Quotation and Bidding System

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&
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Abstract
The problem is essentially one of developing a bidding/estimation system for a small subcontractor in the telecommunications infrastructure industry. Currently all bidding and estimation is done by hand and with spreadsheets, and nothing in the process is automated. A bidding and estimation system would improve the response time and accuracy of the process.

Problem Domain Description
The system is a quotations management system for a small, second-tier subcontractor in the telecommunications industry. The company has been in business for approximately 30 years, serving such customers as AT&T, Rockwell International (now Alcatel Network Systems), Sprint PCS, Lincoln Telephone (now AllTel), and similar companies, as well as other contractors and material vendors in the telecommunications infrastructure industry. The company currently tracks all quotations and jobs (successful quotations) in an Excel spreadsheet, and an Access database, so multiple data entry (and related accuracy) is an issue here. A copy of one spreadsheet bid (RFQ) response, as still in use by the company is included in the appendix.

The customer sends RFQs (Requests For Quotation) to a group of their preferred vendors, who each estimate material and labor costs, based on the requirements specified in the quotation. The customer will select the bidder (company) who mostly closely matches their requirements, and usually, this means the company who responds with the lowest total price. A copy of an actual RFQ is included in the appendix.

Each RFQ is an aggregation of jobsites (locations where the actual work is to be performed). So, a given quotation will consist of at least one jobsite, but can easily include 10 or 30 or more sites. Larger companies might be sent RFQs including hundreds or more jobsites.
Each jobsite can be seen as an aggregation of line items specific to that site. For example, AllTel's cell site at 27th and Old Cheney Road might be a jobsite (the company actually built that cell cite a number of years ago). At that site there is a list of items that the customer wants to be completed. For this system, we have called these line items sitelines, but that is just an arbitrary name.

The line items will normally be a material item, i.e. a DB212 antenna, with an associated labor line item that describes installation of the material items. In this way, the companies can estimate the labor costs for installing the line items. The material (DB212 antenna) may be specified as either customer furnished or contractor furnished. If the customer furnishes an item, then the material line would naturally be blank or zero. If the company is to furnish the item, then the company must contact a vendor who supplies the specified material, for the cost of that material item.

The vendor will respond with pricing for the item. Of course this process is not completed separately for each item, but rather a list of materials by jobsite, and line item is normally completed and sent to the vendor for pricing.

Problems that commonly occur with this process are that different companies may interpret the RFQ differently. This causes problems in that the customer may be faced with a number of RFQ responses that are really not the same (the apples and oranges problem). To alleviate this type of confusion, there is usually a formal addendum process involved with most large RFQs. An addendum can be issued at the request of the Customer, or any of the vendors, in response to questions or clarifications thought

necessary to the specifications. Addendums are issued before the RFQ due date, and companies are expected to include responses to each addendum. A related but different problem that commonly occurs is that circumstances or requirements at a given jobsite might change after the company has been awarded the job. In this case that changes are normally handled by change orders. Change orders are not part of this system, although they would be part of a future order tracking system.

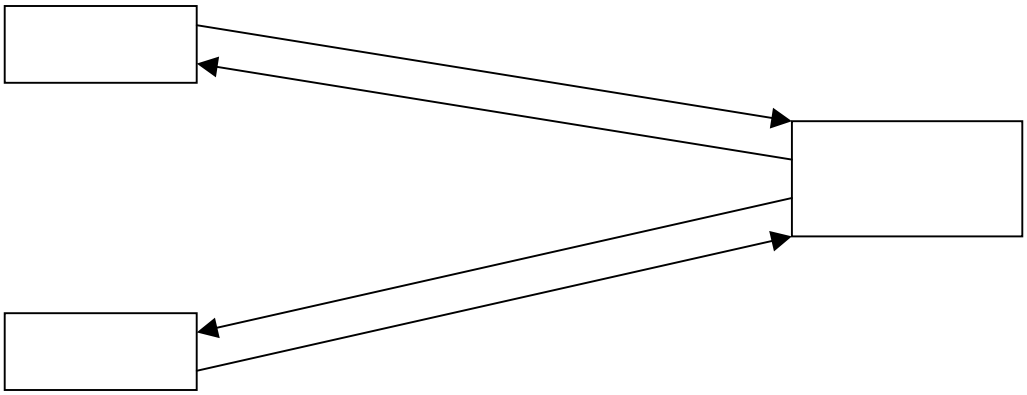
Occasionally, customers will request pricing for an item that has been discontinued or is 'out of stock' for the foreseeable future. Companies then respond with pricing for alternate (equivalent) materials. Unless the customer can include this equivalent material in an addendum, they are likely to receive alternate pricing for several items, again leading to the apples and oranges problem.

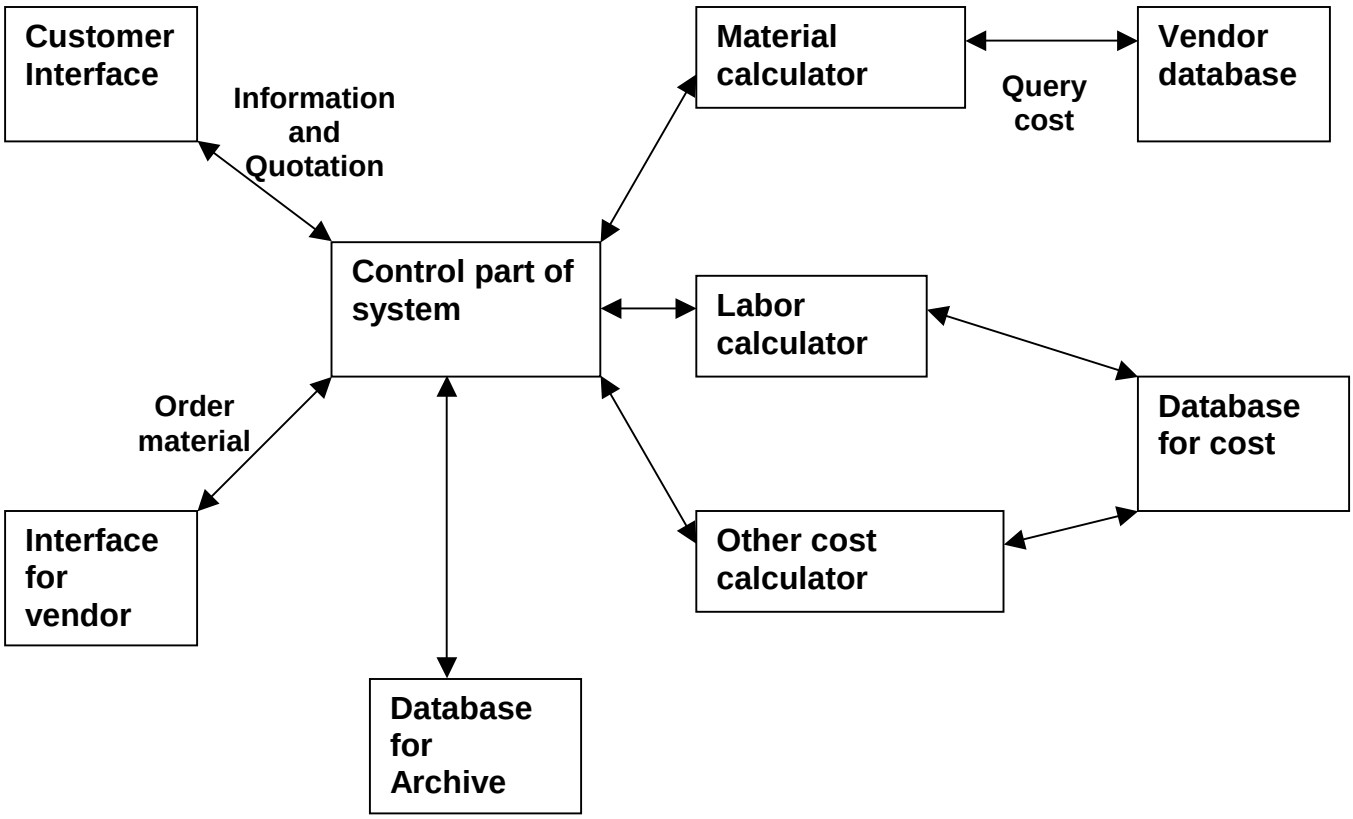
If a company is the successful bidder on a given RFQ, then the customer will issue a contract for the project. Contracts usually specifically refer to or include the original RFQ as source documentation for the contract. For companies, the successful bids/contracts become orders. Order tracking is not part of this system, but is a needed item for the future.

Glossary of terms

Customer	the company, organization or individual who sends RFQs to companies. A company that has some sort of work they want someone else to do for a price.
Vendor	a company who provides a requested product or service to another company, organization or person for a given price.
RFQ	Request For Quotation. A formal, usually written request, sent to a relatively small number of vendors who each respond with their best price for completing the work as specified in the RFQ.
Jobsite	RFQs can be considered aggregations of Jobsites, in that each RFQ will consist of at least one jobsite. Jobsites are the specific locations where the products (material) or services (labor) are to be delivered.
Siteline	Each jobsite can be considered as an aggregation of sitelines, or line items that specify in detail exactly what single product or service is to be provided. Jobsites will consist of at least one siteline.
Addendum	A change to the RFQ issued before the due date, and expected to be responded to by each company in their pricing response.
Order	A successful RFQ response – results in a contract with the customer.
Change Order	A change to the specifications after the contract has been signed.

Block Diagrams





Block diagram for bidding system

Description of the program

The program should be able to receive Requests for Quotations from customers, send responses to customers, request and receive material pricing (and labor pricing if necessary) from vendors (or subcontractors), calculate labor cost, material mark-ups, overhead, profit and other necessary items that constitute a complete response to a RFQ.

Detail requirements for bidding system

Customer:

1. The bidding system should be able to let the customer send the request for quotation.
2. A detailed description form should be provided by the system.
3. After the calculation, the quotation can be sent to the customer.
4. The customer should be able to change requirements about the project as necessary by using the system.

Construction company users:

1. The bidding system should enable users to enter customer information into the database
2. According to the detailed description of project, the bidding system should be able to connect to various vendors' public databases to request material pricing (if material is required for the RFQ).
3. According to the detailed project description, the bidding system should be able to connect to the company's internal database to calculate the labor and other costs associated with a particular RFQ.
4. The system should provide means for transmitting a fully compliant response to the RFQ (a Quotation), back to the customer.

5. If materials required in the RFQ specification details are not available, the system should be able to send a message about alternative materials to the customer, or to request clarification on other or unclear portions of the RFQ specification.
6. The system should be able to calculate the total cost of the project and produce a formal, and fully compliant quotation, as a response to the customer RFQ.
7. The bidding system should also be able to produce separate pricing details for each job site (if the project includes more than one site).
8. The system should be able to search archived records and provide details and cost data of similar previous projects, including unsuccessful bids as well as completed projects.
9. The system will locate the best price from the different vendors.
10. If the RFQ detail specifications change in any material way prior to the bid date, the system will provide a new quotation reflecting all such changes.

Further requirements for the bidding system:

If a particular RFQ is successful, resulting in a signed contract, the system will be able to provide the specification details of the RFQ to the Contract Management System. This requirement is not really a part of the bidding system, but would be vital to an actual implementation.

Use Cases

Use Case Name:	**Customer Registration**
Summary:	New customers must register with the company to receive a unique customer ID. It can send RFQs later using its customer ID.
Primary Actor:	Customer
Other Actors:	None
Goal:	New customers register with the company, and provide detailed information, for example, contact information.
Basic Course of Events:	This use case begins when a new customer comes to the company's website seeking business opportunities. The customer clicks the "Register" menu on the web page, fills out the registration form including customer ID, company name, billing address and phone/fax numbers etc. If all data fields are correctly entered and the requested customer ID has not been used by another customer, the customer may use the Request for Quotation use case to request service from the company. The customer may also use the Profile Editing use case to edit the information entered in the registration form.
Trigger: *(the specific action that caused the Use Case to start)*	A new customer is interested in doing business with the company
Pre-conditions:	N/A
Post-conditions:	The customer ID is used to identify specific customers. No two customers can use the same customer ID.

Use Case Name:	**Profile Editing**
Summary:	Customers can edit their profiles as needed.
Primary Actor:	Customer
Other Actors:	None
Goal:	Customer may add, change, or delete its profile information as necessary. For example, to change phone number, relocate the business, etc.
Basic Course of Events:	This use case begins when a registered customer wants to change its profile information.

	Each customer enters its customer ID and password, and clicks the “Log In” button on the system web page. All profile data will be brought to the user in a form of editable data entries. After the customer makes the changes, it clicks the “submit” button. If no data errors are found, a “success” message will be send to the customer.
Pre-conditions:	The customer must be a registered customer.
Post-conditions:	Old profile information is lost.

Use Case Name:	**Send RFQ to Company**
Summary:	The customer fills out the RFQ form and submits it.
Primary Actor:	Customer
Other Actors:	N/A
Goal:	A registered user uses the web interface to fill the RFQ form. The customer may add, change, or delete its profile information if needed. For example, change of phone number, close of business, etc.
Basic Course of Events:	This use case begins when a registered customer wants to initiate business with the contractor. The customer logs into the system, goes to the RFQ form. fills out the form, including customer ID, bonding requirements, bond amount, overhead, tax, and most importantly, jobsites and line items.
Pre-conditions:	The customer must be a registered customer.
Post-conditions:	N/A

Use Case Name:	**Send RFQ Addendum**
Summary:	Send Addendum in response to questions or clarifications thought necessary to the specifications.
Primary Actor:	Customer
Other Actors:	Company
Goal:	A formal addendum process is often involved with most large RFQs. The Customer sends Addendum in response to questions or clarifications posed by the company or its subcontractors and thought necessary to the specifications.
Basic Course of Events:	This use case begins when the company has questions regarding the RFQ or the Vendor has questions on request for prices. After receipt of an RFQ, if the company has questions need or clarifications on the RFQ, (and it is before the due date) the company will send the customer a request for clarification. The customer may (or may not, if it is determined that no change is to be made) return a response as an addendum. If a supplier (vendor or subcontractor) has questions regarding the RFQ, it will send those questions to the company. If it is before the RFQ due date, and the company can answer the questions, the company will send a response back to the supplier. If the questions involve the customer, the company will transmit the question to the customer.
Trigger: *(the specific action that caused the Use Case to start)*	The company has a question regarding the RFQ specifications.
Pre-conditions:	The request for clarification must be prior to the due date.
Post-conditions:	Questions are cleared.

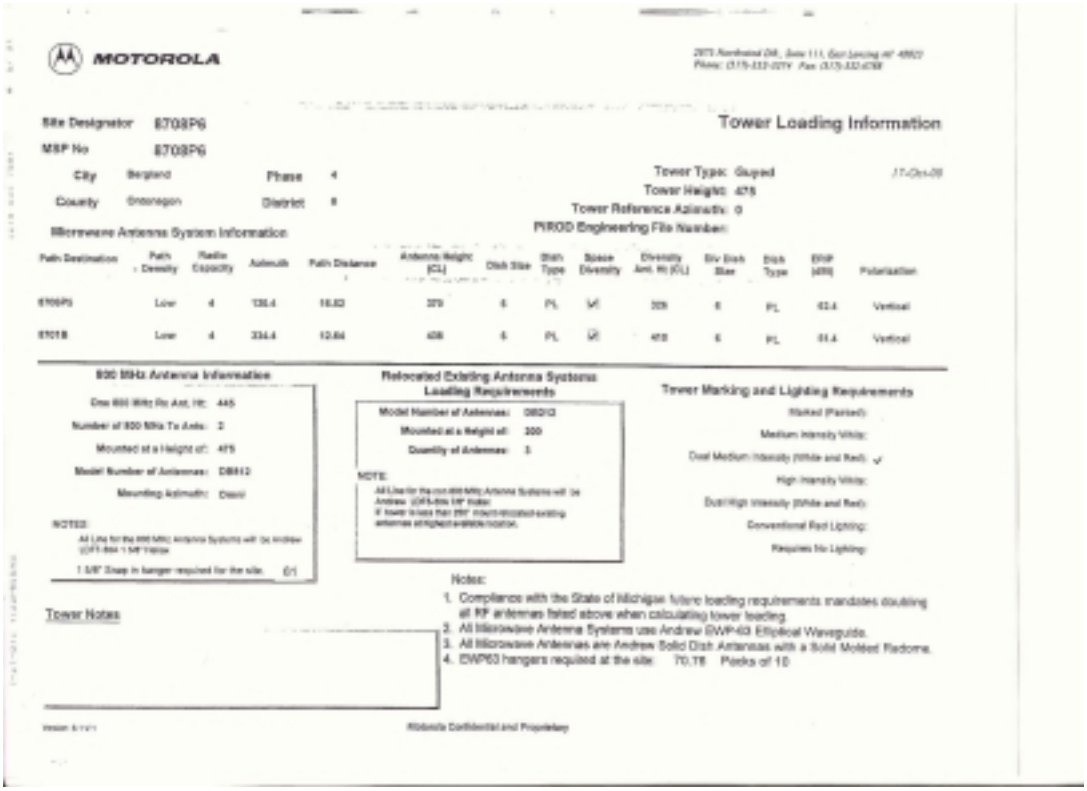
Use Case Name:	**Send Vendor Addendum**
Summary:	Send Addendum in response to questions or clarifications thought necessary to the specifications.
Primary Actor:	Vendor
Other Actors:	Customer, vendor,
Goal:	A formal addendum process always involved with most large RFQs. Send Addendum in response to questions or clarifications thought necessary to the specifications.
Basic Course of Events:	This use case begins when the vendor has questions on the large request for prices sent by the company. Upon receipt of Request For Prices, if the vendor has questions need to clear on RFQs and it is before the due date, the vendor will send the company an addendum for clarification. The company will send back the response of the addendum. If the company cannot answer the questions and need to contact the customer, the company uses the “send RFQ addendum” use case to request for addendum. Upon the receipt of the addendum from the customer, the company sends its own addendum back to the vendor.
Trigger: *(the specific action that caused the Use Case to start)*	The Vendor has some questions on the RFQs that need to be cleared.
Pre-conditions:	The questions need to be answered by the customer
Post-conditions:	Questions are cleared

Appendix

Exhibit 1: Current "Bid System" – Excel Spreadsheet

MICRO TOWER, INC.- PRICING DETAIL							
QUOTED TO:	TEXAS EASTERN		REVISIONS				
QUOTE #:	97278		REV. NO.:				
BID DATE:	2-01-98		REV. DATE:				
SITE NAME OR #:	STARKS	LAKE CHARLES	GILLIS	HOLMWOOD	NEW IBERIA	LAKE ARTHUR	CENTERVILE
STATE OR COUNTRY:	LA	LA	LA	LA	LA	LA	LA
HEIGHT:	EXISTING 340'	EXISTING 340'	EXISTING 300'	EXISTING 190'	EXISTING 340'	EXISTING 320'	EXISTING 340'
STRUCTURE TYPE:	GUYED	GUYED	GUYED	GUYED	GUYED	GUYED	GUYED
MANUFACTURER:	PATH	PATH	ROHN	K&B	EMSCO	EMSCO	EMSCO
WEIGHT:							
FOUNDATION:	N/A	N/A	N/A	N/A	3 ANCHORS [6 CU. YDS.]	3 ANCHORS [6 CU. YDS.]	N/A
ANTENNAS INSTALL:	2-10',3-8',1-6'	1-8',1-6'	2-8'	1-8',2-6'	2-8',2-6'	3-8',2-6'	1-8',2-6'
ANTENNAS REMOVE:	4-10',2-8'	4-10'	1-8',1-6'	1-8'	2-6',2-10'	2-6',2-10'	1-6',1-10'
W/G INSTALL:	1364'-EWP63	440'-EWP63	280'-EWP63	465'-EWP63	940'-EWP63	730'-EWP63,230'-7/8"	575'-EWP63
W/G REMOVE:	1609'-EWP63	1246'-EWP63	420'-EWP63	170'-EWP63	1280'-EWP63	1198'-EWP63	645'-EWP63
TOWER/MOD STEEL:	4,500.00	2,250.00	-	-	17,250.00	5,100.00	8,500.00
INSTALLATION:	7,450.00	4,050.00	N/A	N/A	29,500.00	18,250.00	19,125.00
REMOVAL:	-	-	N/A	N/A	3,200.00	1,000.00	1,000.00
FOUNDATION:	N/A	N/A	N/A	N/A	9,460.00	9,460.00	N/A
ANTENNAS:	-	-	-	-	-	-	-
INSTALLATION:	2,900.00	1,100.00	900.00	1,650.00	2,300.00	2,950.00	1,650.00
REMOVAL:	2,400.00	2,000.00	600.00	400.00	2,000.00	1,800.00	1,000.00
W/G LADDER:	-	-	-	-	-	-	-
INSTALLATION:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
W/G- COAX:	-	-	-	-	-	-	-
INSTALLATION:	3,750.00	1,210.00	770.00	1,280.00	2,585.00	2,350.00	1,580.00
REMOVAL:	2,815.00	2,180.00	735.00	300.00	2,240.00	2,100.00	1,130.00
ANT. MOUNTS:	4,500.00	1,500.00	1,500.00	2,250.00	3,000.00	3,000.00	2,250.00
INSTALLATION:	4,500.00	1,500.00	1,500.00	2,250.00	3,000.00	3,000.00	2,250.00
REMOVAL:	600.00	400.00	200.00	100.00	INCLUDED	400.00	200.00
PAINT:	-	-	-	-	-	-	-
INSTALLATION:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LIGHTS:	-	-	-	-	-	-	-
INSTALLATION/MOD.:	N/A	N/A	N/A	N/A	2,500.00	N/A	N/A
SAFETY CLIMB:	-	-	-	-	-	-	-
INSTALLATION:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GROUNDING:	-	-	-	-	-	-	-
INSTALLATION:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
W/G BRIDGE:	-	-	-	-	-	750.00	750.00
INSTALLATION:	N/A	N/A	N/A	N/A	N/A	750.00	750.00
CLEAN-UP:	125.00	125.00	125.00	125.00	125.00	125.00	125.00
TESTING:	2,150.00	1,250.00	1,250.00	1,250.00	1,250.00	1,250.00	1,250.00
DELIVERY:	NOT QUOTED	NOT QUOTED	NOT QUOTED	NOT QUOTED	NOT QUOTED	NOT QUOTED	NOT QUOTED
SITE TOTALS:	35,690.00	17,565.00	7,580.00	9,605.00	78,410.00	52,285.00	41,560.00
SUB TOTAL:	698,990.00						
SALES/USE TAXES:	NOT QUOTED						
BONDING:	NOT QUOTED						
MOBILIZATION:	3 INCLUDED						
TOTAL:	698,990.00						

Exhibit 2: Example RFQ (Request For Quotation)



MOTOROLA

2873 Northwind Dr., Suite 111, East Lansing MI 48823
Phone: (517)-332-3274 Fax: (517)-332-6788

Site Designator 8708P6

MSP No 8708P6

City Bergland Phase 4

County Ontonagon District 8

Tower Loading Information

Tower Type: Guyed 17-Oct-08

Tower Height: 475

Tower Reference Azimuth: 0

PIROD Engineering File Number:

Microwave Antenna System Information

Path Destination	Path Density	Radio Capacity	Azimuth	Path Distance	Antenna Height (CL)	Dish Size	Dish Type	Space Diversity	Diversity Ant. Ht (CL)	Div Dish Size	Dish Type	ERP (dBi)	Polarization
8708P5	Low	4	136.4	16.82	370	6	PL	☑	305	6	PL	62.4	Vertical
8701B	Low	4	334.4	12.84	408	6	PL	☑	410	6	PL	61.4	Vertical

800 MHz Antenna Information

One 800 MHz Rx Ant. Ht: 445

Number of 800 MHz Tx Ants: 2

Mounted at a Height of: 475

Model Number of Antennas: DB812

Mounting Azimuth: Omni

NOTES:

All Line for the 800 MHz Antenna Systems will be Andrew (CFT-50A 1 5/8" Hdlite)

1 5/8" Snap in hanger required for the site. 61

Relocated Existing Antenna Systems Loading Requirements

Model Number of Antennas: DB212

Mounted at a Height of: 200

Quantity of Antennas: 3

NOTE:

All Line for the non 800 MHz Antenna Systems will be Andrew (CFT-50A 1/8" Hdlite)

If tower is less than 200' mount relocated existing antennas at highest available location.

Tower Marking and Lighting Requirements

Marked (Painted):

Medium Intensity White:

Dual Medium Intensity (White and Red): ✓

High Intensity White:

Dual High Intensity (White and Red):

Conventional Red Lighting:

Requires No Lighting:

Tower Notes

Notes:

1. Compliance with the State of Michigan future loading requirements mandates doubling all RF antennas listed above when calculating tower loading.
2. All Microwave Antenna Systems use Andrew EWP-63 Elliptical Waveguide.
3. All Microwave Antennas are Andrew Solid Dish Antennas with a Solid Molded Radome.
4. EWP63 hangers required at the site: 70.78 Packs of 10

Version: 5.1.1.1

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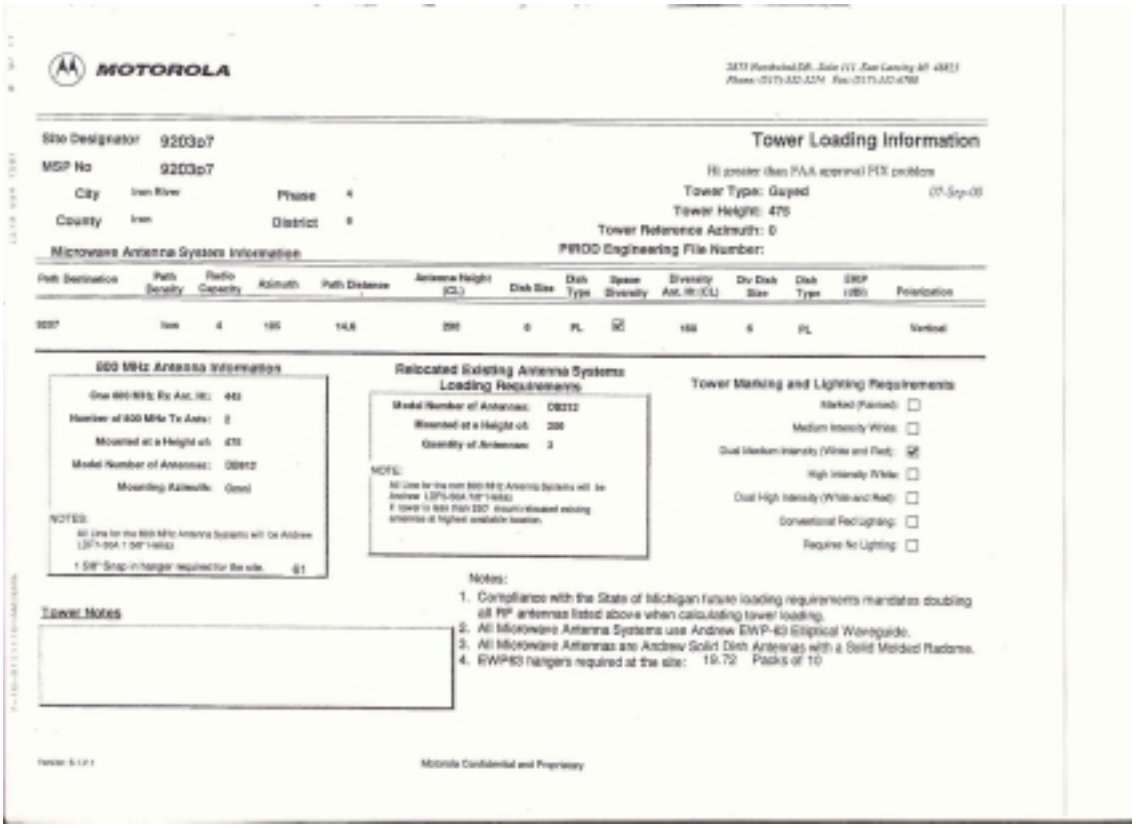

MOTOROLA

2873 Northwind Dr., Suite 111, East Lansing MI 48823
Phone: (517)-332-3274 Fax: (517)-332-6788

Site Designator 9203p7

MSP No 9203p7

City Iron River Phase 4

County Iron District 8

Tower Loading Information

Hi greater than FAA approval FIX problem

Tower Type: Guyed 07-Sep-08

Tower Height: 475

Tower Reference Azimuth: 0

PIROD Engineering File Number:

Microwave Antenna System Information

Path Destination	Path Density	Radio Capacity	Azimuth	Path Distance	Antenna Height (CL)	Dish Size	Dish Type	Space Diversity	Diversity Ant. Ht (CL)	Div Dish Size	Dish Type	ERP (dBi)	Polarization
9207	low	4	185	14.6	290	6	PL	☑	158	6	PL		Vertical

800 MHz Antenna Information

One 800 MHz Rx Ant. Ht: 445

Number of 800 MHz Tx Ants: 2

Mounted at a Height of: 475

Model Number of Antennas: DB812

Mounting Azimuth: Omni

NOTES:

All Line for the 800 MHz Antenna Systems will be Andrew (CFT-50A 1 5/8" Hdlite)

1 5/8" Snap in hanger required for the site. 61

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Quantity of Antennas: 3

NOTE:

All Line for the non 800 MHz Antenna Systems will be Andrew (CFT-50A 1/8" Hdlite)

If tower is less than 200' mount relocated existing antennas at highest available location.

Tower Marking and Lighting Requirements

Marked (Painted): ☐

Medium Intensity White: ☐

Dual Medium Intensity (White and Red): ☑

High Intensity White: ☐

Dual High Intensity (White and Red): ☐

Conventional Red Lighting: ☐

Requires No Lighting: ☐

Tower Notes

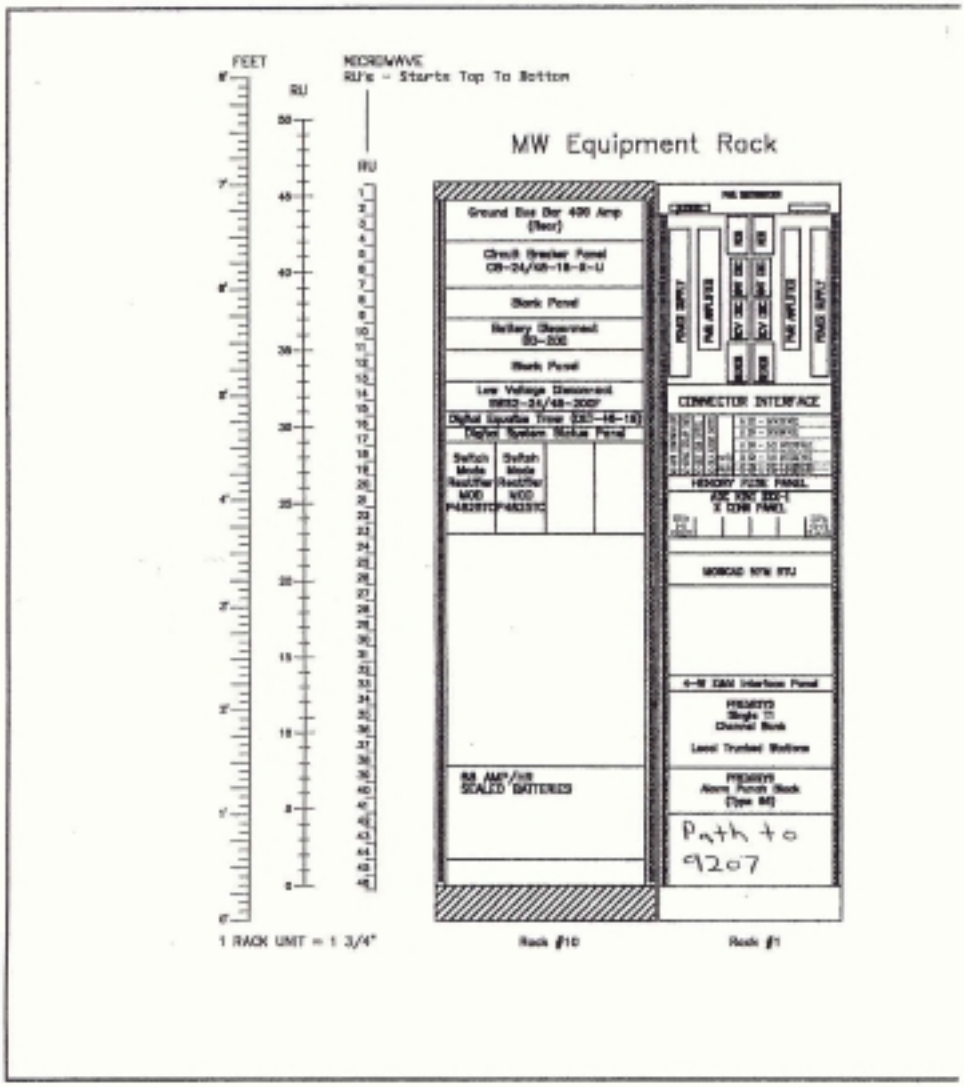
Notes:

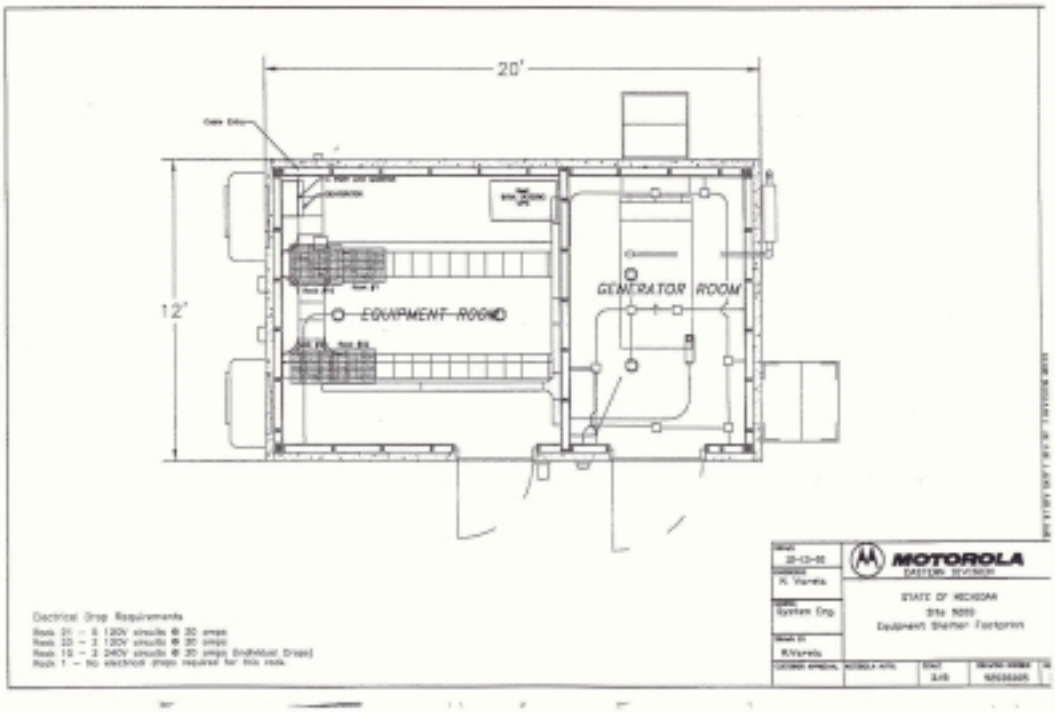
1. Compliance with the State of Michigan future loading requirements mandates doubling all RF antennas listed above when calculating tower loading.
2. All Microwave Antenna Systems use Andrew EWP-63 Elliptical Waveguide.
3. All Microwave Antennas are Andrew Solid Dish Antennas with a Solid Molded Radome.
4. EWP63 hangers required at the site: 19.72 Packs of 10

Version: 5.1.1.1

Motorola Confidential and Proprietary

9203 Iron River





Electrical Drop Requirements

Rack 21 – 3 120V circuits @ 20 amps
Rack 22 – 3 120V circuits @ 20 amps
Rack 15 – 3 240V circuits @ 20 amps (Individual Drops)
Rack 1 – No electrical drops required for this rack.

MOTOROLA
EASTERN DIVISION

STATE OF MICHIGAN
Site 5000
Equipment Shelter Footprint

R.Varela

21048

Subcontractor SOM Phase II Lump Sum Pricing Format

Site #- 9203

Site Name- IRON RIVER MICH.

	Lump Sum Price Breakdown	UNITS	QTY	MAT'L /SF/ UNIT	LABOR /SF/ UNIT	DIRECT MAT'L $	LABOR $	EQP/TOOL & INDIRECT MAT'L $	TOTAL $
1.0	**General Considerations**								
	Indirect Personnel	LS							
	Clean up	LS	1						1000
	Mobilization	LS							-0-
	Subtotal Section 1.0								1000
							--		
2.0	**Tower**								
	Erection 475'		1						36100
	Lighting		1						4200
	Lightning Arrester System		1						1500
	Subtotal Section 2.0								41800
3.0	**New Feedlines & Antennas**								
	800 Antennas								
	Celwave PD10017	EA							
	Decibel DB812	EA	3		550				1650
	Diagnars B801 8,10 or 12	EA							
	800 Lines 1 5/8" Andrew 1395'	LF			2.75				3835
	Microwave Dishes								
	Install 12'	EA							
	Install Dish Mount	EA							
	Install 10'	EA							
	Install Dish Mount	EA							
	Install 8'	EA							
	Install Dish Mount	EA							
	Install 6'	EA	2		500				1000
	Install Dish Mount	EA	2		300				600
	EW63 Lines 369'	LF			3.85				1415
	Ice Bridge 3'x10' with 4 posts	LS	1						1200
	Mount Dehydrator & Line Monitor	LS	1						1200
	Run Strobe and SO cards into shelter and mount light controllers on wall terminate conductors into controllers	LS							1600
	Subtotal Section 3.0								12500
4.0	**Other**								
							Total		55300