.*: unique alpha numeric value that identifies a work assignment
- *Work Order No.*: unique alpha numeric value that identifies a work order
- *Start Date*: date that the work assignment was begun.
- *Finish Date*: date that the work assignment was complete. This field is left blank until the work assignment is complete.
- *Location.Name*: name of customer in which work will be performed
- *Location.Address*: address of customer in which work will be performed
- *Supervisor*: name of person supervising the work assignment.
- *Vehicle No.*: alphanumeric identifier of the vehicle used on the work assignment. If there is no vehicle used on the assignment, this field is left blank.
- *Task*: description of task that will be performed

- *Material*: material used in the task
- *Unit Cost*: estimated cost per unit of the material.
- *Qty Sent*: quantity of material sent to the work site.
- *Qty Used*: quantity of material consumed at the work site.
- *Task*: description of task that will be performed
- *Employee*: name of employee performing the task.
- *Rate*: hourly rate of employee performing the task.
- *Hrs*. *Est.*: estimated hours to perform the task.
- *Hrs. Used*: actual hours to perform the task.
- *Authorization Date*: date that task was complete.
- *Authorized By*: name of person who authorizes the work assignment. Typically, this is the same person who approved the work order.

Invoice Form

- *Invoice No.*: unique alpha numeric value that identifies an invoice
- *Proposal No.*: unique alpha numeric value that identifies a proposal
- *Date*: date that the invoice was generated.
- *Start Date*: starting date in which work is billed.
- *End Date*: ending date in which work is billed.
- *Task*: description of task that will be performed
- *Location*: name of location in which work was performed.
- *Amount*: amount billed for work performed.
- *Date Complete*: date that work was complete at the location.
- *Total Before Tax*: computed field (sum of the amounts on the invoice).
- *Tax*: amount of tax computed as the total before tax times the tax rate.

- *Total After Tax*: sum of the total before tax and the tax.