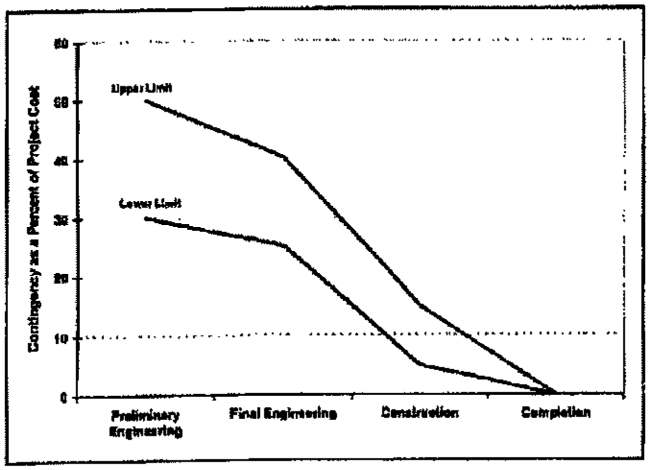

Figure 1—Project Contingency Should Decrease Over the Life of a Project.

Table 1—Example Guidelines for Initial Contingency Assignment.

Contract Type	Initial Change Order Contingency *(as a % of Contract Cost)*
Procurement Only	5%
Typical Construction	10%
Special Construction:	
Tunnels	15%
Very Small Contracts	20%

ACCURATE CONSTRUCTION CONTRACT FORECASTING

Once construction contracts have been awarded, accurate forecasts are needed to track contingency consumption. The people most able to provide accurate forecast information for each construction contract are those closest to the action. These are typically the resident engineers, project controls engineers, or contract administrators with direct responsibility for day-to-day construction management. Using either spreadsheets or specialized construction management software, the field team should maintain the most thorough contract forecast possible, given the other demands on their time. This forecast should include the original contract amount, approved change orders, pending change orders, and all identified cost issues. A well maintained forecast will change from day to day as issues are identified, negotiations are completed, and costs are agreed upon. This field-generated contract forecast (F) is another important numerical input to the CTS.

From experience we know that even the best field team will not be able to forecast all the change issues and associated costs until very close to the end of construction. For this reason, to develop an accurate value for the estimate at completion (EAC), we must keep some retained contingency (C_R) in addition to the field-generated Contract Forecast (F). This can be expressed as follows:

$$EAC = F + C_R$$

(equation 1)

Intuitively, the value of retained contingency (C_R) should be based on the initial contingency (C_I) value assigned at contract award and should drop as the contract is completed and risk drops.

AN EMPIRICAL FORMULA FOR RETAINED CONTINGENCY

For simplicity, one could assign retained contingency (C_R) based on the assumption that risk drops linearly as a contract is completed and is inversely related to the percent complete. As an example, at 80 percent complete 20 percent of initial contingency (C_I) would be retained to account for changes that have not yet been identified. Intuitively, this linear assumption seems conservative, as we would expect that more than half of the change issues should have been identified at the 50 percent completion point. In order to test the straight-line assumption and modify it if necessary, the author collected some real world data. Actual cost (A) and contract forecast (F) data were collected over four years, on a monthly basis, for 15 of the largest construction contracts on a light rail expansion program managed by the Valley Transportation Authority in San Jose, California. The contracts studied had a combined value of $257 million and covered a wide array of work including heavy civil and track, tunnel, elevated structure, station finish and overhead contact system construction contracts.

For each monthly Contract Forecast (F) reading, the Value of Changes Forecast (Δ_t) at that time was calculated by subtracting the Original Contract Amount (C_0).

$$\Delta_t = F - C_0$$

(equation 2)

Once each contract is complete, the final contract amount (CF) is known and the final value of changes (Δ_F) can be calculated as follows:

$$\Delta_F = C_F - C_0$$

(equation 3)

The proportion of final changes forecast ($\Delta_{t/F}$) at each point in time can be readily calculated using the final value of changes (DF) as follows:

$$\Delta_{t/F} = \Delta_t / \Delta_F$$

(equation 4)

Figure 2 shows a scatter diagram with a total of 282 monthly coordinates for the proportion of final changes forecast ($\Delta_{t/F}$) on the y-axis (expressed as a percent) and percent complete (P) on the x-

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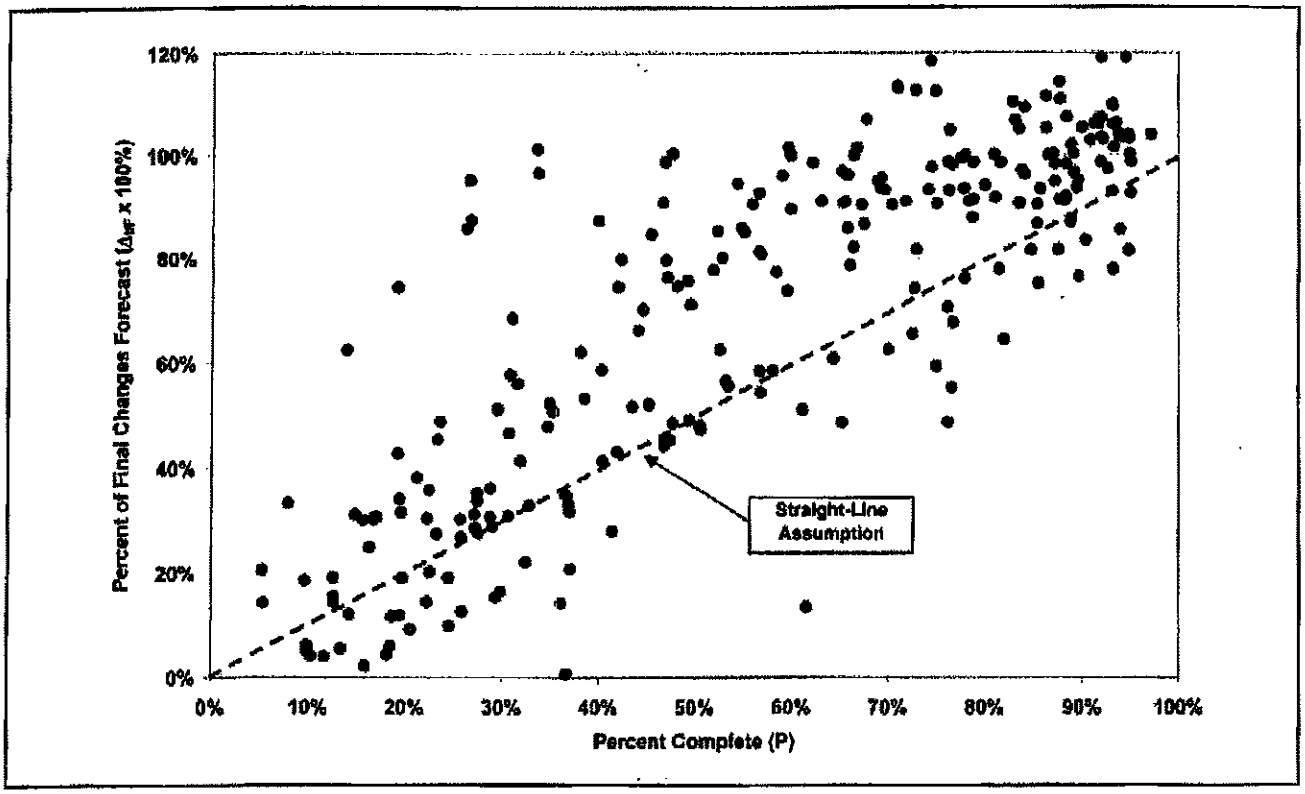

Figure 2—Scatter Diagram of Data with Straight-Line Assumption Superimposed.

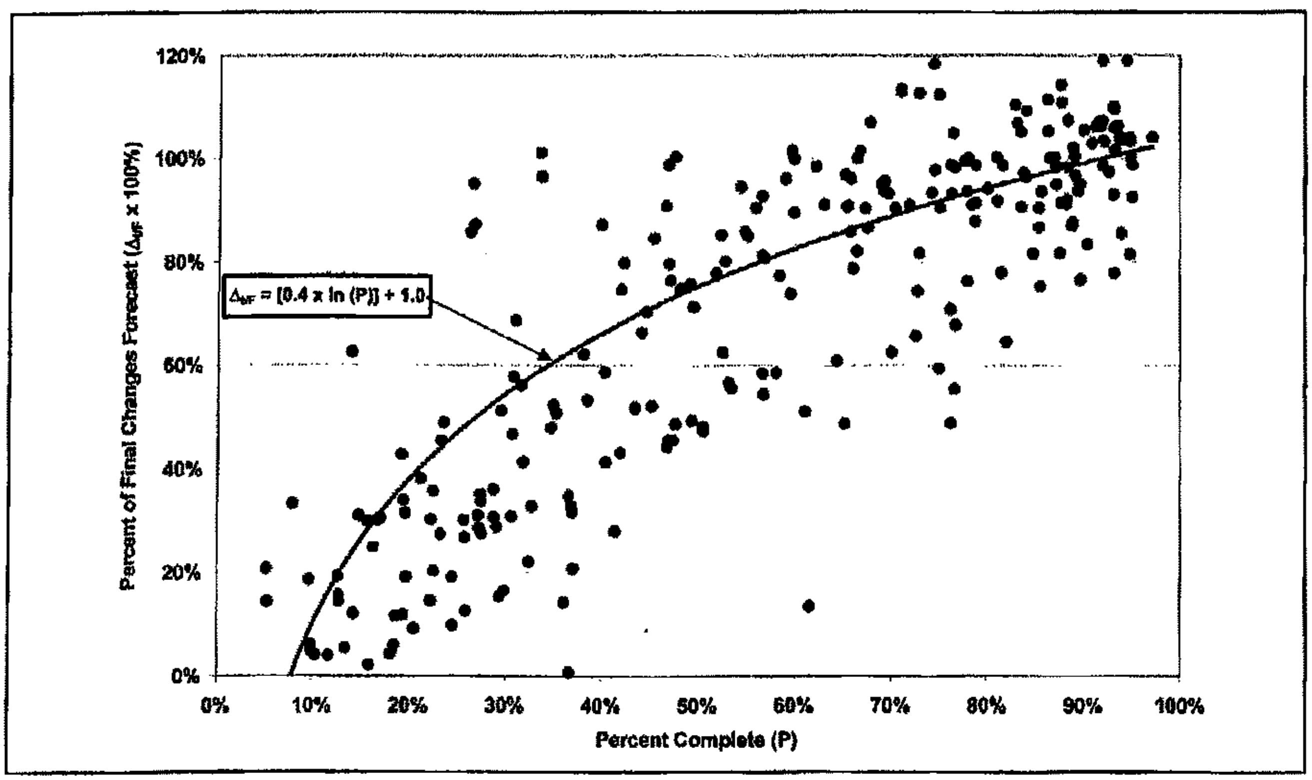

Figure 3—Scatter Diagram from Figure 2 With the Best-Fit Curve and Equation.

axis. (Values for P<5% and P>95% were excluded for clarity.) The dashed line on the graph shows the straight-line assumption we are testing.

Although the data points in our sample don't trace out a perfect curve, it is clear that the straight-line assumption is not accurate and is probably too conservative. In order to find a better solution, the author employed the spreadsheet program's curve-fitting feature. The best-fit curve (R^2=0.46), shown in figure 3, is a natural logarithmic function ($\ln = \log_e$) described as follows:

$$\Delta_{I/F} = 0.4\ln(P) + 1.0 \quad \text{(equation 5)}$$

This equation provides a value for the proportion of final changes Forecast ($\Delta_{I/F}$) expected to be included in the contract forecast (F) as a function of percent complete (P). It should be noted that, for values of percent complete (P) less than approximately 25percent, the best-fit curve does not fit the data very well. For this reason, and due to the fact that forecast data can be highly variable in the early stages of contract execution, estimate at complete (EAC) values derived from this equation and the contingency Tracking system (CTS), to be described shortly, should be considered to be unreliable until at least 25 percent completion is reached.

Table 2—Values of $\Delta_{I/F}$ Resulting from the Empirical Equation.

Percent Complete (P)	Percent of Final Changes Included in Contract Forecast ($\Delta_{I/F}$ x 100%)
10%	8%
20%	36%
30%	52%
40%	63%
50%	72%
60%	80%
70%	86%
80%	91%
90%	96%
100%	100%

Natural log functions are readily calculated by spreadsheet programs, and table 2 shows the results of this equation for a range of percent complete (P) values. The numerical results generated by this empirical equation seem to be intuitively more accurate than the straight-line assumption, as the proportion of final changes forecast ($\Delta_{I/F}$) rises quickly in the first half of contract completion as cost issues are identified and negotiated, then levels out as completion is reached.

As an example, for a contract that is 50 percent complete, table 2 shows that we can expect that a good contract forecast (F) figure has captured 72 percent of the final changes that will occur on the contract. To account for the 28 percent of changes that have not yet been forecast, we would simply retain 28 percent of the initial contingency (C_I) value in addition to the contract forecast (F) value. Since the value of $\Delta_{I/F}$ derived in our empirical equation is expressed as a decimal, we would subtract it from one to arrive at a value for retained contingency (C_R). Mathematically, retained contingency (C_R) is derived as follows:

$$C_R = (1 - \Delta_{I/F}) \times C_I \quad \text{(equation 6)}$$

Substituting in our empirical equation for $\Delta_{I/F}$:

$$C_R = [1 - (0.4\ln(P) + 1.0] \times C_I \quad \text{(equation 7)}$$

Simplifying the equation results in the following:

$$C_R = -0.4\ln(P) \times C_I \quad \text{(equation 8)}$$

Table 3—An Example CTS for a Simplified Light Rail Project.

		Numerical Inputs				*Calculated Values*			
		B	*F*	*A*	C_I	*P = (A/F) as %*	C_R = - 0.4 ln(P) x C_I	EAC = F + C_{RET}	O_{SD} = B - EAC
Contract No.	Contract Description	Current Budget	Current Forecast	Actual Costs	Initial Contingency	Percent Complete	Retained Contingency	Estimate at Completion	Contingency Surplus/(Deficit)
A100	Procure Rail, Ties and Special Trackw	525,000	525,000	525,000	25,000	100.0%	0	525,000	0
A999	Procurement Allocated Contingency	0	0	0	0	0.0%	0	0	0
	Subtotal Procurement	**525,000**	**525,000**	**525,000**	**25,000**	**100.0%**	**0**	**525,000**	**0**
C100	Civil, Track & Landscaping	11,000,000	11,325,000	7,630,000	1,000,000	67.4%	157,970	11,482,970	(482,970)
C200	Stations & Park and Ride Facilities	3,300,000	3,125,000	1,000,000	300,000	32.0%	136,732	3,261,732	38,268
C999	Civil Allocated Contingency	25,000	0	0	0	0.0%	0	0	25,000
	Subtotal Construction	**14,325,000**	**14,450,000**	**8,630,000**	**1,300,000**	**59.7%**	**294,702**	**14,744,702**	**(419,702)**
S100	Overhead Contact System	1,650,000	1,550,000	50,000	150,000	3.2%	206,039	1,756,039	(106,039)
S200	Combined Communications & Signals	2,300,000	2,000,000	0	300,000	0.0%	300,000	2,300,000	0
S999	Systems Allocated Contingency	25,000	0	0	0	0.0%	0	0	25,000
	Subtotal Systems	**3,975,000**	**3,550,000**	**50,000**	**450,000**	**1.4%**	**506,039**	**4,056,039**	**(81,039)**
Z999	Project (Unallocated) Contingency	1,500,000	0			0.0%	0	0	1,500,000
	Subtotal Project Contingency	**1,500,000**	**0**	**0**	**0**	**0.0%**	**0**	**0**	**1,500,000**
	TOTAL PROJECT	**$20,325,000**	**$18,525,000**	**$9,205,000**	**$1,775,000**	**49.7%**	**$800,741**	**$19,325,741**	**$999,259**

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Table 4—Numerical Inputs to the CTS

Numerical Input	*Designation*	*Contract Status / Type*	*Value to Use*
Current Budget	B	Pre-Bid	Current Budget, which should include change order contingency that was developed using the contingency guidelines.
		Active	Current Budget, which was reset at award to equal the Original Contract Value + Initial Contingency (C_I).
		Contingency Line	Current Budget for the contingency line.
Current Forecast	F	Pre-Bid	Set equal to the Current Budget (B) less any change order contingency included in that number.
		Active	Original Contract Amount + Approved/Pending Change Orders + Identified Potential Changes. *(Note: This value should not include any allowance for changes that have not yet been identified.)*
		Contingency Line	Always zero.
Actual/Incurred Costs to Date	A	Pre-Bid	Always zero.
		Active	Use either Actual or Incurred Costs for the contract, depending on what's available from the cost system.
		Contingency Line	Always zero.
Initial Contingency	C_I	Pre-Bid	Change order contingency included in the Current Budget
		Active	Use the contingency guidelines, based on the contract risk type, to develop a percentage factor to apply to the Original Contract Amount.
		Contingency Line	Always zero.

Table 5—Calculated Values Used in the CTS

Calculated Value	*Designation*	*Calculation*	*Description*
Contract Percent Complete	P	A / F	Measure of progress toward contract completion expressed as a percentage.
Retained Contingency	C_R	$-0.4 \ln(P) \times C_I$	This equation was derived empirically. C_R is an allowance for future changes that have not yet been identified. *(For P=0, $C_R = C_I$)*
Estimate at Completion	EAC	$F + C_R$	Contract estimated cost at completion that takes into account all approved/identified changes plus an allowance for future changes.
Contingency Surplus/Deficit	$C_{S/D}$	B - E	A contract's projected impact on project contingency. Negative values (deficit) represent consumption of project contingency while positive values (surplus) indicate contracts that will return contingency back to the project upon completion.

We now have all the prerequisites in place for a construction phase contingency tracking system (CTS).

THE CONTINGENCY TRACKING SYSTEM (CTS)

The contingency tracking system (CTS) was developed to provide an up-to-date snapshot of remaining cost contingency on a large rail and highway expansion program. The goal was to provide an objective measure of remaining contingency that takes into account the latest forecast cost for each component construction contract as well as an allowance for changes that will likely occur but have not yet been identified. The CTS had to be simple to understand so that it would be accepted by a number of project stakeholders, and easily maintained so as not to present a recurring burden to the project controls staff. The CTS focuses on the construction category of project costs since, during the construction phase, this is where the vast majority of risk remains. Table 3 shows the CTS as applied to a simplified project, in this example a small light rail project. At first glance, it looks somewhat complex but as will be shown, it consists of readily available numerical inputs and values derived from these inputs with simple calculations.

The rows of the CTS represent construction contracts and contingency line items that are organized by contract type. In this example, an allocated contingency line is included in each construction category as well as a project contingency line at the bottom. The specifics of how contingency is deployed across the project categories are a matter of preference, but the CTS can be adapted to any scenario.

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The contracts in table 3 range in progress from pre-bid (S200), to active (C100, C200, and S100), to completed (A100) in order to demonstrate how the CTS treats each type. Totals for each column are shown by category and at the bottom line. The columns are organized into two groups: numerical inputs and calculated values.

NUMERICAL INPUTS TO THE CTS

The numerical inputs to the CTS should all be readily available information from either the project cost report or forecast reports maintained by field construction management staff. These numerical inputs are as follows and are summarized in table 4 for handy reference:

Current Budget (B)

Taken from the project cost report, it should include all budget transfers/changes that resulted from the evolution of contract scope up until contract award and, as discussed, should also include an amount to cover change orders. When bids are received and the contract is awarded, the budget should be re-set to equal the original contract amount plus an initial contingency (C_I) by transferring budget to/from allocated and/or project contingency. Ideally, this budget will not be changed again until the contract is completed and excess budget is returned to contingency.

Current Forecast (F)

Before a contract is bid, this will equal the current budget, less the amount included to cover change orders. After contract award, field construction management personnel typically maintain the current forecast as previously discussed. Note that the current forecast should not include any factors to predict the value of unidentified changes, as the CTS will account for these.

Actual Costs (A)

Taken from the project cost report. The value of all payments made on a given contract as of the date the CTS is being updated.

Initial Contingency (C_I)

Before a contract is bid, the initial contingency guidelines discussed earlier are typically employed to develop the Initial Contingency (C_I) value based on the engineer's estimate. When bids are received and the contract is awarded, C_I is recalculated using the same guidelines applied to the bid amount. Note that, while the other numerical inputs are updated on a regular basis, initial contingency is a static number that will not change once contract award is made.

CALCULATED VALUES USED IN THE CTS

The CTS takes the numerical inputs described above to derive calculated values that are ultimately used to arrive at the total contingency available after taking construction cost trends into account. These calculated values are as follows and are summarized in table 5 for handy reference:

Contract Percent Complete (P)

There are many ways to ascertain progress toward completion of construction contracts. For simplicity, the CTS relies on Actual Costs (A) and the Current Forecast (F) to generate this number as follows:

$$P = A / F$$

(equation 9)

Retained Contingency (C_R)

This calculation is at the heart of the CTS. It represents a forecast value of change orders that have not yet been identified by the construction management team but that we anticipate from experience will sooner or later be encountered. As derived earlier, this number is a natural log function, calculated as follows:

$$C_R = -0.4 \ln(P) \times C_I$$

(equation 8)

This formula provides invalid results for a zero value of percent complete (P). In this case, the value of initial contingency (C_I) should be used.

Estimate at Completion (EAC)

This number is simply the sum of the current forecast (F) provided by our field construction management staff and Retained Contingency (C_R). The estimate at completion (EAC) is calculated as equation 1 demonstrates.

The author has used this EAC value as an early warning of contracts that are trending toward exceeding agency contract authorization limits. It often provides a warning several months before an overrun becomes readily apparent, but tends to be unreliable until a contract is at least 25 percent complete, as discussed earlier.

Contingency Surplus/Deficit (CS/D)

By comparing the estimate at completion (EAC) to the current budget (B) we can determine whether a given contract is trending towards adding to or depleting project contingency. The contingency surplus/deficit ($C_{S/D}$) is calculated as follows:

$$C_{S/D} = B - F$$

(equation 10)

When the contingency surplus/deficit ($C_{S/D}$) is totaled across all construction contracts, allocated contingency lines and the project contingency line, the resulting value represents a good estimate of contingency available for non-construction project categories (e.g. right-of-way, design, and management).

The "punch line" of our CTS example is shown in the bottom right corner of table 3. This number represents the contingency available for other project risks after construction risks are covered. In the example, although the budgeted project contingency is $1.5 million, the CTS shows that only about $1.0 million in contingency is actually available for non-construction project risks. The CTS is forecasting that the construction contracts will consume $0.5 million of project contingency to complete.

Note that, in the example project depicted in table 3, the total bottom-line value for retained contingency (C_R) is approximately $0.8 million. Recall, that this is the amount the CTS is adding to the field-generated contract forecasts to account for unidentified changes. Therefore, a project manager who relied solely on the field-generated forecasts to calculate EAC's would think that $1.8 million in contingency was available. If a scope addition valued at $1.25 million was approved, it might lead to a nasty surprise, as construction contracts progressed and additional changes were identified, resulting in an overrun of the project budget.

ADVANTAGES AND LIMITATIONS OF THE CTS

The main advantage of the CTS is its simplicity. It does not require advanced mathematics, statistics, or computer programming abilities to set up and maintain. This simplicity makes it easier to explain to and achieve buy-in from project stakeholders for the results that it generates. The basis for the Retained Contingency (C_R) calculation at the heart of the CTS is a set of real-world data, and the results pass the reasonableness test. The simple spreadsheet format and readily available numerical inputs make maintenance quite easy, which is important because the CTS should be updated on a regular basis in order to spot trends early. Another advantage is that the CTS provides an objective reading of remaining contingency, generated in a consistent manner from month to month. The only subjective input to the CTS is the initial contingency (C_I) value for each contract, and even that results from the application of a pre-determined set of guidelines and is set just one time for the life of the contract. Individual judgment can be applied to the values that result from the CTS, but the objectivity and consistency of the calculation method is important given the high stakes involved in managing project contingency.

As discussed, the retained contingency (C_R) calculation at the heart of the CTS was derived empirically from real world data on a light rail project. That data did not conform perfectly to a smooth curve; hence there is bound to be some inaccuracy in the empirical equation that resulted from it. However, the results shown in table 2 seem to be intuitively more representative of reality than the simplified straight-line alternate assumption. The fact that the data used to derive the calculation came from light rail projects may limit its usefulness in other sectors, e.g. building construction. More study is needed here, with forecast data collection and analysis in other sectors of construction necessary to verify or modify the retained contingency (C_R) calculation as appropriate. Also, as mentioned earlier, the estimate at completion (EAC) calculation can produce inaccurate results on an individual contract basis prior to approximately 25 percent completion due to inconsistent forecast information and poor correlation of the model in the early stages of contract execution.

As with any mathematical system, the CTS is only as good as the data that goes into it. The most important and hardest numerical input to come by is an accurate current forecast (F) for each contract. If reliable current forecast numbers are not available, the CTS will be of limited value. Finally, although simple, the CTS does require that consumers of its output be educated on the assumptions and calculations that underpin it to the point that they can understand and trust its results. There is no purpose in setting up and maintaining the CTS if project stakeholders have no understanding of or faith in it and are unwilling to act on its results.

As stated at the beginning of this paper, contingency is defined as an amount added to the budget to account for changes that inevitably occur. Using pre-established guidelines, we can establish a percentage of the original bid to initially include in our contract budget to account for change order growth. We have seen that, to derive an accurate estimate at completion (EAC) for each construction contract, we must start with a thorough contract forecast and add a retained portion of the initially established change order contingency to account for changes that have not yet been identified. A formula for calculating the retained contingency value was then derived based on a sample of real-world data. By comparing EAC's calculated in this way with the current budget for each contract, we can determine the amount each contract will add to or subtract from project contingency. Finally, by summing these impacts over all contracts and contingency lines, a bottom-line value of project contingency available for non-construction uses can be obtained.

The contingency tracking system (CTS) combines all of these steps into a compact and easily maintainable spreadsheet table. Using the CTS, project managers have a guide to the expected final cost of each contract and the approximate value of project contingency left after accounting for construction risks. This ability to see into the future will serve project managers well as they navigate the many obstacles standing in the way of successful project delivery.

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Area Labor Study for KCPL Iatan Unit 2 Project

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INDUSTRIAL CONSTRUCTION & TURNAROUND CONSULTANT

KCPL Iatan Unit 2 Project
Area Labor Study

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1.0 Overview

The period of 2006 through 2012 will see unprecedented amounts of new industrial construction and retrofits in the Midwest and gulf coast states. In addition, the rebuilding from hurricane damage will add to the strain on skilled manpower supply. It is reported that it will take 43,000 crafts to rebuild housing alone in the New Orleans area and predictions are for a 35% shortage of skilled workers overall in the gulf coast region.

The result of this high demand for skilled workers will be higher wages and incentive pay. The non union sector has not been successful in attracting and maintaining a skilled workforce in recent years. Existing skilled manpower is estimated to be 25,000 people in the gulf coast region.

Wages have been flat for 20 years, benefits are lagging other occupations, all resulting in a 75% drop in enrollment at NCCER, the ABC training center for construction crafts. The gulf coast private sector is very concerned about stability in the non union construction area regarding costs, schedules, and supply of workers.

Only recently, a non union welder on the gulf coast is paid $29 per hour in wages plus $3.50 per hour in fringes, $70 per day Per Diem, and up to $2.00 per hour in incentives. The standard work week is 5-10's.

The oil refining work load requirements add pressure to the Pipefitter, Boilermaker, and Electrician manpower problems. In addition, the $100 Billion dollar Tar Sands Project in Canada will preclude the use of Canadian workers on US work.

The Iatan Project will have reasonable success in attracting tradesmen due to the union's high wage and fringe packages (see attachment 2). For example, the Pipefitter wage in Kansas City is $34.83 per hour plus $15.00 per hour in fringes, compared to the Pipefitter union wage in Houston and Tulsa of $23 per hour and $10 per hour in fringes. It is significant to note that now the union fringe benefits are accrued to the workers home local. In the past the fringes stayed in the local where the work was performed.

The Kansas City Building trades enjoy a good reputation with the contractors for productive work and jobsite harmony when compared to many other parts of the country.

The International unions are interested in keeping their existing clients such as KCPL and expanding market share. Progressive activities are ongoing with the national building trades, such as the establishment of the Mechanical Trades Alliance, headed up by UA General President Bill Hite. This alliance is focusing on shared resources for the training of workers, productivity enhancements, and seamless jurisdiction between the trades. Other initiatives involve competitive agreements for use in low density union areas.

I recommend the NMAPC (National Maintenance Agreement) for this project (See paragraph 1.4). This agreement is administered by equal numbers of international union representatives, contractors, and a very competent staff. The application of the agreement is consistent among all crafts. All trades are bound to the agreement including the carpenters and teamsters even though those particular crafts have disaffiliated themselves with the AFL/CIO.

My review for information herein included inquiries of the following;

- Kansas City Building Trades

- UA, BM, IW International Representatives
- Four National Contractors
- NACBE
- NMAPC
- UA, BM, & IW Kansas City Locals
- BM Locals in surrounding areas
- Director of Pride Inc. of St. Louis
- Burns & McDonnell Sales and Marketing information

1.1 BEST PRACTICES

Approximately 30% of this projects costs will be construction labor therefore productivity enhancement is a must.

The ability to attain good productivity results requires the following practices at a minimum;

1). The contractor must be committed to the zero injury culture and techniques.

2). Detailed planning and scheduling by the contractor. This must be a serious effort. The plan must run the job. The contractor must have these resources.

3). Timely delivery of materials and equipment.

4). Minimize engineering and fabrication changes.

5). Substance abuse testing, including random.

6). Timely delivery of engineering and technical information.

7). The contractors must provide ample tools and equipment.

8). The contractor must have experienced and competent staff and supervision.

9). The contractor must control the labor on site. Utilize and understand the labor agreement management article to its fullest extent.

10). Control work jurisdiction between the crafts.

11). Negotiate a crew mix within the crafts using apprentices.

12). Avoid saturated manning and high work density.

13). Avoid shift work and overtime.

14). Promote craft ownership in the project. This begins with the safety initiative.

15). Minimize worker turnover. A 10% increase in turnover results in a 2.5% increase in labor costs plus productivity and safety impacts.

1.2 SAFETY/WORKER COMPENSATION

Training and orientation should be centered around the Zero Injury Techniques. (RE: Zero Employee Injury, Nelson Consulting).

The top high impact techniques are:

- Pre project / Pre task planning.
- Safety orientation and training. The quality of the training is much more effective than the quantity of training.
- Safety incentive, recognition and rewards program.
- Substance abuse program.
- Staffing for safety.
- Accident investigation.
- Worker participation and empowerment.
- A demonstrated management commitment.

Safety excellence is top driven; the owner, construction manger, and contractor executives and staff must actively support its commitment to having a zero injury work site. I also believe that the union business manager must become an active participant. I have a concern that they are not totally involved today.

Substance abuse testing on union projects has been somewhat more difficult to accomplish because the NLRB has ruled random testing of an employee must be negotiated or included in the collective bargaining agreement. I believe this could be negotiated through the NMAPC and the International Unions. Another method for accomplishing random testing would be to have an owner's drug policy for all contractors on their site.

1.3 QUALITY

Welder quality is excellent for pipefitters and boilermakers, however it is recommended to test each welder prior to start of work.

The NMA agreement allows 4 hours of pay if the welder passes the test.

The contractor on the Council Bluffs Project expressed that he has never had to perform as much on site training for any one project in the company's history. In particular the skill level of the Ironworkers, Carpenters, and Certified Operators was a serious problem. Most had very little industrial experience.

1.4 LABOR AGREEMENT

Attached is a copy of the NMAPC agreement and a summary of the agreement.

It is recommended that this project be done under the NMAPC agreement.

All crafts will be under the same agreement, therefore application of the articles are consistent among all.

The management clause is strong but it requires the contractor to use it effectively.

All trades are signatory including the Carpenters and Teamsters.

Consistent application of the agreement will minimize grievances and other HR issues which tend to take management time away from execution of the work.

Likewise, it is important the contractors enforce the work rules and agreement from day one on the project.

On reimbursable work I would consider placing a portion of the contractors fee at risk and use the management of the agreement as an incentive.

There is a "book of decisions" covering interpretation resulting from past issues and grievances which were ruled upon by the policy committee.

Even though the agreement is defined as maintenance, there have been broad interpretations of the agreement to include new construction.

The agreement is a stand alone national program without local administration. The only part of a local agreement is wages, fringe benefit trusts, and referral rules.

One may conclude that voting on issues and grievances, with the makeup of the policy committee being 14 management and 14 international union representatives to be along party lines, but as a member of the committee for many years, I have never seen a close vote, which says a great deal about the NMA

The vehicle is the NMAPC program, a labor- management organization that can reduce labor costs by at least 16% over local agreements. Some of these advantages include:

*No strikes clause- including substantial penalties

*Mandated pre-job conferences

*Alternate dispute resolution to reduce workmen's compensation insurance costs

*All overtime @ 1 1/2x except for Sundays and holidays

*All crafts observe the same 7 unpaid holidays

*Flexibility in scheduling

*Commitment to drug free workplace

*Contractor determines crew size needed

*Welder certification cost control

*Only 1 foreman per craft on any shift is guaranteed 40 hours pay

*Provision to enable participants to respond to changing needs

The Facts: *Over 1.6 billion man-hours worked since 1971

The Committee: The NMAPC is the construction industry's first incorporated labor management committee. It's members are 14 national maintenance contractors and 14 representatives from the participating International Unions of Building and Construction Trades Department, AFL-CIO. The office of the Impartial Secretary administers the NMAPC Program with a full time staff located in Arlington, Virginia. The Committee is a proactive entity which meets regularly to administer the NMAPC Program and provide a national forum to promote labor management cooperative efforts in construction.

1.4 LABOR AGREEMENT (Cont.)

NMAPC, Inc.
1501 Lee Highway, Suite 202
Arlington, Virginia 22209-1109

Web:	www.nmapc.org
Email:	info@nea-nmapc.org
Phone:	703-841-9707
Fax:	703-524-3364
Founded:	1971

1.5 MANPOWER

The compiling of manpower only focuses on the critical crafts of Boilermakers, Pipefitters, Ironworkers, and Electricians.

Membership rosters are as follows:

- Pipefitters - 600 members
- Boilermakers - 500 Members (200 live in the Kansas City Metro area)
- Electricians - 1200 Members
- Ironworkers - 1200 Members (covers western Missouri and eastern Kansas)

Boilermakers:

It is quite evident that the Boilermaker union feels an overwhelming responsibility to service KCPL work.

Local 83 covers Kansas, Iowa, Nebraska, and Western Missouri. The Boilermaker work through 2007, 2008, and 2009 in the four state area will average 1100 men with estimated peaks at 1600 men. The St. Louis and Southern Illinois locals have approximately 200 men working in local 83 presently but due to their upcoming workload these locals will not be a source of workers.

Local 83, with its wage and fringe structure plus a 5-10's work week will be in a position to man the Iatan project. They have had up to 900 boilermaker travelers in the past on work around the Kansas City metro area.

In the event the manpower during the project becomes a critical issue, even more so than we know now, consideration should be made for paying subsistence rather than increasing overtime hours of work due to the inefficiency encountered with overtime.

Additional workload on power projects in Wisconsin, Minnesota, and Michigan are going to exceed manpower availability in those respective locals by 1000 to 1200 Boilermakers in the 2007 through 2009 period. (1400 members, 2600 required). Currently there are 500 Boilermakers working 6-10's on the Council Bluffs project.

Nationally the Boilermaker Union has 26,000 active construction members which in my view will likely be exceeded by 5000 during the 2008/2009 period.

We must keep in mind the labor contract expires 12/31/07 and could see wage increases at $2.00 to $3.00 per hour.

Pipefitters:
The Kansas City Local has Jurisdiction over the Iatan and Norborne projects. The peak loading will occur during 2009 at 800 men for the two projects when the schedules overlap. A fairly steady requirement of 200 to 250 Pipefitters will be required on other work during the same time period.

This totals approximately 1000 men required where the local availability is 600. Presently they have 150 men out of work.

Again with the high wage and fringe in local 533, plus 5-10's work schedules, additional manpower will be available from Texas, Oklahoma, Louisiana, and Arkansas. Presently the Council Bluffs project has 600 Pipefitter travelers.

The Pipefitter contract expires 5/31/08.

Ironworkers:
Local 10 covers western Missouri and eastern Kansas and has 1200 active members with about 600 available in the Kansas City Metro area. Presently they have full employment; however, the commercial workload will decline somewhat by mid 2007.

The Ironworkers fringe package is the highest of all the trades which includes a $5.35 per hour annuity. This is an attraction for out of town workers.

The ironworker's skill level is reasonably good for setting heavy and high steel.

Manning of Iatan does not appear to be a problem with a 5-10's schedule.

Electricians:
This local has approximately 1200 members and presently does not have full employment. Most members are employed on commercial work.

The IBEW has a major effort ongoing nationally in training and innovative labor contracts in the low density union areas. Ed Hill, IBEW General President, is one of the building trades most progressive leaders on issues such as hours worked for hours paid, quality, safety, and training.

Their labor contract expires on 9/2/07 and I would expect to see $2.00 to $3.00 per hour settlements.

1.6 Summary

Solely for skilled labor attraction it is recommended the Iatan project work 5-10's when the critical crafts of Boilermakers and Pipefitters are required. This is approximately mid 2007. Obviously the entire project must work the 5-10's, not just the critical crafts, to keep labor harmony.

The total cost calculation for the project to work 5-10's from the start of civil / site work to completion is $35,524,000. If started only when critical crafts are required in mid 2007 that cost would be reduced by $5,000,000. When considering overtime work I would never consider hours greater than 10 hours per day or 6 days per week. For Example, the inefficiency for 7-12's is in excess of 30% and the premium pay adds 40% to labor costs.

I would consider a worker subsistence / Per Diem before increasing overtime beyond the 5-10's schedule. 6-10's, for example, only yields 8.2 hours of work per day after applying an inefficiency factor.

Labor escalation is expected to be 8-10% per year. See Attachment 2 for contract expiration dates and existing wage and fringe packages.

The average cost rate (Wage, fringe, Insurance, and taxes) is $53.45 per hour. A crew mix with apprentices will lower the overall rate. The contractor must request apprentices and give them meaningful work on the site. It is reasonable to expect 25% of the crew on work of this type could be apprentices.

Employees should be expected to be "work ready" when they arrive at the site. This would include safety training, site orientation, substance abuse testing, and all certification to be completed prior to signing up for employment.

A serious "Zero Injury" safety program must be in place prior to the start of work. I recommend Emmitt Nelson of Nelson Consulting in Houston, Texas for this endeavor.

A substance abuse policy with pre-employment, for cause, and random testing is a must. The pre-employment failure rate at Council Bluffs was an average of 10%. A recent power project in Northern Iowa had a 35% failure rate.

The NMAPC labor agreement is an agreement the Kansas City Building trades are familiar with and is very cost effective. It does require the contractor to manage the agreement for good results. The expectations for the project must be made clear to the labor organizations early on. This will also minimize turnover. In addition to the direct costs of turnover there is a high correlation between productivity and turnover. A turnover rate of 30% could result in a productivity factor of 1.5.

Attachment 1
Cost to Work 5-10's

- **Basis is Burns & McDonnell Manhour Summary** 3,864,327 Mhs
- **Factors:**
  - **Premium Time** 20% of manhours at half time
  - **Inefficiency** 8% of manhours at full rate
- **Cost Calculations:**

Premium time	3,864,327 Mhs
	X 20%
	772,865 Mhs
	X $22.00
	$17,000,000
Inefficiency	3,864,327 Mhs
	X 8%
	309,146 Mhs
	X $53.45
	$16,524,000

- **Total cost for 5-10's:**

Premium time	$17,000,000
Inefficiency	$16,524,000
Total	**$33,524,000**

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Attachment 2
Craft Labor Rates

Craft	% of Job	JM Wage	Through	JM Wage	Through	JM Wage	Through	Fringes**	Contract Expiration
Insulator	1.2	29.64	9/30/07	31.64	9/30/08			18.80	9/30/08
Boilermaker	20.2	29.85	9/1/07	30.55	12/31/07			17.26	12/31/07
Carpenter / MW	10.2	31.85	4/1/07	33.70	4/1/08	35.55	3/31/09	9.66	3/31/09
Cement Finisher	.7	26.23	4/1/07	28.23	4/1/08	29.83	3/31/09	10.87	3/31/09
Electrician	11.2	31.53	9/2/07					14.31	9/2/07
Operators	10.7	32.31	3/31/07					9.98	3/31/07
Ironworkers	8.7	26.95	4/1/07	28.80	4/1/08	30.65	3/31/09	16.65	3/31/09
Laborer	10.4	23.05	3/31/07					9.76	3/31/07
Pipefitter	24.3	34.83	6/1/07	36.93	5/31/08			15.00	5/31/08
Sheetmetal	.9	35.87	6/30/07					13.41	6/30/07
Teamster	1.5	26.55	3/31/07					8.86	3/31/07
Avg.	100	30.73						13.81	

** Some Fringes calculated on paid hours

Payroll taxes and Insurance:

• W/C	6.8 % @ EMR of 1
• General Liability	5.0 %
• FICA	7.65 %
• FUI	.8 %
• SUI	8.8 %
	29.05 % x Wages

Overtime:
- Time & ½ after 8 hours / day & Saturday
- Double Time Sunday & Holidays

Example:

Boilermaker Wage	$29.85
Fringes	$17.26
T & I (29.05%)	$ 8.67
Total Cost	$55.78 Per Hour

Average Cost Rate:	ST	T-1/2 Add	2T Add
Wage	$30.73	15.37	
Fringes	$13.81	4.00	
T & I	$ 8.91	2.65	
Total Cost	$53.45	$22.00	$44.00

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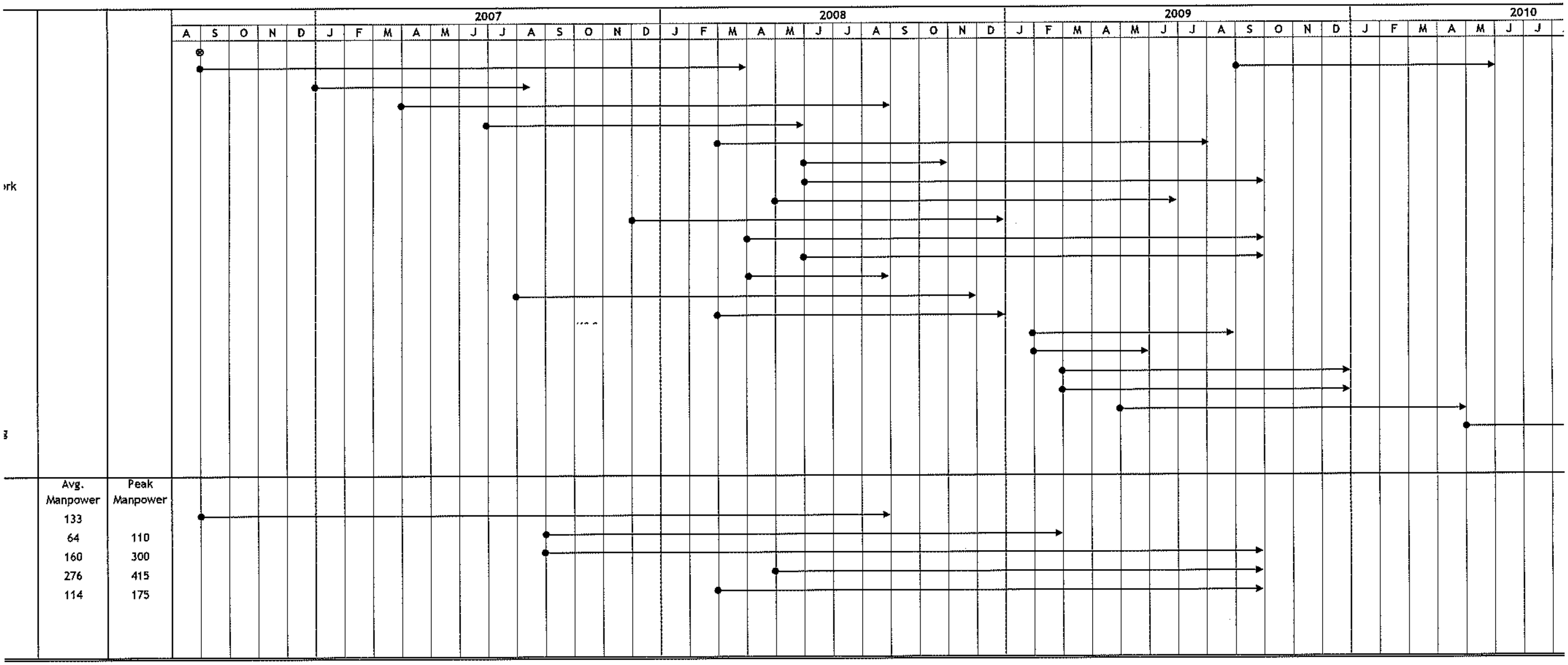
2.0
IATAN UNIT 2 PROJECT
PROJECT SCHEDULE AND MANPOWER



Schedule DF

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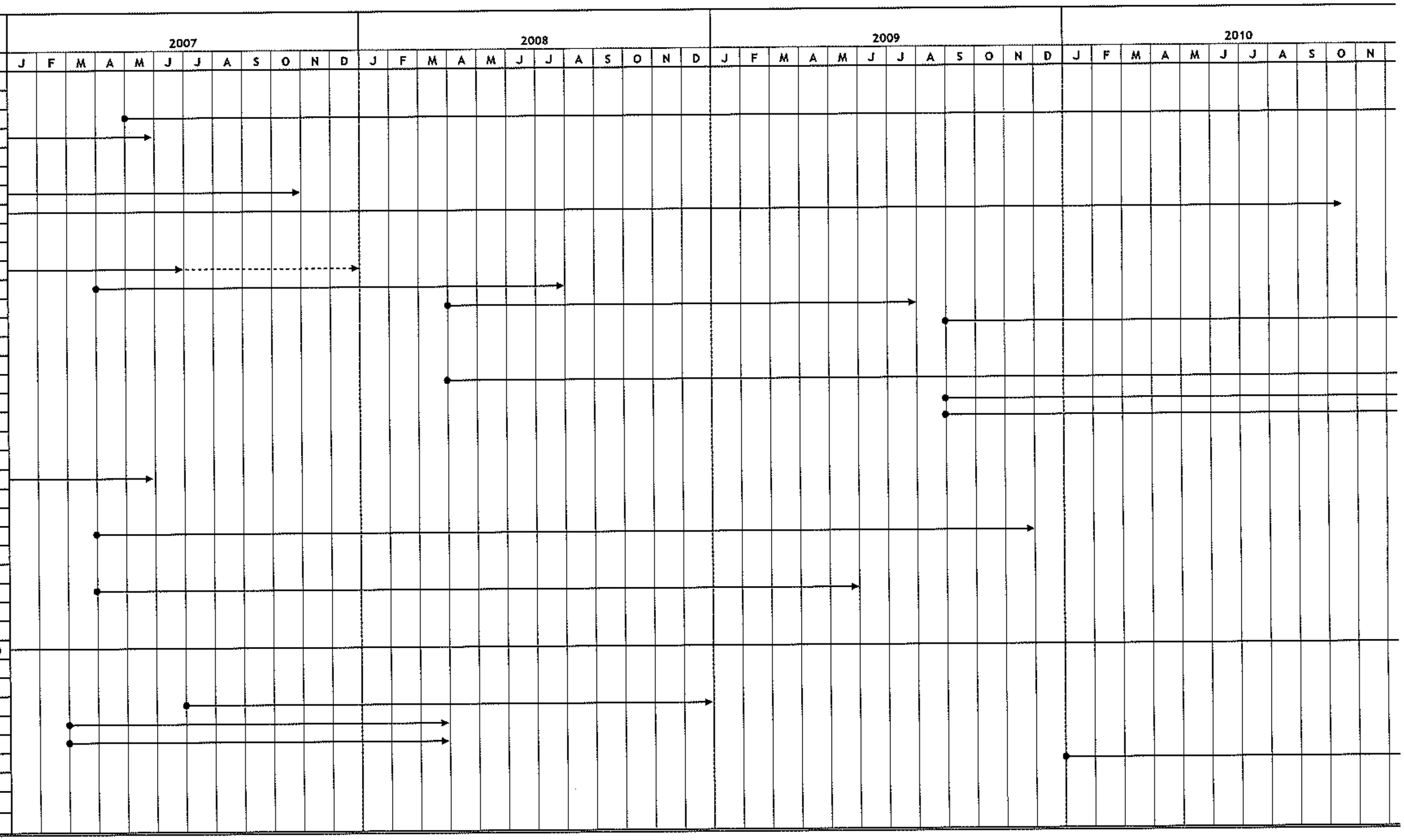
3.0
IATAN UNIT 2 PROJECT
CURRENT AND FUTURE AREA WORKLOAD

	Location	Critical Crafts Avg. Manpower BM	PF	IW	EL
00 MW CFB	Norborne, MO	160	270	64	114
		120	40		20
R	LaCygne, KS	120	40		20
	Iatan, MO				
MW CFB	Council Bluffs, IA	600	600		200
R	Council Bluffs, IA	120	40		20
rubber	Muscatine, IA	120	40		20
r		120	40		20
0 MW CFB		160	250	60	100
ubber - (1) 800 MW	Ottumwa, IA	120	40		20
rubber - (2) 300 M	Burlington, IA	120	40		20
	Asbury, MO	100	30		20
s					
	Springfield, MO	120	180	45	75
	Hastings, NE	Non-Union			
	Holcomb, KS	400	500	120	200
	Kansas	40	40		40
W FGD	Kansas	120	40		20
ber & Baghouse	Lawrence, KS	120	40		20
	Kansas				



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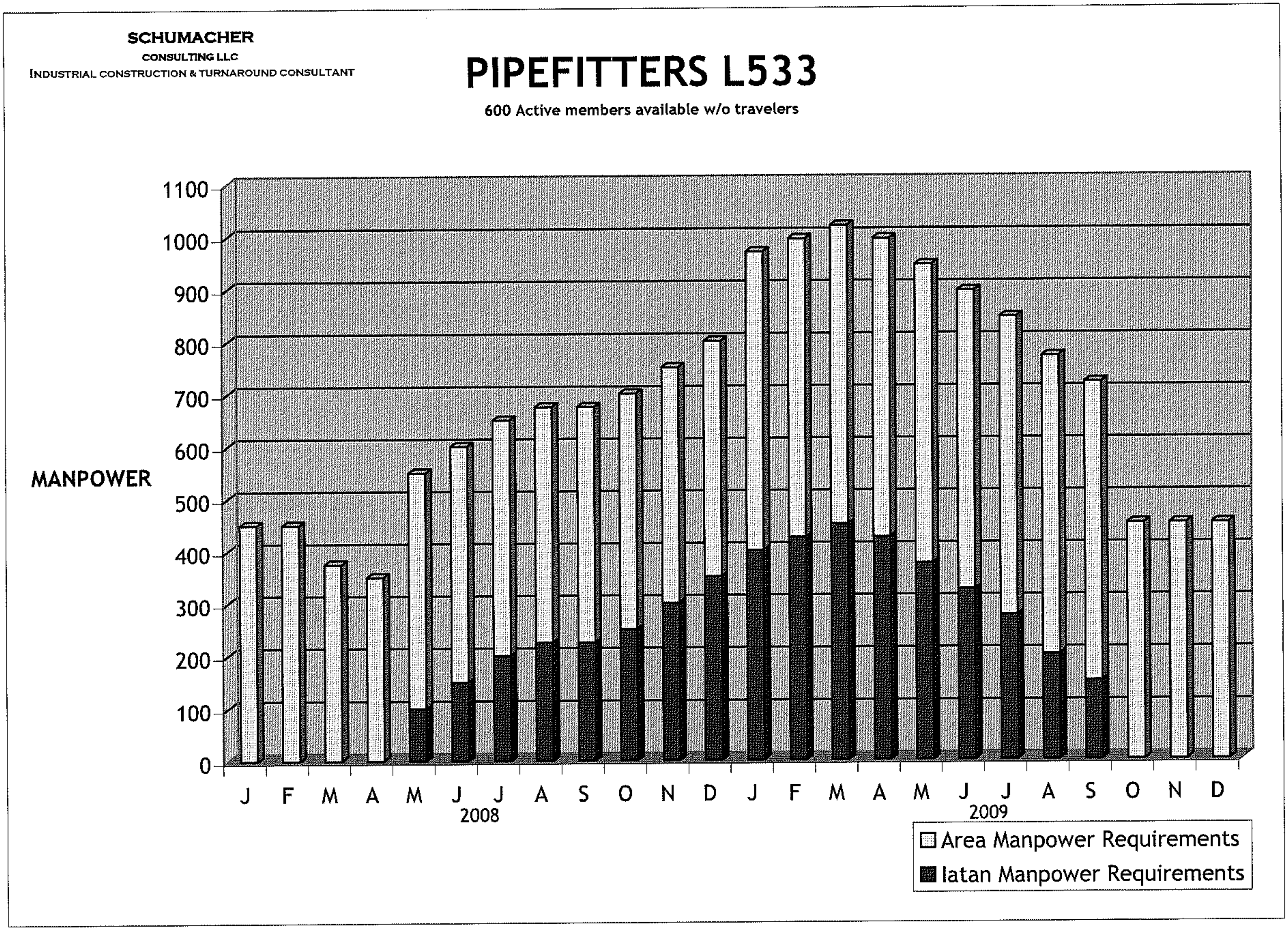
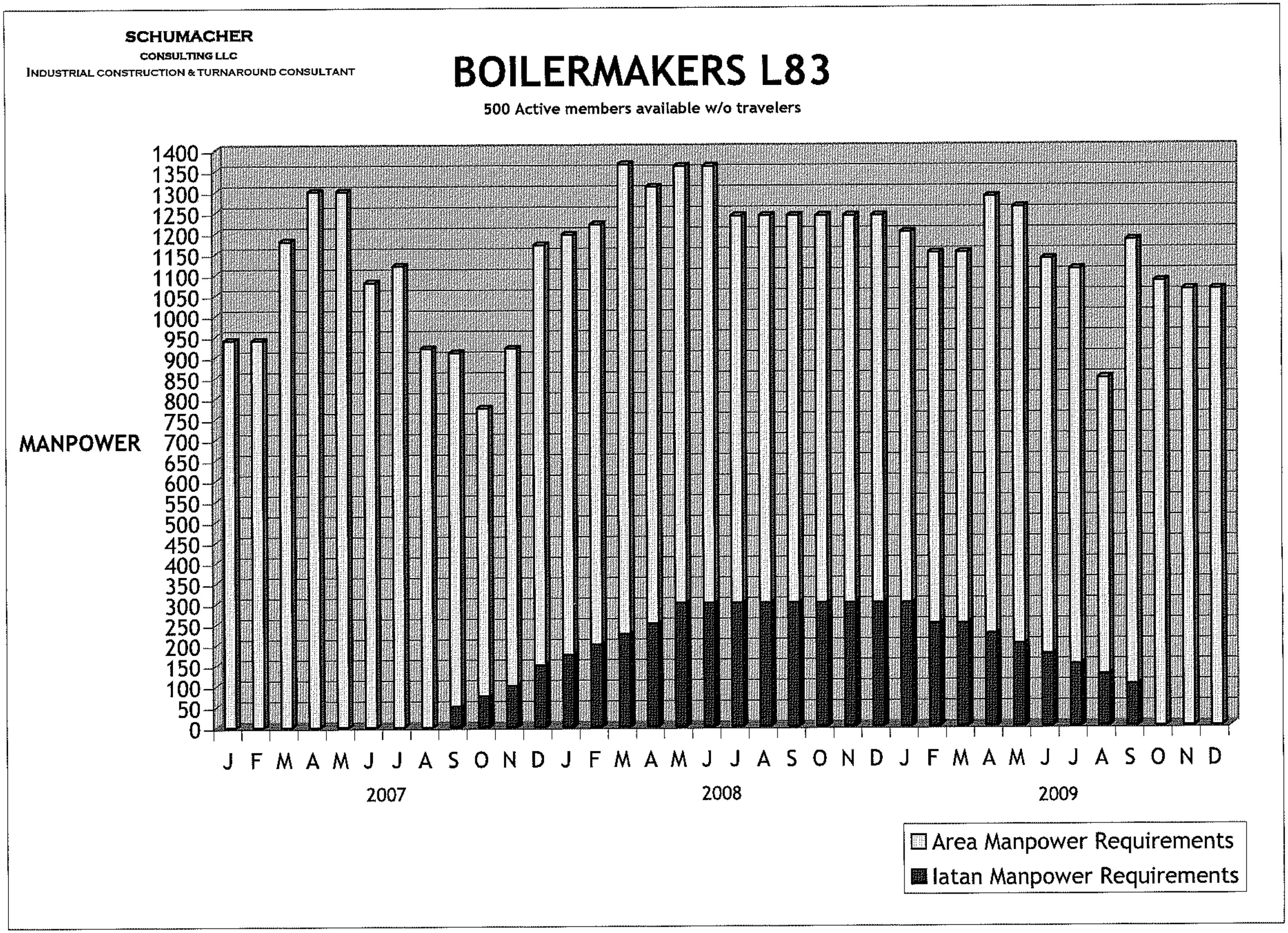
4.0
IATAN UNIT 2 PROJECT
OTHER WORKLOAD

	Location	Critical Crafts Avg. Manpower BM	PF	IW	EL	2007	2008	2009	2010
ustrial	Kansas City, MO	0	200	300	400				
int & T/A	Coffeyville, KS	55	165		100				
Int. & T/A	McPherson, KS	50	150		80				
ker	Wood River, IL	120	400		250				
arounds		2,650,000 Manhours							
	Eastern MO	260	80		40				
r	Eastern MO	240	100		40				
V CFB	Eastern MO	180	300		120				
	Eastern MO					$477,000,000	$500,000,000	$560,000,000	$140,000,000
	Marissa, IL	400	550	130	225				
it									
d Baghouses		600	200		200				
	St. Genevieve, MO	400	150		150				

Schedule DF



Schedule DFM2010-5



Schedule DFM2010-5

PIPEFITTERS	2008												2009											
Date	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Area Manpower	450	450	375	350	450	450	450	450	450	450	450	450	570	570	570	570	570	570	570	570	570	450	450	450
Iatan Manpower	0	0	0	0	100	150	200	225	225	250	300	350	400	425	450	425	375	325	275	200	150	0	0	0

BOILERMAKERS

2007												
Date	J	F	M	A	M	J	J	A	S	O	N	D
Area Manpower	940	940	1180	1300	1300	1080	1120	920	860	700	820	1020
Iatan Manpower	0	0	0	0	0	0	0	0	50	75	100	150

2008												
Date	J	F	M	A	M	J	J	A	S	O	N	D
Area Manpower	1020	1020	1140	1060	1060	1060	940	940	940	940	940	940
Iatan Manpower	175	200	225	250	300	300	300	300	300	300	300	300

2009												
Date	J	F	M	A	M	J	J	A	S	O	N	D
Area Manpower	900	900	900	1060	1060	960	960	720	1080	1080	1060	1060
Iatan Manpower	300	250	250	225	200	175	150	125	100	0	0	0

SCHEDULE DFM2010-6

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