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# AIR COMMAND AND STAFF COLLEGE

STUDENT REPORT  
COMPUTER SOFTWARE FOR LIFE CYCLE COST

MAJOR RICHARD E. BOWMAN 87-0300

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**REPORT NUMBER** 87-0300

**TITLE** COMPUTER SOFTWARE FOR LIFE CYCLE COST

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Submitted to the faculty in partial fulfillment of  
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<p>At many base contracting offices, best bid cost calculations are still being done by hand. The purpose of this project is to determine if computer software (with supporting documentation) can be developed to calculate the best bid cost. The result of these calculations is typically referred to as the life cycle cost (LCC) of the system. This software will be used to procure automated data processing equipment but can be easily adapted to any other contract analysis of life cycle cost. This report documents the creation and use of this life cycle cost spreadsheet template for the Wang VS computer system. KEYWORDS: MANUAL OPERATIONS, COMPUTER</p>					
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## PREFACE

There are many time consuming tasks being performed today by hand, which could be done more effectively by computer. At many base contracting offices, best bid cost calculations are still being done by hand. The purpose of this project is to determine if computer software (with supporting documentation) can be developed to calculate the best bid cost. The result of these calculations is typically referred to as the life cycle cost (LCC) of the system. This software will be used to procure automated data processing equipment but can be easily adapted to any other contract analysis of life cycle cost. This report documents the creation and use of this life cycle cost spreadsheet template for the Wang VS computer system.

The author wishes to publicly acknowledge the assistance and support of the many people who contributed to the project including the project's sponsor and his faculty advisor. A special thanks goes to Mrs Ramona Hicks and Mrs Alice Watkins for their patience in explaining the project requirements and computer system operation.

This project was sponsored by the Air Force Logistics Management Center. The software developed for this project can be obtained on floppy disc by contacting the Air Force Logistics Management Center, Directorate of Contracting, Gunter AFS, AL, 36114. The telephone number is AV 446-4085 or commercial 205-279-4085.

Appendix B of this report stands by itself. The sponsor can publish it with Appendix A attached as a separate stand-alone user's guide for the spreadsheet template.



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## ABOUT THE AUTHOR

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Major Richard E. Bowman graduated from the United States Air Force Academy in June 1974 with a B.S. in Engineering Science with an area of emphasis in computer control systems. He was assigned as a Missile Combat Crew Member with the 90<sup>th</sup> Strategic Missile Wing, F. E. Warren AFB, WY. While there, he received his Master's in Business Administration (with an emphasis in Information Systems) from the University of Wyoming. He then was assigned to the Advanced Ballistic Reentry Systems Office at Los Angeles AFS, CA. In 1979, he transferred to the Teal Ruby Program where he became the Spacecraft Project Manager. During his time on the program, he was responsible for the design, development and test of many of the spacecraft subsystems including the flight software and flight control hardware. While at Los Angeles AFS, he continued his personal interest in computers by building a Heathkit H-89 microcomputer. His next assignment was to Arnold Engineering Development Center (AEDC), Arnold AFS, TN. While there, he was responsible for the thermal-vacuum space simulation testing of the Global Positioning System Block II qualification satellite. Later as Chief of the Reentry Systems Division at AEDC, he was responsible for aerodynamic and materials testing for intercontinental ballistic missile and submarine launched ballistic missile reentry vehicles, space shuttle thermal protection system components, and Strategic Defense Initiative related kinetic energy weapons effects testing. He is a graduate of the Program Manager Course at the Defense Systems Management College, Squadron Officers School, and Air Command and Staff College. He is active in the National Management Association and is recognized as a Certified Manager by the Institute of Certified Managers. His decorations include the Defense Meritorious Service Medal, the Air Force Meritorious Service Medal, and the Air Force Commendation Medal.



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## EXECUTIVE SUMMARY

Part of our College mission is distribution of the students' problem solving products to DoD sponsors and other interested agencies to enhance insight into contemporary, defense related issues. While the College has accepted this product as meeting academic requirements for graduation, the views and opinions expressed or implied are solely those of the author and should not be construed as carrying official sanction.

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REPORT NUMBER 87-0300

AUTHOR(S) MAJOR RICHARD E. BOWMAN

TITLE COMPUTER SOFTWARE FOR LIFE CYCLE COST

I. Purpose: Determine if documented computer software can be developed to calculate the best bid cost, considering system life and cost of money discount factors.

II. Problem: There are many time consuming tasks being performed today by hand that could be done more effectively by computer. At many base contracting offices, best bid cost calculations are still being done by hand. The purpose of this project is to determine if computer software (with supporting documentation) can be developed to calculate the best bid cost. The calculations should consider system life and time-value-of-money discount factors. The result of these calculations is typically referred to as the life cycle cost (LCC) of the system. This software will be used to procure automated data processing equipment but can be easily adapted to any other contract analysis of life cycle cost. If computer software can be developed, the calculations would be faster and more accurate.

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## CONTINUED

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III. Solution Method: First, the calculations to be performed were defined, the available hardware was inventoried, existing life cycle cost programs were examined for applicability, and programming software was reviewed to pick an appropriate system to implement the solution. Then the calculations were developed on the computer and test cases were run to determine if the software performed the required tasks. Finally, the development and use of the software was documented. The documentation allows users with little computer experience to use the software. More experienced users can make changes to meet their individual needs.

IV. Solution Chosen: The Wang VS hardware system was chosen because it had the required capabilities and it is being installed in a vast majority of Air Force base contracting offices. The Wang 20/20 Spreadsheet program was chosen as the software to run the program. A fill-in-the-blank template was developed to solve the life cycle cost problem. The software was reviewed by contract buyers at Maxwell AFB and their comments and suggestions were used in the development of the user's guide.

V. Conclusions: The software developed under this project represents an important time saving tool for base level contract buyers.

VI. Recommendations: A follow-on project, similar to this one, to calculate a weighted factors analysis of competing proposals would yield similar time saving results for base level contract buyers.

## **CHAPTER ONE INTRODUCTION**

There are many time consuming tasks being performed today by hand that could be done more effectively by computer. At many base contracting offices, best bid cost calculations are still being done by hand. The purpose of this project is to determine if computer software (with supporting documentation) can be developed to calculate the best bid cost. The calculations should consider system life and time-value-of-money discount factors. The result of these calculations is typically referred to as the life cycle cost (LCC) of the system. This software will be used to procure automated data processing equipment but can be easily adapted to any other contract analysis of life cycle cost. If computer software can be developed, the calculations will be faster and more accurate.

The problem was solved with a straight-forward approach. First, the required calculations were defined, the available hardware was inventoried, existing life cycle cost programs were examined for applicability, and programming software was reviewed to pick an appropriate system to implement the solution. Then the calculations were developed on the computer and test cases were run to determine if the software performed the required tasks. Finally, the development and use of the software were documented and the user's guide was checked with sample inputs by contract buyers at the Maxwell AFB Contracting Office. With the documentation, users with little computer experience can use the software. More experienced users can make changes to meet their individual needs.

This project is sponsored by the Air Force Logistics Management Center (AFLMC), Directorate of Contracting, Gunter AFS, AL. The original request for the software development was submitted to the AFLMC by the 3800<sup>th</sup> Air Base Wing, Base Contracts Office, Maxwell AFB, AL. All of the software development work was performed on the Maxwell AFB equipment.

## **CHAPTER TWO**

### **THE LIFE CYCLE COST PROBLEM**

To get a better feel for the scope of the life cycle cost problem, it is important to understand what life cycle cost is, why the current emphasis exists, and why this capability is needed at the base level.

#### **LIFE CYCLE COST CONCEPTS**

Life cycle cost (LCC) is simply the total cost of obtaining, operating, and disposing of a system. The system can be anything from a computer for local base use (the main thrust of this project) to a system such as the B-1B bomber. Determining life cycle cost can be broken down into two basic steps (1) obtaining all the expected costs for the life of the system and (2) applying a time-value-of-money calculation to obtain the LCC for the system.

The first step--obtaining all the expected costs during the system's life--can be a simple or very complex task depending on the system. Systems life is defined as "... a forecast or projection of the period of time which begins with the installation of the systems or items and ends when the Government's need for such systems or items terminates." (7:5) It is important to note the "system/item's life is not necessarily synonymous with technological life (utility before becoming obsolete), physical life (utility before physically wearing out), or application life (utility in a given function)." (7:5) The costs are usually broken down into categories such as purchase cost, maintenance cost, spare parts cost, installation cost, training cost, basing or housing cost, and disposal cost. The importance of examining these categories very closely can be seen from the example of the Polaris submarine program. The original plan to build the submarines did not consider the cost of disposing of them and the reactors thirty years later. No acceptable disposal plan has been developed and when one is, it could very easily cost more than the original cost to build the submarine. If LCC had been considered early on, a disposal plan could have been

developed and funded, or perhaps a completely different approach would have been taken to the design of the submarine. While this first step of the process is important for determining the estimated cost of the system, the second step is important in determining the least costly of two or more competing systems.

The second part of the process takes into account the time-value-of-money concept. The basic concept is, one dollar today is more valuable than one dollar some time in the future because the current dollar can be invested and earn interest. The corollary--from the government purchasing side--is, given the choice of making a one-dollar payment today or sometime in the future, the payment should be made in the future because you can earn interest on the dollar until the payment must be made. Once this idea is grasped, it becomes apparent that any proposal for equipment or services which includes payments made in the future should be examined to take into account time-value-of-money considerations. A proposal with a low initial price and high follow-on costs could be more cost efficient in the long run than a proposal with medium initial costs and medium follow-on costs.

### **WHY USE LIFE CYCLE COST**

There are two reasons this is an important concept. The first and most obvious reason is it allows the true purchase cost of a system to be considered during the selection process. Another equally important reason is it is required for all automatic data processing systems procured with a value of more than \$25,000. (6:24-4; 5:70.3-11)

### **REASONS FOR USING A COMPUTER**

These LCC calculations can be very detailed, tedious, and time-consuming. They are currently often performed by hand at the base level. For example, suppose a calculation was for

- a. a 120-month contract with,
- b. five cost categories,
- c. two contract options (buy versus rent), and
- d. five bidders on the contract.



That makes:

$$\begin{aligned} &120 \text{ months} \times 5 \text{ cost categories} \times 2 \text{ contract options} \times 5 \text{ bidders} \\ &= \mathbf{6,000} \text{ hand calculations.} \end{aligned}$$

If any of the values are changed on a bid revision, a significant amount of the work would need to be redone. For example, one changed value would result in thirteen additional entries on a hand calculator to recompute the LCC. This counts the single element to be recomputed and the recalculation of the bottom line figures. This is a perfect place for a computer to relieve the "busy work" required of the contract buyer. A computer would do the calculations and prepare a written report of the calculations with fewer errors because all the time-value-of-money factors (six digit numbers) would already be in the program and would not have to be entered by hand. This cuts the amount of keyboard work by more than 50 percent and eliminates the hand transfer of the results to the report sheet. This makes revisions very easy, increases reliability, and improves accuracy. If a computer is a reasonable solution to the problem, the question then becomes, "Which computer and software should be used to do the job?"

## **CHAPTER THREE**

### **HARDWARE AND SOFTWARE SELECTION**

This chapter describes the hardware and software examined to implement the solution to the life cycle cost calculation problem. It should be recognized that the selection process was iterative, and several passes were made through the decision loop as more information on hardware and software was found. First, two basic hardware systems were reviewed--the Zenith family of microcomputers that have been on government contract for four years and are widely available, and the Wang VS family of minicomputers that are currently being procured for most Air Force contracting offices. (4:1; 8:--). Once a hardware system was chosen, a review was done to determine availability of existing life cycle cost software. Then, available programming software was reviewed. The strengths and weaknesses of any existing software were compared to the strengths and weaknesses of available development software. The most appropriate one was chosen.

#### **HARDWARE SELECTION**

The Zenith family of microcomputers was first available on a purchase order basis in 1983 and since then has proved to be very popular. (4:1) They are widely available and relatively inexpensive. The current system (available beginning in Feb 1986) is the Zenith Z-248. (3:3) A starter system consists of a Z-248 with two floppy drives, 512KB memory, a BASIC interpreter, diagnostic software, Microsoft Windows and owner's manual. The starter system with a printer can be obtained for under \$2000. (3:5) The Maxwell AFB Contracting Office does not have a Zenith system, but the office has access to a Zenith system from another organization on the base.

The other available system is the Wang VS system, installed at Maxwell AFB in 1984. Maxwell AFB was one of three bases chosen to use the system on a trial basis before the decision was made in 1986 to install it at most Air Force base contracting offices. (8:--). The Wang VS100 has at least 2 megabytes of memory,

can handle up to 128 workstations, and can use up to 9.9 billion bytes of on-line disk storage.(11:33) The Maxwell AFB system is configured with 3 megabytes of memory, 33 workstations and 6 megabytes of disk storage. (13:--)

The factors considered in choosing the hardware system were

- a. the hardware capability to do the job,
- b. software compatible with the hardware,
- c. software capability to do the job,
- d. local availability, and
- e. Air Force wide availability.

The hardware must be capable of doing the job and have adequate supporting software.

HARDWARE SELECTION CHART		
CRITERIA \ SYSTEM	ZENITH	WANG
HARDWARE CAPABILITY	YES	YES
SOFTWARE COMPATIBILITY	YES	YES
SOFTWARE CAPABILITY	YES	YES
LOCAL AVAILABILITY	ON BASE	IN PLACE
WIDE AVAILABILITY	PROBABLY	BEING PROCURED

Figure 1. Hardware Selection

It is also important to have easy access to the hardware for the contract buyer who will use the system. Figure 1 shows a selection chart.

The evaluations are based on the author's experience with computer systems. Both hardware systems have the required capability to do the job. Both systems have very similar development software available, and the implementation of this life cycle cost program is well within the capabilities of either system. While both systems are available, the Wang system is easily accessible and additionally it is being installed Air Force wide at most base contracting offices. It is important to note, use of the Wang system eliminates the requirement for the contract buyer to learn how to operate two different computer systems. The Wang System was chosen because it best met the selection criteria.

### **SOFTWARE SELECTION**

A two step approach was taken in reviewing available software. First, a review was made to see if any software already existed to do the life cycle cost calculations. Then, available development software was reviewed to determine its usefulness in implementing a solution. For this purpose, development software is defined as a programming language or software tool. Examples are machine language, assembly language, BASIC, Fortran, spreadsheets, and data bases. Any existing life cycle cost software would be in one of these languages.

During the search for existing life cycle cost software, two programs emerged. The first was found using the DIAL-A-LOG system belonging to the Air Force Small Computer Office at Gunter AFS, AL. The 3303d Contracting Squadron/LGCX, Randolph AFB, TX is currently running this software on a Wang 2200 System using a Wang 4230 Workstation. It is written in the BASIC programming language. However the 3303d is converting to the new Wang VS System, so this package will soon be outdated. (9:--) The software could be converted to run on the new Wang VS system, but this approach was not chosen because it is not as easy for the end user to convert or modify software written in BASIC as in some other programming languages. It was used as a guide for output formatting. (1:--) The second software program is available from the Defense Systems Management College and is designed to run on Zenith or IBM microcomputers. It was downsized to run on microcomputers from a family of mainframe computer programs developed by Honeywell. The program is designed

to evaluate very complex contract actions involving maintainability, reliability, production rates, and unit cost calculations. This package is much more complex than the software needed for this project. (2:--)

There are many programming packages available. Those considered were Cobol, Fortran, Basic, and the Wang 20/20 spreadsheet. (11:CS-1 - CS-30) The first three are advanced programming languages and are more difficult for the first-time user. The fourth is a relatively simple spreadsheet program with advanced user features making it attractive, especially if the user has previous experience with a spreadsheet program. The selection criteria for the programming software were

- a. ease of use,
- b. short training time,
- c. ease of modification by the user, and
- d. ease of creation of the required software programming.

Items a and b are important because the person using this program will probably not be a trained computer programmer. In fact, he or she may have very little computer expertise. Items c and d are particularly important in this day of rising software costs.

A Program Management Directive (PMD), issued 7 October 1985, established the Information Systems Technology Application Program (ISTAP), which is charged with modernizing software development methods in the Air Force. The ISTAP advocates the use of commercial software, programming aids, and end user development to facilitate software production. If the ISTAP achieves its goals, after 1989, 50 percent of all software developed in the Air Force will be developed by end-users. (10:22)

The big advantages end-user developed software gives are rapid development, low cost, versatility, and ease of modification. (10:--)

Figure 2 shows the advantages and disadvantages of each of the software packages considered. The evaluations are based on the author's experience with computer systems. The Wang 20/20 spreadsheet software was chosen.

Wang 20/20 is a spreadsheet application enabling you to create, modify, store, and print data as a spreadsheet model using a column and row format. The spreadsheet concept is straightforward and is easily grasped by a new computer user. What you see on the computer screen as you enter the data is what you get when you print out the final product. Wang 20/20 also combines the standard spreadsheet functions such as addition, subtraction, multiplication, etc. with graphics, special analysis tools, and interfaces with other applications. (12:1-1) The technique used with this software is a fill-in-the-blank template on the computer. A contract buyer with little or no computer experience can easily use this template for the required calculations.

SOFTWARE SELECTION CHART				
CRITERIA SOFTWARE	EASY TO USE	EASY TRAINING	EASY TO MODIFY	EASY TO CREATE
3303rd S/W	Yes	Yes	No	Exists
DSMC S/W	Medium	Complex	No	Exists
COBOL	Yes	Yes	Maybe	Maybe
FORTTRAN	Yes	Yes	Maybe	Maybe
BASIC	Yes	Yes	Maybe	Maybe
WANG 20/20	Yes	Yes	Yes	Yes

Figure 2. Software Selection

With the hardware and programming software chosen, a conceptual layout of the software template was needed. This layout would be the foundation to guide the programming of the software template.

## **CHAPTER FOUR**

### **LIFE CYCLE COST MODEL DESCRIPTION**

This chapter outlines the concepts behind the design of the software template. A software template should meet several criteria. It should cover the range of anticipated procurement methods, handle the dollar amounts anticipated in the calculations, and be easy to understand. (8:--) This chapter describes how the template meets these three criteria. Detailed user instructions are covered in Chapter Five.

#### **TEMPLATE PROCUREMENT METHODS AND SIZE**

The template is designed to handle five different procurement methods. This is accomplished by including in the template different cost categories to handle the different elements of the various proposals. A brief description of the different procurement methods the template can handle follows:

a. PURCHASE. Outright purchase after installation and acceptance of the equipment.

b. LEASE.

(1) STRAIGHT LEASE - The contractor retains title to the equipment throughout the system life. Such plans can provide multiyear leasing at determinable prices where the agency exercises a renewal option at the end of each fiscal year.

(2) LEASE WITH OPTION TO PURCHASE (LWOP) - Lease with the option to purchase at predetermined intervals of time. The purchase price is reduced by subtracting rental credits as set forth in the offeror's proposal.

c. SPECIAL PLANS.

(1) LEASE-TO OWNERSHIP. . . - A plan whereby title transfers after payment of n months of lease/rental, but with no obligation to continue to lease beyond each fiscal year. . . .

(2) INSTALLMENT PURCHASE PLAN - A plan that is similar to a



lease to ownership plan, except that the Government is sometimes granted "encumbered" title after installation and acceptance of the equipment, with "clear" title passing at the end of the contract. . . .  
(7.6)

The template is sized to accommodate procurements up to 120 months duration and a total value of \$99,999,999.99. This is the maximum value normally handled at the base contracting level. (8:--)

### **TEMPLATE DESCRIPTION**

The template is divided into four key areas. The areas are identified on a diagram illustrating the layout of the working area of the spreadsheet template.

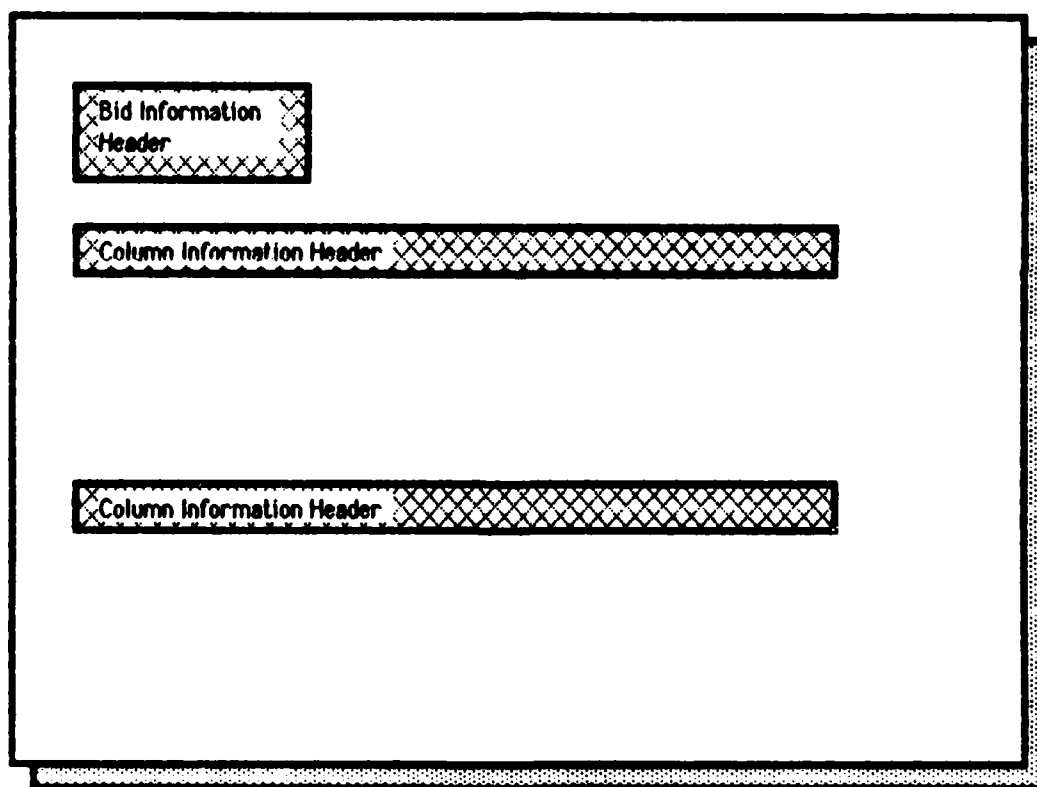


Figure 3. Header Information Areas

As each area is identified, it is described and added to the pictorial, until the complete template is developed.

1) **Header Information Areas.** These areas, shown in Figure 3, identify data entry locations for each procurement action. Typical information would be vendor name, acquisition method, date, number of months, purchase cost information, etc. The Bid Information Header is where the procurement identification data is found on the template. The first Column Header Information Area is for the Bid Cost Data Entry Area and the second is for the Calculation Area. Typical cost information which would be entered in this area includes purchase cost, software cost, and maintenance cost. A complete list can be found by looking at the column headings on the sample printout in Appendix A. The Column Header Information Areas of the template are locked to avoid inadvertent change or deletion of the information by the software user.

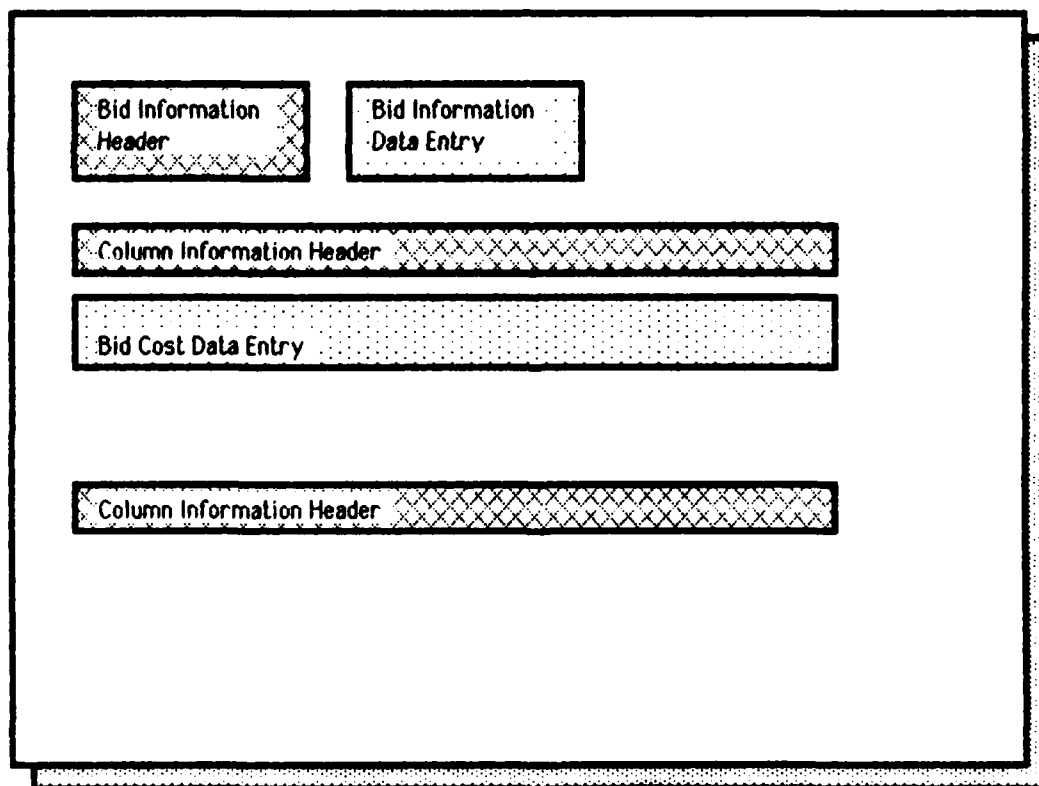


Figure 4. Data Entry Areas

2) **Data Entry Areas.** These areas are used to enter the data for an offeror. Figure 4 shows them located in two areas on the template. The first is to the right of the Bid Information Header. The identifying data for the calculations are in this area. Included are vendor name, solicitation number, acquisition method, date and the calculation duration in months. The second area where data are entered on the template is the Bid Cost Data Entry Area under the first Column Information Header. This is where all the cost data for the calculations of an offeror's proposal are entered. This area is compressed in the pictorial to conserve space. On the actual template it is 120 lines long to accommodate the 120-month calculation requirement.

3) **Time-Value-of-Money Factor Area.** This area of the template stores the time-value-of-money calculation factors. The factors in the template are based on an annual discount rate of 10 percent. (7:9)

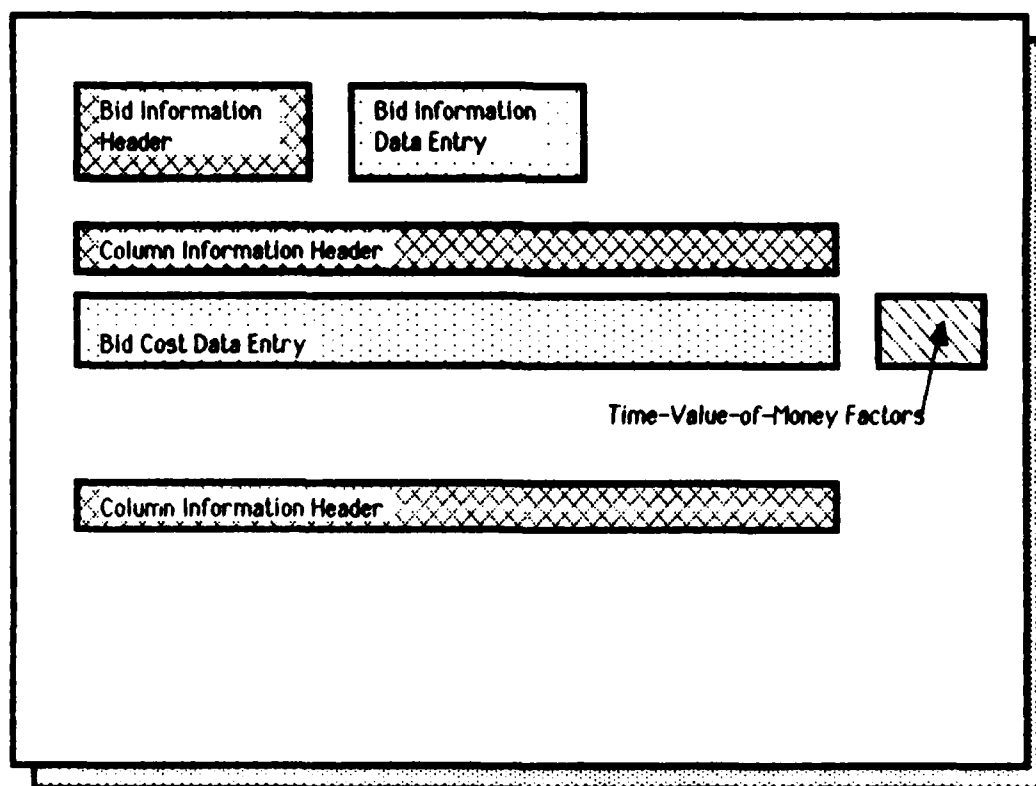


Figure 5. Time-Value-of-Money Factor Area

Each factor is shown to the right of the month to which it applies. The location of this area of the template is shown in Figure 5 and is compressed in size in the figure. The actual Time-Value-of-Money Factor Area is 120 lines long. This area of the template is locked to avoid inadvertent change to the data.

4) **Calculation Areas.** The Calculation Areas are shown in Figure 6.

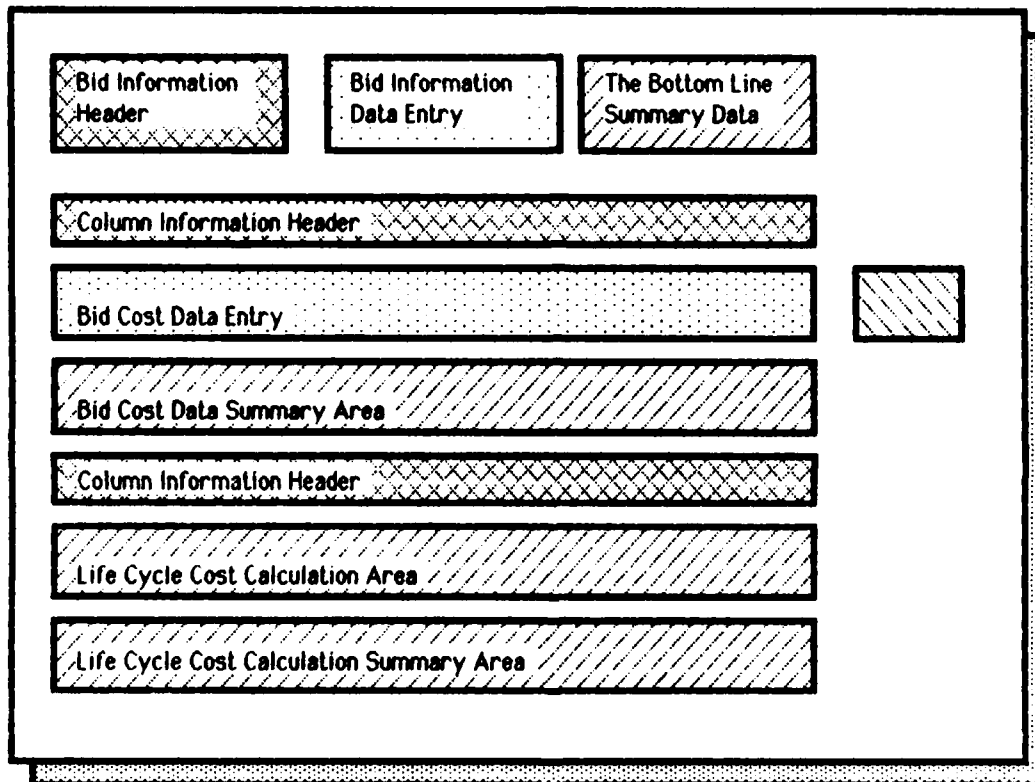


Figure 6. Calculation Areas

The first one--Bid Cost Data Summary Area--is a summary of all the bid cost data by column and a total of all the columns. A cross-check with the figures from the offeror's proposal can be made to ensure all the data were entered correctly. The second area--Life Cycle Cost Calculation Area--is where the life cycle cost calculations are accomplished. In this area, each entry in the Bid Cost

Data Area is multiplied by the corresponding entry in the Time-Value-of-Money Factor Area, and the result of each individual calculation is shown. In the Life Cycle Cost Calculation Summary Area, all results of the life cycle cost calculations are summed by column to give a total. Then the column totals are summed to give a bottom line figure for the calculations of the offeror's proposal. The fourth calculation area--The Bottom Line Summary Data--is in the upper right corner of the template. It shows the results of all the calculations on the first page of the printout to avoid having to leaf through five pages of the final printout looking for an answer. All of the Calculation Areas of the template are locked to prevent the user from inadvertently changing the calculation formulas.

A complete annotated pictorial of the template is shown in Figure 7. A copy of the complete template printout from the computer is included as Appendix A.

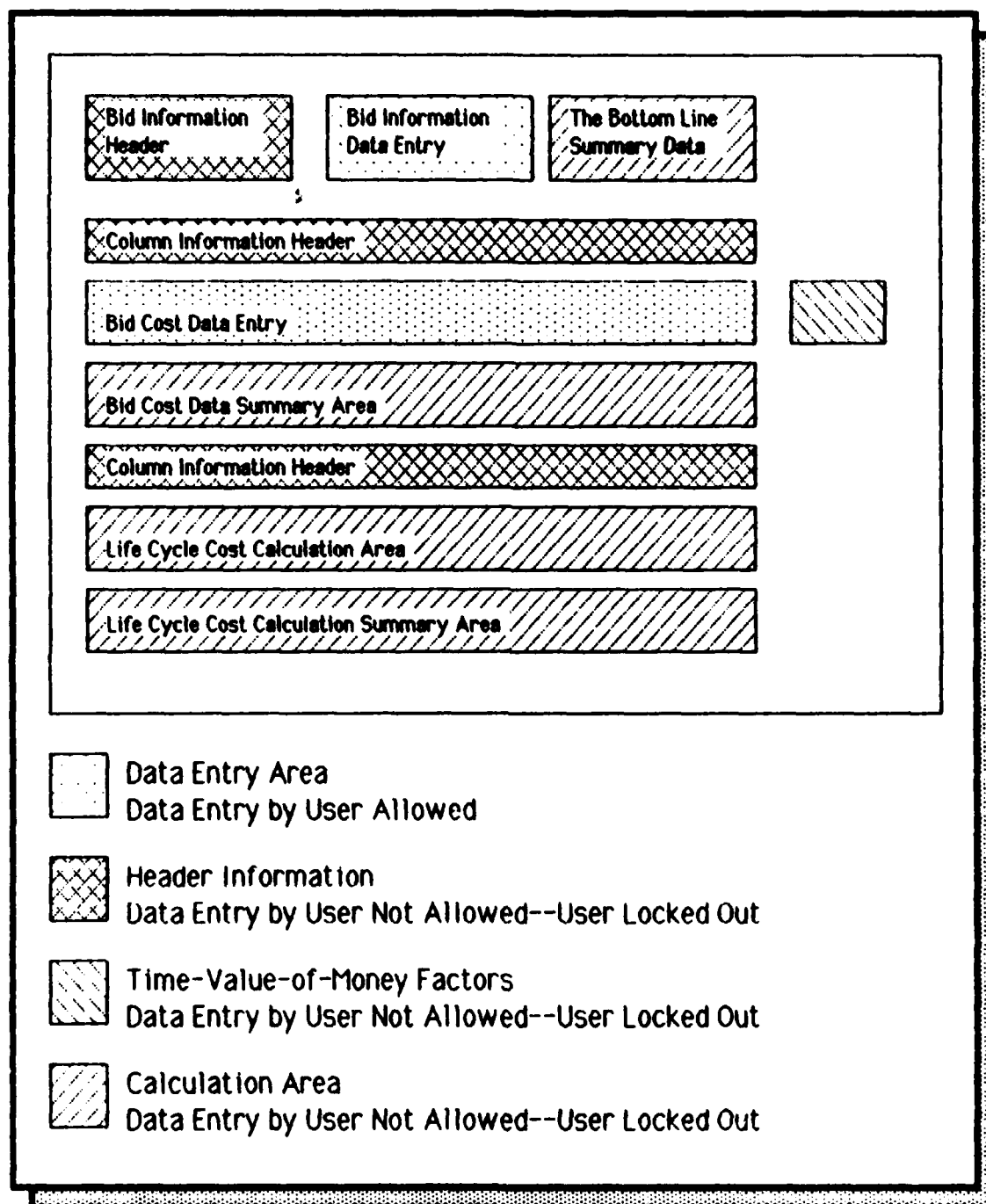


Figure 7. Annotated Template Pictorial

## **CHAPTER FIVE**

### **TEMPLATE USER INSTRUCTIONS**

This chapter contains step-by-step directions describing how to use the Wang 20/20 life cycle cost spreadsheet template. As a caution, it is not an in-depth tutorial on the Wang 20/20 spreadsheet. The instructions will allow first-time users to access the spreadsheet template, enter and change data, print the results, and save the completed spreadsheet. Any questions not answered by these instructions can be answered by referring to the Wang 20/20 User's Guide or by talking with your local Wang System Administrator who is responsible for operating and maintaining the Wang system on your base.

Before the software can be used, it must be loaded in the computer memory. The user must also have a password and an identifying code (user id). Your local System Administrator can verify that the life cycle cost template and Wang 20/20 spreadsheet are loaded. If they are not, he or she will be able to load them into memory for you. The System Administrator will also arrange to issue a password, user id, and conduct any system orientation needed.

### **TEMPLATE ORIENTATION**

Before describing the spreadsheet commands, a few comments are in order about the concept of a spreadsheet template. A template is basically a fill-in-the-blank form on the computer screen. The template performs calculations on the data entered. The computer screen can be thought of as a window looking onto a large sheet of paper with many columns and rows. In our case, the paper (or template) has 9 columns and 268 rows. Each place data appears on the screen is called a cell of the spreadsheet. The cells are named by identifying the column and row associated with the cell. For example, the first cell in the upper left corner of the template is identified by [0,0]. The last cell in the bottom right hand corner is [8,267], column 8 and row 267. Some of the

cells already have information in them. Some have only zeros. This can be seen by examining the sample printout shown in Appendix A. The computer screen can only display a small portion of this large spreadsheet template at one time, so the computer window can be moved to show the various parts of the spreadsheet template. The following paragraphs describe how to move the window around the spreadsheet template, what the user will see as he or she works with the template, and how to save the work.

### **SPECIAL PURPOSE KEYS**

On the Wang, several special purpose keys allow the user to move the computer window around the template and to move the data entry point around the screen. These keys are found on the top row and on the right side of the keyboard. Some of their functions are shown in Figure 8. A detailed description of these and the rest of the special purpose keys can be found in the Wang 20/20 User's Guide. There is a special key identification strip available to label each of the special purpose keys while using the Wang 20/20 spreadsheet. Check with your System Administrator to see if it is available at your base. If it is not readily available, it is very easy to make a paper strip to lay on the keyboard to identify the special purpose keys.

### **CONTROLLING THE CURSORS**

There are two cursors when using the Wang 20/20 software. One is located in the upper left corner of the screen--the data and command entry area. It is a single space ( ) and appears as an underline character. The other cursor is in the template area of the spreadsheet and appears as a long, solid underline character ( ) the width of the cell it is in. When you first load the template, the small cursor will be blinking in the upper left hand corner of the screen and the large cursor will be near the center of the screen next to the title "NAME OF VENDOR."

### **ACCESSING THE SPREADSHEET TEMPLATE**

The first step is to start the Wang 20/20 spreadsheet software. Enter the commands shown in Figure 9 using the computer keyboard.




PF5	Moves the cell cursor one cell to the left.
PF6	Moves the cell cursor one cell to the right.
PF7	Moves the cell cursor one cell up.
PF8	Moves the cell cursor one cell down.
PF9	Moves the cell cursor one page to the left.
PF10	Moves the cell cursor one page to the right.
PF11	Moves the cell cursor one page up.
PF12	Moves the cell cursor one page down.
PF16	Backs out of any command sequences. Use this if the command chosen is not the one wanted.
>	Moves the cell cursor directly to the specified cell. 1. Type > 2. Enter the cell reference 3. Press ENTER. THIS IS VERY CONVENIENT AND SAVES TIME.
	These keys are used to move around the command area at the top left of the screen.

Figure 8. Special Purpose Keys (12:3-4 - 3-6)

1. Sign on with your user id and password as shown by your System Administrator.
2. Press HELP.
3. Press PF16.
4. Press ENTER.
5. Press PF1 to display the Run screen.
6. Type S2020 in the program field, and press EXEC. This is not the same as ENTER.
7. Type S2020LIB in the Library field. The cursor moves automatically to the Volume field.
8. Enter the name of the system volume for your system (every Wang VS system designates one volume as the system volume -- the program S2020 and the library S2020LIB are on your system volume). See your System Administrator for this information.
9. Press ENTER to display the 20/20 Logo screen. There will be a pause while the program is started.
10. Press ENTER to display an empty worksheet.

Figure 9. Starting Wang 20/20 (12:2-1 - 2-2)

Once the spreadsheet software is loaded, the empty fill-in-the-blank master template that does the life cycle cost calculations or an already filled in template must be called to the screen. The computer file name of the empty master template is LCCMODEL. Use the commands shown in Figure 10. This command sequence loads the blank master template that has all zeros for data or a template that has already been worked on.

When the template first appears on the screen, it will appear as if the Bid Information Header, Bid Information Data Entry and the first Column Information Header are repeated starting at row 12. This is because the top header information is locked in place.

1. Type /SR
2. Press Enter.
3. To load the empty master template, type (user id2020).LCCMODEL after the current (Volume). You will be typing over SYSDATA. For example, if your user id is RB, type RB2020.LCCMODEL after the current (Volume).
- 3a. To load a template already worked on, type (user id2020).(template's name) after the current (Volume). You will be typing over SYSDATA.
4. Press Enter.

Figure 10. Loading a Template (12:4-65)

As the cell cursor moves down into the Bid Cost Data Entry Area, the first set of column headings will remain visible and the second set will disappear from view. If you do not want to leave the headings locked on the screen, see Figure 14 for instructions on how to remove them.

### **NAMING THE TEMPLATE**

**CAUTION: IF THE NAME OF THE TEMPLATE IS NOT CHANGED TO PROTECT THE MASTER TEMPLATE, A NEW MASTER TEMPLATE WILL HAVE TO BE LOADED.**

1. Type /SW
2. Press ENTER. (Volume).(user id2020).LCCMODEL will show at the top, left of the screen
3. Use the cursor control arrow ( → ) to move to the the first letter of LCCMODEL portion of the name. Type the new name over LCCMODEL. If there are any letters of LCCMODEL left, press the SPACE BAR until they are removed.
4. Press ENTER.
5. If the computer prompts that the file already exists, Press PF16, go back to Step 1 and pick a different name.

Figure 11. Naming the Template (12:4-65)

If the master template (LCCMODEL) was loaded, the name of the template on the screen **MUST** be changed to avoid putting data into the blank master. The commands shown in Figure 11 will change the name of the template on the screen. When told to enter a new template name, the "(volume).(library)." portion of the name will be the same as what is shown at the top of the screen. The template name is then entered after the "(volume).(library)." part of the name. A name that is descriptive of the proposal being evaluated will help identify the file when it is used in the future. The maximum name length is 8 characters. A typical name might appear as "(volume).(library).Acmebuy", signifying that the proposal under evaluation is from a vendor named Acme and the proposal is for the purchase of a product. The commands in Figure 11 create a file with all zeros in the data area. After the template is filled in, it will be saved again with the new data.

### **ENTERING AND CHANGING TEMPLATE DATA**

When working with the template on a color terminal, the words and numbers appear in two different colors. The ones that are light blue are locked and cannot be changed easily by the user. This prevents typing mistakes, such as erasing pre-set column headings or the time-value-of-money factors.

#### **TO ENTER OR CHANGE DATA**

1. Position the cursor on the cell to be changed using the special cursor control keys on the top row of the keyboard.
2. Type the new data entry.
3. Press ENTER.

Figure 12. Entering Data (12:--)

The words and numbers in green are unlocked, and the user can enter offeror data in this area. On a single color terminal, the unlocked cells are highlighted and the locked cells are subdued. The steps for entering the data are shown in Figure 12.

To enter data in the locked areas of the spreadsheet, the selected cell must first be unlocked. This is accomplished using the unlock command shown in Figure 13. After a cell is unlocked and a change made, it should be locked to protect the contents from accidental change. These commands are also shown in Figure 13.

TO UNLOCK	TO LOCK
1. Move the cursor to the cell to be unlocked.	1. Move the cursor to the cell to be locked.
2. Type /FLU	2. Type /FLL
3. Press ENTER.	3. Press ENTER.

Figure 13. Unlocking and Locking Cells (12:4-18)

### **FIXED HEADER INFORMATION**

The master template LCCMODEL has the header information locked in place on the screen so that it will always be visible while entering data. It will also appear at the top of each page of the report when it is printed. To delete this option use the commands shown in Figure 14.

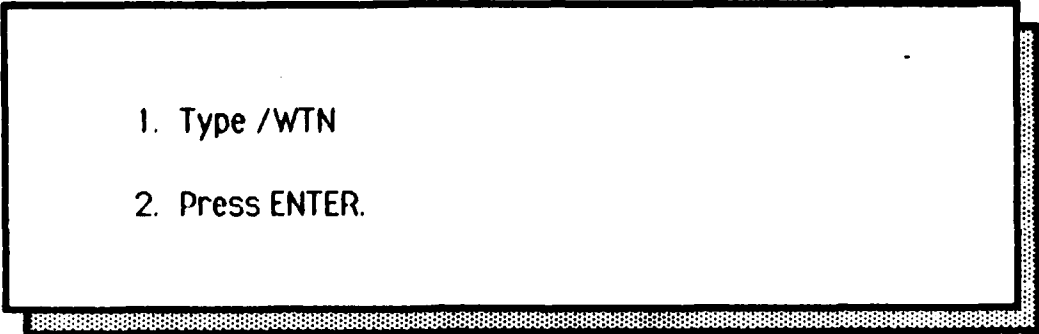
- 
1. Type /WTN
  2. Press ENTER.

Figure 14. Unlocking the Fixed Header Information (12:4-94)

### **SAVING THE WORK**

The command box for saving the work is shown in Figure 15. It can be used at the end of the work period or anytime during the work. It is a good idea to save the work periodically, even if it is not complete. This avoids the possibility of losing the work if there are computer problems.

### **PRINTING THE COMPLETED TEMPLATE**

The final product is printed out using the commands in Figure 16. The finished report will be five or six pages long depending on whether or not the fixed header information was removed. The periods on the data sheet that were not used will print out with zeros. Check with your System Administrator to determine the correct procedure for sending the printout to a printer with wide paper

1. Type /SW

2. Press ENTER. The computer will show the name of the worksheet that was assigned at the beginning of the work period. If a new name has not been assigned to the file, now is the time to go to Figure 11, Step 3 and do it. Then continue with these instructions.

3. Press ENTER. If the file was already renamed, the computer will ask if the file should be superseded. If you do not want the file superseded, press PF16 and go to Figure 11 to give the template a new name.

4. Press ENTER

Figure 15. Saving the Work (12:4-65)



1. Type /P
2. Press ENTER.
3. The computer prompts "Print?" Press ENTER.
4. The computer prompts "Printer?" Press ENTER.
5. The computer prompts with the range of the template. "0..8,0..267" Press ENTER.

Figure 16. Printing the Completed Template (12:4-62 - 4-64)

### QUITTING THE PROGRAM

The directions shown in Figure 17 will quit work and exit the program. Before Step 3, the computer will ask if you are sure you want to quit. If the answer is yes, then just press ENTER like Step 3 directs. If you do not want to quit, press PF16. This will get you back in the data entry mode.

**CAUTION: SAVE THE WORK BEFORE USING THIS COMMAND. THE COMPUTER WILL NOT PROMPT WITH A REMINDER TO SAVE THE WORK.**

1. Type /Q
2. Press ENTER. The computer will ask you if you are sure you want to quit?
3. If you DON'T want to quit, Press PF16.
- 3a. If you DO want to quit, Press ENTER.

THE NEXT STEPS WILL LOG OFF THE COMPUTER AND SHOULD BE ACCOMPLISHED AT THE END OF EACH WORK PERIOD.

4. Press HELP.
5. Press PF16.
6. Press ENTER.

Figure 17. Quitting the program (12:4-64)

## **SUMMARY**

Spreadsheet software is a very powerful tool because it is easy to learn and use. Further study of the Wang 20/20 spreadsheet software by the user can turn this simple template into a working knowledge of spreadsheet capabilities and allow the user to modify, build, and use templates to do many other jobs. This can be an extremely useful tool to expand a worker's productivity.

## **CHAPTER SIX CONCLUSION**

The spreadsheet template developed as part of this project was checked with sample cases by the contract buyers in the Maxwell AFB Contracting Office. Their comments on instruction clarity and correctness were used in the final preparation of the user's guide.

The spreadsheet capability available on the Wang VS System is a very powerful tool for analyzing contract data. It performs repetitive operations with great accuracy and allows the user to spend his or her valuable time doing important data analysis instead of punching a calculator. Because of this, the computer will be used more and more to increase productivity. As a recommended follow-on to this project, another template could be developed for the Wang 20/20 spreadsheet software. The template would do weighted factors analysis for proposal evaluation. This would allow much faster and more accurate calculation and printing of the proposal evaluation. If one factor's weight or evaluation changed, it could be entered in the template and all the calculations would be accomplished automatically. This is a great time saver when all government organizations are being asked to do more with less.

Copies of the life cycle cost template and the user instructions in Appendix B can be obtained by contacting the Air Force Logistics Management Center, Directorate of Contracting, Gunter AFS, AL 36112. The phone numbers are AV 446-4085 and commercial 205-279-4085. The software will be supplied on floppy disk.

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## APPENDICES

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### APPENDIX A

Complete Spreadsheet Template Printout



NAME CF VENDOR  
 NUMBER CF SCLICITATION  
 METPC CF ACQUISITION  
 DATE  
 NUMBER CF PERIODS

SUMMARY  
 TOTAL BIC COST  
 TOTAL PRESENT VALUE COST

PROFESSAL DATA ENTRY AREA

MCNT- PURCHASE NUMBER CCST	CA-CALL MAINTENANCE CCST	PCNTLY MAINTENANCE CCST	APPLICATION S/W CCST	SYSTEM S/W CCST	INSTALLATION CCST	TRAINING CCST	PRESENT VALUE FACTORS
1	30.00	30.00	30.00	30.00	30.00	30.00	0.55205
2	30.00	30.00	30.00	30.00	30.00	30.00	0.55240
3	30.00	30.00	30.00	30.00	30.00	30.00	0.97656
4	30.00	30.00	30.00	30.00	30.00	30.00	0.56875
5	30.00	30.00	30.00	30.00	30.00	30.00	0.56106
6	30.00	30.00	30.00	30.00	30.00	30.00	0.55146
7	30.00	30.00	30.00	30.00	30.00	30.00	0.54592
8	30.00	30.00	30.00	30.00	30.00	30.00	0.55246
9	30.00	30.00	30.00	30.00	30.00	30.00	0.55101
10	30.00	30.00	30.00	30.00	30.00	30.00	0.55364
11	30.00	30.00	30.00	30.00	30.00	30.00	0.51634
12	30.00	30.00	30.00	30.00	30.00	30.00	0.55901
13	30.00	30.00	30.00	30.00	30.00	30.00	0.55185
14	30.00	30.00	30.00	30.00	30.00	30.00	0.55476
15	30.00	30.00	30.00	30.00	30.00	30.00	0.55766
16	30.00	30.00	30.00	30.00	30.00	30.00	0.55063
17	30.00	30.00	30.00	30.00	30.00	30.00	0.55356
18	30.00	30.00	30.00	30.00	30.00	30.00	0.55764
19	30.00	30.00	30.00	30.00	30.00	30.00	0.55927
20	30.00	30.00	30.00	30.00	30.00	30.00	0.55312
21	30.00	30.00	30.00	30.00	30.00	30.00	0.56625
22	30.00	30.00	30.00	30.00	30.00	30.00	0.55965
23	30.00	30.00	30.00	30.00	30.00	30.00	0.55302
24	30.00	30.00	30.00	30.00	30.00	30.00	0.55446
25	30.00	30.00	30.00	30.00	30.00	30.00	0.55196
26	30.00	30.00	30.00	30.00	30.00	30.00	0.55342
27	30.00	30.00	30.00	30.00	30.00	30.00	0.55657
28	30.00	30.00	30.00	30.00	30.00	30.00	0.55663
29	30.00	30.00	30.00	30.00	30.00	30.00	0.55425
30	30.00	30.00	30.00	30.00	30.00	30.00	0.55796
31	30.00	30.00	30.00	30.00	30.00	30.00	0.55175
32	30.00	30.00	30.00	30.00	30.00	30.00	0.55567
33	30.00	30.00	30.00	30.00	30.00	30.00	0.55234
34	30.00	30.00	30.00	30.00	30.00	30.00	0.55736
35	30.00	30.00	30.00	30.00	30.00	30.00	0.55131
36	30.00	30.00	30.00	30.00	30.00	30.00	0.55371
37	30.00	30.00	30.00	30.00	30.00	30.00	0.55947
38	30.00	30.00	30.00	30.00	30.00	30.00	0.55624
39	30.00	30.00	30.00	30.00	30.00	30.00	0.55782
40	30.00	30.00	30.00	30.00	30.00	30.00	0.55203
41	30.00	30.00	30.00	30.00	30.00	30.00	0.55631
42	30.00	30.00	30.00	30.00	30.00	30.00	0.55063
43	30.00	30.00	30.00	30.00	30.00	30.00	0.55063

NAME CE VENCE  
 NUMBER CP SOLICITATION  
 METPCC CP ACQUISITION  
 DATE  
 NUMBER CP PERIODS

SUMMARY

TOTAL BIC CCST  
 TOTAL PRESENT VALUE CCST

PRECEDAL DATA ENTRY AREA

MONTH NUMBER	FLURCHASE CCST	MONTHLY MAINTENANCE CCST	MONTHLY MAINTENANCE CCST	APPLICATION S/W CCST	SISTEP S/W CCST	INSTALLATION CCST	TRAINING CCST	PRESENT VALUE FACTORS
44	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.705061
45	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.659483
46	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.653950
47	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.608460
48	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.623012
49	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.677820
50	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.672245
51	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.666921
52	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.641855
53	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.655421
54	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.651228
55	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.646076
56	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.640865
57	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.635054
58	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.630862
59	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.625876
60	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.620921
61	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.616005
62	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.611136
63	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.606301
64	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.601503
65	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.596746
66	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.592025
67	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.587342
68	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.582655
69	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.578065
70	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.573512
71	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.568975
72	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.564474
73	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.560006
74	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.555578
75	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.551182
76	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.546822
77	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.542466
78	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.538105
79	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.533947
80	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.529722
81	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.525522
82	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.521375
83	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.517250
84	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.513158
85	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.509058
86	50.00	50.00	50.00	50.00	50.00	50.00	50.00	0.505071

NAME CP VENDOR  
 NUMBER OF SUBCITATION  
 METHOD OF ACQUISITION  
 DATE  
 NUMBER OF PERIODS

SUMMARY

TOTAL BIC CCST  
 TOTAL PRESENT VALUE CCST

PROPOSAL DATA ENTRY AREA

MONTH NUMBER	PURCHASE CCST	CA-CALL MAINTENANCE CCST	MONTHLY MAINTENANCE CCST	APPLICATION S/W CCST	SYSTEM S/W CCST	INSTALLATION CCST	TRAINING CCST	PRESENT VALUE FACTORS
87	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.501075
88	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.497111
89	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.493179
90	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.489277
91	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.485406
92	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.481566
93	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.477757
94	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.473977
95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.470227
96	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.466507
97	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.462817
98	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.459115
99	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.455323
100	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.451515
101	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.447757
102	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.444058
103	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.440324
104	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.436588
105	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.432842
106	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.429096
107	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.425350
108	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.421604
109	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.417858
110	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.414112
111	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.410366
112	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.406620
113	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.402874
114	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.399128
115	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.395382
116	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.391636
117	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.387890
118	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.384144
119	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.380398
120	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.376652
TOTALS	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL CCST	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

LIFE CYCLE CCST ADJUSTED FOR PRESENT VALUE

CA-CALL MONTHLY



NAME OF VENDOR  
 NUMBER OF SOLICITATION  
 METHOD OF ACQUISITION  
 DATE  
 NUMBER OF PERIODS

SUMMARY

TOTAL BID COST  
 TOTAL PRESENT VALUE COST

PROPOSAL DATA ENTRY AREA

MONTH NUMBER	PURCHASE COST	CN-CALL MAINTENANCE COST	MONTHLY MAINTENANCE COST	APPLICATION S/W COST	SYSTEM S/W COST	INSTALLATION COST	TRAINING COST	PRESENT VALUE FACTORS
41	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
42	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
43	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
46	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
47	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
48	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
49	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
53	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
54	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
56	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
57	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
58	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
59	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
60	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
61	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
62	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
64	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
65	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
66	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
67	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
68	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
69	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
70	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
71	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
72	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
73	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
74	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
76	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
77	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
78	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
79	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
80	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
81	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
82	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
83	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

NAME	CF	VENDOR	XXXX
NUMBER	CF	SOLICITATION	XXXX
METPGC	CF	ACQUISITION	XXXX
DATE			XXXX
NUMBER	CF	PERIODS	XXXX

TOTAL BIC COST	\$0.00
TOTAL PRESENT VALUE COST	\$0.00

## PAGECSAL CATA-ENTRY AREA

[illegible]

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## APPENDICES

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### APPENDIX B

User's Guide with Reference Citations Deleted

## CHAPTER ONE INTRODUCTION

There are many time consuming tasks being performed today by hand that could be done more effectively by computer. At many base contracting offices, best bid cost calculations are still being done by hand. The calculations typically consider system life and time-value-of-money discount factors. The result of these calculations is usually referred to as the life cycle cost (LCC) of the system. The software in this user's guide can be used to procure automated data processing equipment but can be easily adapted to any other contract analysis of life cycle cost. The computer software will allow faster, more accurate calculations.

These LCC calculations can be very detailed, tedious, and time-consuming. They are currently often performed by hand at the base level. For example, suppose a calculation was for

- a. a 120-month contract with,
- b. five cost categories,
- c. two contract options (buy verses rent), and
- d. five bidders on the contract.

That makes:

$$\begin{aligned} &120 \text{ months} \times 5 \text{ cost categories} \times 2 \text{ contract options} \times 5 \text{ bidders} \\ &= \mathbf{6,000} \text{ hand calculations.} \end{aligned}$$

If any of the values are changed on a bid revision, a significant amount of the work would need to be reaccomplished. This is a perfect place for a computer to relieve the "busy work" required of the contract buyer.



A computer would do the calculations and prepare a written report less prone to error because all the six-digit time-value-of-money factors would already be in the program and would not have to be entered by hand. This cuts the amount of keyboard work by 50 percent and eliminates the hand transfer of the results to the report sheet. It also makes the generation of revisions very easy.

The software is designed to run on the Wang VS computer system using the Wang 20/20 spreadsheet software. This system is being procured for most Air Force base contracting offices.

This project is sponsored by the Air Force Logistics Management Center (AFLMC), Directorate of Contracting, Gunter AFS, AL 36114. Copies of the software on floppy disk and this user's guide can be obtained by contacting the sponsor. The sponsor can be reached by phone at AV 446-4085 or commercial 205-279-4085.

## **CHAPTER TWO**

### **LIFE CYCLE COST MODEL DESCRIPTION**

This chapter outlines the concepts behind the design of the software template. A software template should meet several criteria. It should cover the range of anticipated procurement methods, handle the dollar amounts anticipated in the calculations, and be easy to understand. This chapter describes how the template meets these three criteria. Detailed user instructions are covered in Chapter Five.

#### **TEMPLATE PROCUREMENT METHODS AND SIZE**

The template is designed to handle five different procurement methods. This is accomplished by including in the template different cost categories to handle the different elements of the various proposals. A brief description of the different procurement methods the template can handle follows:

a. PURCHASE. Outright purchase after installation and acceptance of the equipment.

b. LEASE.

(1) STRAIGHT LEASE - The contractor retains title to the equipment throughout the system life. Such plans can provide multiyear leasing at determinable prices where the agency exercises a renewal option at the end of each fiscal year.

(2) LEASE WITH OPTION TO PURCHASE (LWOP) - Lease with the option to purchase at predetermined intervals of time. The purchase price is reduced by subtracting rental credits as set forth in the offeror's proposal.

c. SPECIAL PLANS.

(1) LEASE-TO OWNERSHIP. . . - A plan whereby title transfers after payment of n months of lease/rental, but with no obligation to continue to lease beyond each fiscal year. . . .

(2) INSTALLMENT PURCHASE PLAN - A plan that is similar to a

lease to ownership plan, except that the Government is sometimes granted "encumbered" title after installation and acceptance of the equipment, with "clear" title passing at the end of the contract. . . .

The template is sized to accommodate procurements up to 120 months duration and a total value of \$99,999,999.99. This is the maximum value normally handled at the base contracting level.

### **TEMPLATE DESCRIPTION**

The template is divided into four key areas. The areas are identified on a diagram illustrating the layout of the working area of the spreadsheet template.

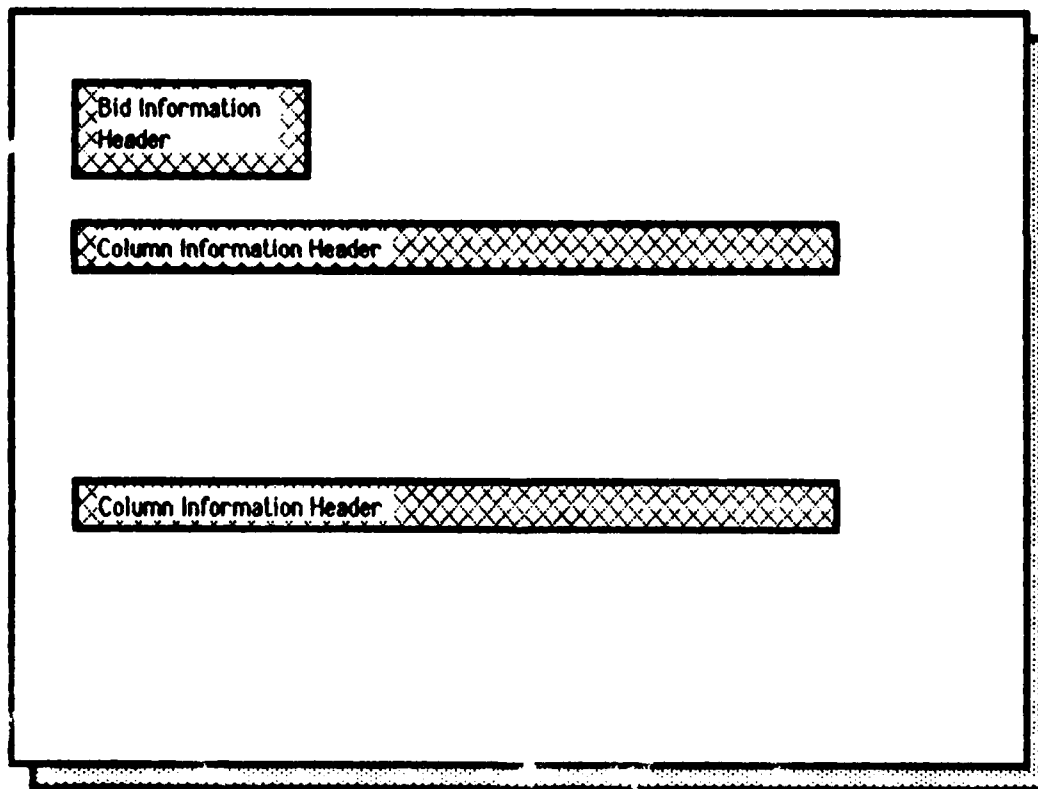


Figure 1. Header Information Areas

As each area is identified, it is described and added to the pictorial, until the complete template is developed.

1) **Header Information Areas.** These areas, shown in Figure 1, identify data entry locations for each procurement action. Typical information would be vendor name, acquisition method, date, number of months, purchase cost information, etc. The Bid Information Header is where the procurement identification data is found on the template. The first Column Header Information Area is for the Bid Cost Data Entry Area and the second is for the Calculation Area. Typical cost information which would be entered in this area includes purchase cost, software cost, and maintenance cost. A complete list can be found by looking at the column headings on the sample printout in Appendix A. The Column Header Information Areas of the template are locked to avoid inadvertent change or deletion of the information by the software user.

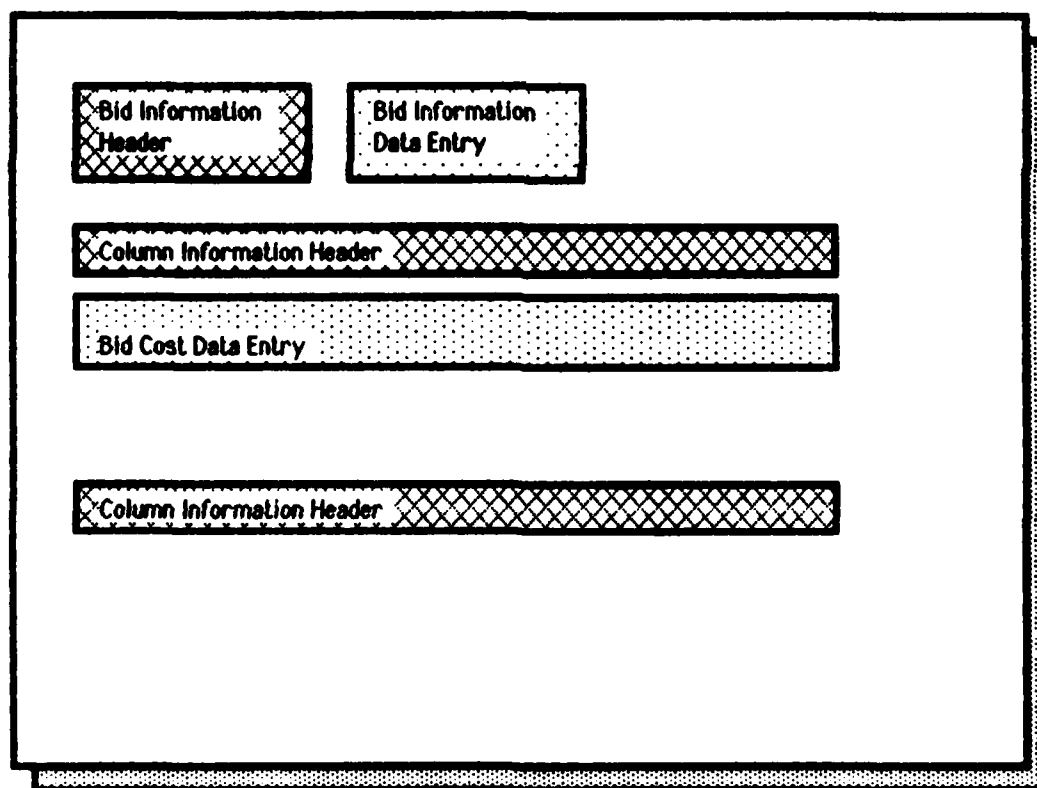


Figure 2. Data Entry Areas

2) **Data Entry Areas.** These areas are used to enter the data for an offeror. Figure 2 shows them located in two areas on the template. The first is to the right of the Bid Information Header. The identifying data for the calculations are in this area. Included are vendor name, solicitation number, acquisition method, date and the calculation duration in months. The second area where data are entered on the template is the Bid Cost Data Entry area under the first Column Information Header. This is where all the cost data for the calculations of an offeror's proposal are entered. This area is compressed in the pictorial to conserve space. On the actual template it is 120 lines long to accommodate the 120-month calculation requirement.

3) **Time-Value-of-Money Factor Area.** This area of the template stores the time-value-of-money calculation factors. The factors in the template are based on an annual discount rate of 10 percent. (7:9)

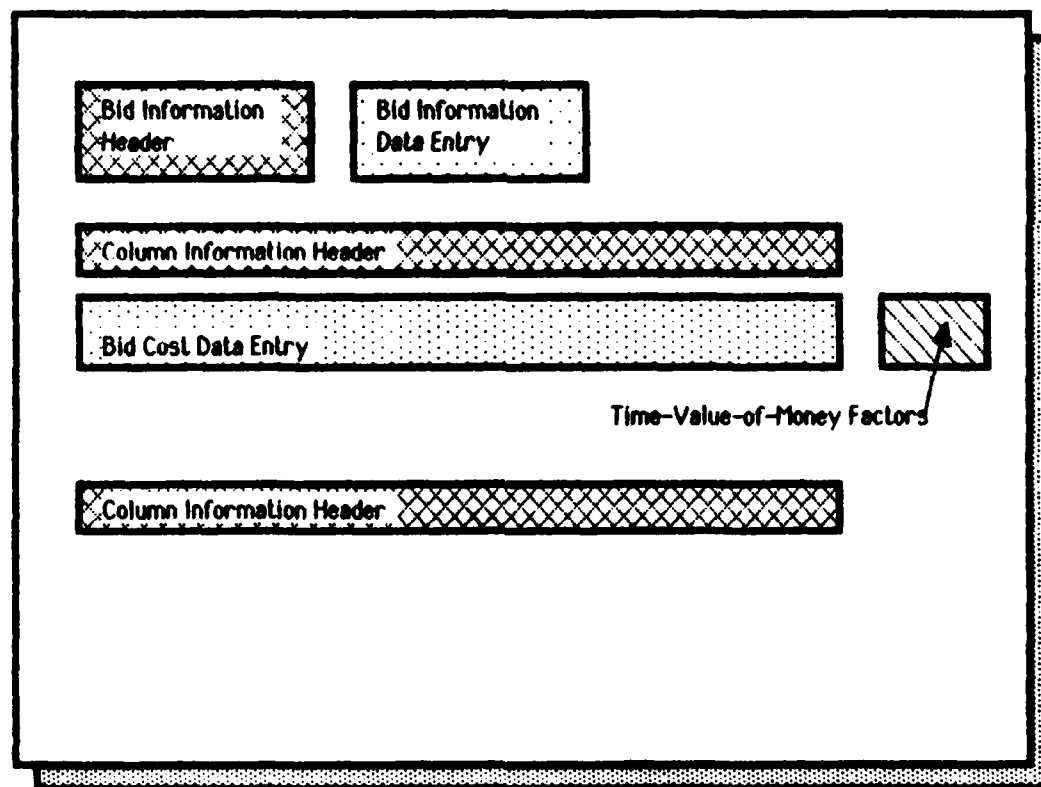


Figure 3. Time-Value-of-Money Factor Area

Each factor is shown to the right of the month to which it applies. The location of this area of the template is shown in Figure 3 and is compressed in size in the figure. The actual Time-Value-of-Money Factor Area is 120 lines long. This area of the template is locked to avoid inadvertent change to the data.

4) **Calculation Areas.** The Calculation Areas are shown in Figure 4.

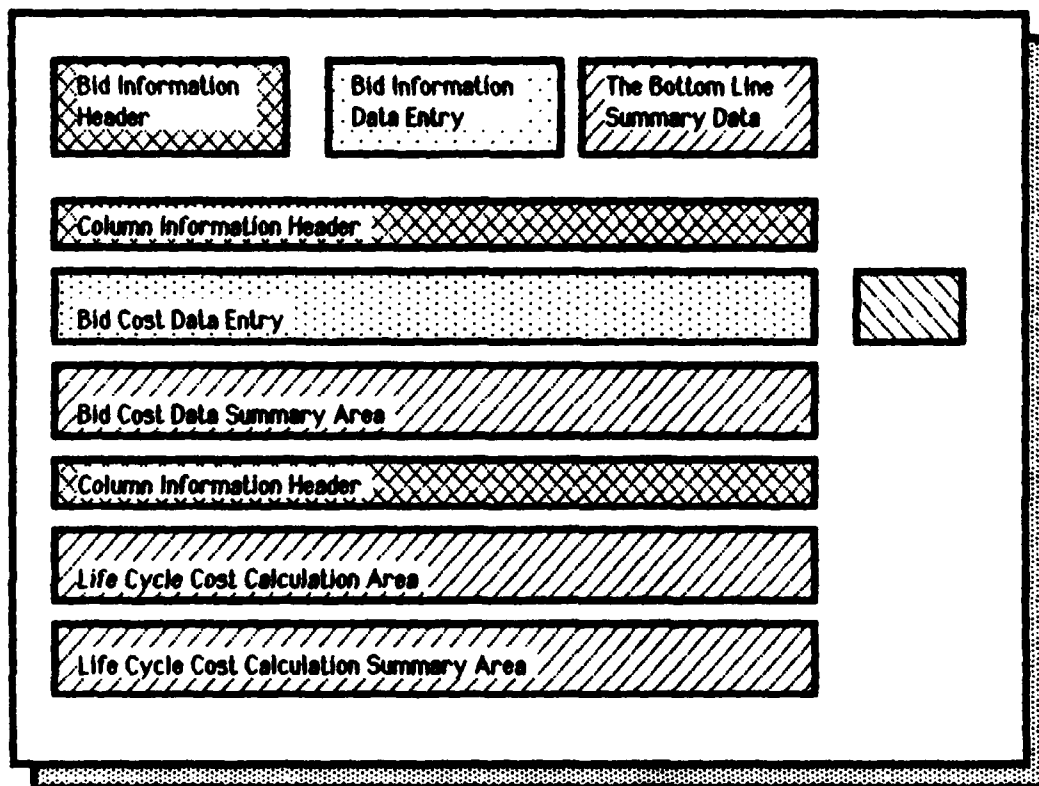


Figure 4. Calculation Areas

The first one--Bid Cost Data Summary Area--is a summary of all the bid cost data by column and a total of all the columns. A cross-check with the figures from the offeror's proposal can be made to ensure all the data were entered correctly. The second area--Life Cycle Cost Calculation Area--is where the life cycle cost calculations are accomplished. In this area, each entry in the Bid Cost

Data Area is multiplied by the corresponding entry in the Time-Value-of-Money Factor Area, and the result of each individual calculation is shown. In the Life Cycle Cost Calculation Summary Area, all results of the life cycle cost calculations are summed by column to give a total. Then the column totals are summed to give a bottom line figure for the calculations of the offeror's proposal. The fourth calculation area--The Bottom Line Summary Data--is in the upper right corner of the template. It shows the results of all the calculations on the first page of the printout to avoid having to leaf through five pages of the final printout looking for an answer. All of the Calculation Areas of the template are locked to prevent the user from inadvertently changing the calculation formulas.

A complete annotated pictorial of the template is shown in Figure 5. A copy of the complete template printout from the computer is included as Appendix A.

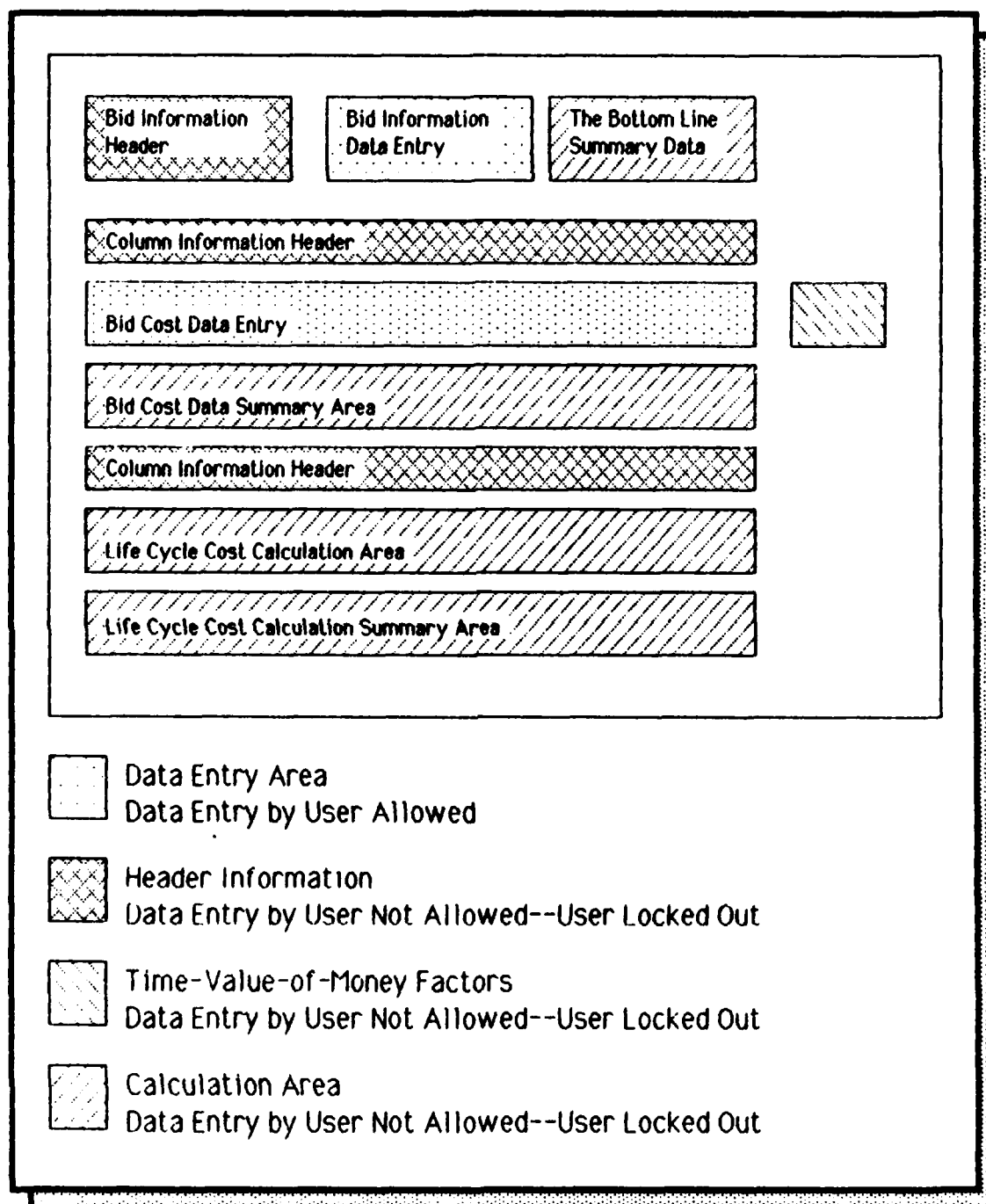


Figure 5. Annotated Template Pictorial



## CHAPTER THREE

### TEMPLATE USER INSTRUCTIONS

This chapter contains step-by-step directions describing how to use the Wang 20/20 life cycle cost spreadsheet template. As a caution, it is not an in-depth tutorial on the Wang 20/20 spreadsheet. The instructions will allow first-time users to access the spreadsheet template, enter and change data, print the results, and save the completed spreadsheet. Any questions not answered by these instructions can be answered by referring to the Wang 20/20 User's Guide or by talking with your local Wang System Administrator who is responsible for operating and maintaining the Wang system on your base.

Before the software can be used, it must be loaded in the computer memory. The user must also have a password and an identifying code (user id). Your local System Administrator can verify that the life cycle cost template and Wang 20/20 spreadsheet are loaded. If they are not, he or she will be able to load them into memory for you. The System Administrator will also arrange to issue a password, user id, and conduct any system orientation needed.

#### TEMPLATE ORIENTATION

Before describing the spreadsheet commands, a few comments are in order about the concept of a spreadsheet template. A template is basically a fill-in-the-blank form on the computer screen. The template performs calculations on the data entered. The computer screen can be thought of as a window looking onto a large sheet of paper with many columns and rows. In our case, the paper (or template) has 9 columns and 268 rows. Each place data appears on the screen is called a cell of the spreadsheet. The cells are named by identifying the column and row associated with the cell. For example, the first cell in the upper left corner of the template is identified by [0,0]. The last cell in the bottom right hand corner is [8,267], column 8 and row 267. Some of the

cells already have information in them. Some have only zeros. This can be seen by examining the sample printout shown in Appendix A. The computer screen can only display a small portion of this large spreadsheet template at one time, so the computer window can be moved to show the various parts of the spreadsheet template. The following paragraphs describe how to move the window around the spreadsheet template, what the user will see as he or she works with the template, and how to save the work.

### **SPECIAL PURPOSE KEYS**

On the Wang, several special purpose keys allow the user to move the computer window around the template and to move the data entry point around the screen. These keys are found on the top row and on the right side of the keyboard. Some of their functions are shown in Figure 6. A detailed description of these and the rest of the special purpose keys can be found in the Wang 20/20 User's Guide. There is a special key identification strip available to label each of the special purpose keys while using the Wang 20/20 spreadsheet. Check with your System Administrator to see if it is available at your base. If it is not readily available, it is very easy to make a paper strip to lay on the keyboard to identify the special purpose keys.

### **CONTROLLING THE CURSORS**

There are two cursors when using the Wang 20/20 software. One is located in the upper left corner of the screen--the data and command entry area. It is a single space ( ) and appears as an underline character. The other cursor is in the template area of the spreadsheet and appears as a long, solid underline character ( ) the width of the cell it is in. When you first load the template, the small cursor will be blinking in the upper left hand corner of the screen and the large cursor will be near the center of the screen next to the title "NAME OF VENDOR."

### **ACCESSING THE SPREADSHEET TEMPLATE**

The first step is to start the Wang 20/20 spreadsheet software. Enter the commands shown in Figure 7 using the computer keyboard.


PF5	Moves the cell cursor one cell to the left.
PF6	Moves the cell cursor one cell to the right.
PF7	Moves the cell cursor one cell up.
PF8	Moves the cell cursor one cell down.
PF9	Moves the cell cursor one page to the left.
PF10	Moves the cell cursor one page to the right.
PF11	Moves the cell cursor one page up
PF12	Moves the cell cursor one page down
PF16	Backs out of any command sequences. Use this if the command chosen is not the one wanted
>	Moves the cell cursor directly to the specified cell. 1. Type > 2. Enter the cell reference 3. Press ENTER. THIS IS VERY CONVENIENT AND SAVES TIME.
	These keys are used to move around the command area at the top left of the screen.

Figure 6. Special Purpose Keys

1. Sign on with your user id and password as shown by your System Administrator.
2. Press HELP.
3. Press PF16.
4. Press ENTER.
5. Press PF1 to display the Run screen.
6. Type S2020 in the program field, and press EXEC. This is not the same as ENTER.
7. Type S2020LIB in the Library field. The cursor moves automatically to the Volume field.
8. Enter the name of the system volume for your system (every Wang VS system designates one volume as the system volume -- the program S2020 and the library S2020LIB are on your system volume). See your System Administrator for this information.
9. Press ENTER to display the 20/20 Logo screen. There will be a pause while the program is started.
10. Press ENTER to display an empty worksheet.

Figure 7. Starting Wang 20/20

Once the spreadsheet software is loaded, the empty fill-in-the-blank master template that does the life cycle cost calculations or an already filled in template must be called to the screen. The computer file name of the empty master template is LCCMODEL. Use the commands shown in Figure 8. This command sequence loads the blank master template that has all zeros for data or a template that has already been worked on.

When the template first appears on the screen, it will appear as if the Bid Information Header, Bid Information Data Entry and the first Column Information Header are repeated starting at row 12. This is because the top header information is locked in place.

1. Type /SR
2. Press Enter.
3. To load the empty master template, type (user id2020).LCCMODEL after the current (Volume). You will be typing over SYSDATA. For example, if your user id is RB, type RB2020.LCCMODEL after the current (Volume).
- 3a. To load a template already worked on, type (user id2020).(template's name) after the current (Volume). You will be typing over SYSDATA.
4. Press Enter.

Figure 8. Loading a Template

As the cell cursor moves down into the Bid Cost Data Entry Area, the first set of column headings will remain visible and the second set will disappear from view. If you do not want to leave the headings locked on the screen, see Figure 12 for instructions on how to remove them.

### **NAMING THE TEMPLATE**

**CAUTION: IF THE NAME OF THE TEMPLATE IS NOT CHANGED TO PROTECT THE MASTER TEMPLATE, A NEW MASTER TEMPLATE WILL HAVE TO BE LOADED.**

1. Type /S'W
2. Press ENTER. (Volume).(user Id2020).LCCMODEL will show at the top, left of the screen
3. Use the cursor control arrow ( → ) to move to the first letter of LCCMODEL portion of the name. Type the new name over LCCMODEL. If there are any letters of LCCMODEL left, press the SPACE BAR until they are removed.
4. Press ENTER.
5. If the computer prompts that the file already exists, Press PF16, go back to Step 1 and pick a different name.

Figure 9. Naming the Template

If the master template (LCCMODEL) was loaded, the name of the template on the screen **MUST** be changed to avoid putting data into the blank master. The commands shown in Figure 9 will change the name of the template on the screen. When told to enter a new template name, the "**(volume).(library).**" portion of the name will be the same as what is shown at the top of the screen. The template name is then entered after the "**(volume).(library).**" part of the name. A name that is descriptive of the proposal being evaluated will help identify the file when it is used in the future. The maximum name length is 8 characters. A typical name might appear as "**(volume).(library).Acmebuy**", signifying that the proposal under evaluation is from a vendor named Acme and the proposal is for the purchase of a product. The commands in Figure 9 create a file with all zeros in the data area. After the template is filled in, it will be saved again with the new data.

### ENTERING AND CHANGING TEMPLATE DATA

When working with the template on a color terminal, the words and numbers appear in two different colors. The ones that are light blue are locked and cannot be changed easily by the user. This prevents typing mistakes, such as erasing pre-set column headings or the time-value-of-money factors.

#### TO ENTER OR CHANGE DATA

- 1 Position the cursor on the cell to be changed using the special cursor control keys on the top row of the keyboard
- 2 Type the new data entry.
- 3 Press ENTER

Figure 10. Entering Data

The words and numbers in green are unlocked, and the user can enter offeror data in this area. On a single color terminal, the unlocked cells are highlighted and the locked cells are subdued. The steps for entering the data are shown in Figure 10.

To enter data in the locked areas of the spreadsheet, the selected cell must first be unlocked. This is accomplished using the unlock command shown in Figure 11. After a cell is unlocked and a change made, it should be locked to protect the contents from accidental change. These commands are also shown in Figure 11.

TO UNLOCK	TO LOCK
1. Move the cursor to the cell to be unlocked.	1. Move the cursor to the cell to be locked
2. Type /FLU	2. Type /FLL
3. Press ENTER.	3. Press ENTER

Figure 11. Unlocking and Locking Cells

### **FIXED HEADER INFORMATION**

The master template LCCMODEL has the header information locked in place on the screen so that it will always be visible while entering data. It will also appear at the top of each page of the report when it is printed. To delete this option use the commands shown in Figure 12.



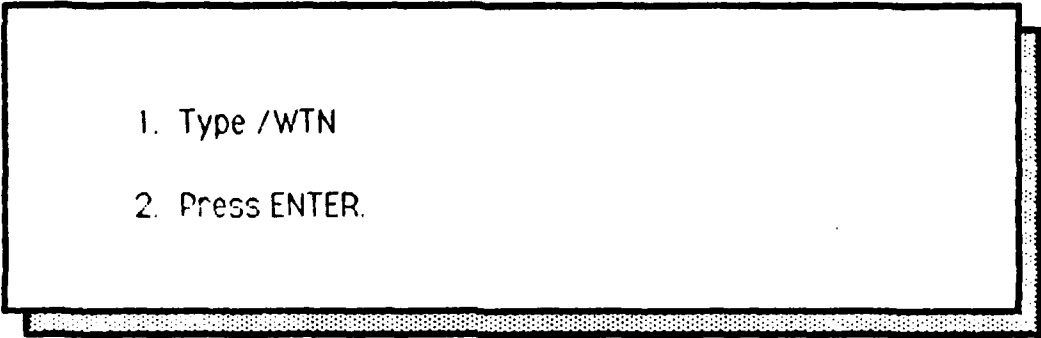
- 
1. Type /WTN
  2. Press ENTER.

Figure 12. Unlocking the Fixed Header Information

### **SAVING THE WORK**

The command box for saving the work is shown in Figure 13. It can be used at the end of the work period or anytime during the work. It is a good idea to save the work periodically, even if it is not complete. This avoids the possibility of losing the work if there are computer problems.

### **PRINTING THE COMPLETED TEMPLATE**

The final product is printed out using the commands in Figure 14. The finished report will be five or six pages long depending on whether or not the fixed header information was removed. The periods on the data sheet that were not used will print out with zeros. Check with your System Administrator to determine the correct procedure for sending the printout to a printer with wide paper.

1. Type /SW

2. Press ENTER. The computer will show the name of the worksheet that was assigned at the beginning of the work period. If a new name has not been assigned to the file, now is the time to go to Figure 11, Step 3 and do it. Then continue with these instructions.

3. Press ENTER. If the file was already renamed, the computer will ask if the file should be superseded. If you do not want the file superseded, press PF16 and go to Figure 9 to give the template a new name.

4. Press ENTER.

Figure 13. Saving the Work

1. Type /P
2. Press ENTER.
3. The computer prompts "Print?" Press ENTER.
4. The computer prompts "Printer?" Press ENTER.
5. The computer prompts with the range of the template. "0..8,0..267" Press ENTER.

Figure 14. Printing the Completed Template

### **QUITTING THE PROGRAM**

The directions shown in Figure 15 will quit work and exit the program. Before Step 3, the computer will ask if you are sure you want to quit. If the answer is yes, then just press ENTER like Step 3 directs. If you do not want to quit, press PF16. This will get you back in the data entry mode.

**CAUTION: SAVE THE WORK BEFORE USING THIS COMMAND. THE COMPUTER WILL NOT PROMPT WITH A REMINDER TO SAVE THE WORK.**

1. Type /Q
2. Press ENTER. The computer will ask you if you are sure you want to quit?
3. If you DON'T want to quit, Press PF16.
- 3a. If you DO want to quit, Press ENTER.

THE NEXT STEPS WILL LOG OFF THE COMPUTER AND SHOULD BE ACCOMPLISHED AT THE END OF EACH WORK PERIOD.

4. Press HELP.
5. Press PF16.
6. Press ENTER.

Figure 15. Quitting the program

## **SUMMARY**

Spreadsheet software is a very powerful tool because it is easy to learn and use. Further study of the Wang 20/20 spreadsheet software by the user can turn this simple template into a working knowledge of spreadsheet capabilities and allow the user to modify, build, and use templates to do many other jobs. This can be an extremely useful tool to expand a worker's productivity.

END

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