

Operations Analysis

for

Protex Central Inc.

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for
Protex Central Inc.
Hastings, Nebraska

I. Purpose of Study

The purpose of the operation analysis of Protex Central Inc. is to fully define the nature and scope of the organization, to develop flow schematics of total company activities, to identify personnel function, to review inventory and ordering procedures, to study procedures currently being used for the purpose of maintaining project or financial control, and to present recommendations for improving company operations.

II. Description of Firm

Protex Central Inc. was formed in 1966 as a division of ABC Electric in Hastings, Nebraska for the purpose of providing quarterly fire alarm inspection services as required by Nebraska law. Four individuals were involved in the initial operation. In 1970, the company secured the dealership for Notifier, a Lincoln-based fire detection equipment company, for the western two-thirds of Nebraska. The company then expanded its operations to sales, installation and service of fire detection systems, while continuing fire inspection services.

In 1970, the company become an independent corporation, expanding its activities to include security systems, clock systems, and chemical suppression systems. In 1979, a management decision was made to dominate the market for that portion of Nebraska west of York, plus some activity in northern Kansas and eastern Wyoming.

The number of individuals employed by Protex Central Inc. has grown from the initial staff of 2 to over 40 people, in the company's 38-year existence. Please refer to the company organizational chart for a detailed layout of the staff.

The company also maintains branch offices in Hastings, Omaha, Des Moines and Scottsbluff. The Hastings, Omaha and Des Moines offices are fully staffed with an Operations Manager, technicians, sales staff, etc. The Scottsbluff office is a 2-man operation. The men who run these offices were experienced installers and technicians for the company, with no prior management experience.

III. Results of Operations Analysis

A. Administration

i. Cost Accounting

- a) **Observations.** Until the last several months, Protex Central Inc. did not have a cost accounting method that would relate the actual cost of labor, material, and expenses to the contract dollar amounts. Standard fees are charged for inspection services regardless of required travel, with only the actual cost of parts being charged on an individual basis to the client. In addition, historical data has not been maintained to determine if a bid or negotiated sales price resulted in profit or loss. Expenses for out-of-town trips are paid on a current flat per diem rate of \$25.00 for meals and lodging. No mileage is paid, since company vehicles are used, and field personnel are furnished with credit cards.

Recently the company instituted the use of a time sheet to be used by field or other hourly technical personnel to log project time by work code and client number, as well as hours attributable to sick leave, vacation, holidays, etc. Information from this time sheet has been utilized in a computer report prepared monthly for Protex Central Inc. by Work Incorporated a Grand Island, Nebraska service bureau. As a result, the information is being developed for determining direct labor costs and mileage cost attributable to a particular client. (This is an intended objective).

Important Objective: No procedure has been established to determine direct or indirect labor costs incurred by management or clerical personnel, either related to a specific client, to sales effort, or to the day-to-day operation of business.

As a result, no information is available to management to determine either the payroll overhead or the total administrative overhead.

Recommendations. In order for Protex Central Inc. to accurately determine the company's actual cost of doing business, a procedure should be developed to determine the direct and indirect costs incurred by management or clerical personnel, whether it is related to general administrative activity, sales effort, or a specific project. Consequently, time sheets should be kept by all personnel, with the work codes expanded to include the complete range of tasks undertaken by the company. Table No. 1 presents a proposed expansion of the existing Chart of Accounts, which will permit a detailed record of time spent and expenses incurred on the various

types of sales activities.

Table No 1.

Proposed Expansion of Chart of Accounts and Work Code

<u>1400 Series - Sales</u>	
1410 Inspections: Overtime	1420 Service: Overtime
1411 Inspections: Fire Alarm	1421 Service: Fire Alarm
1412 Inspections: Security	1422 Service: Security
1413 Inspections: Suppression	1423 Service: Suppression
1414 Inspections: Clock	1424 Service: Clock
1415 Inspections: Fire Station	1425 Service: Fire Station
1430 Installation: Overtime	1440 New Sales: Overtime
1431 Installation: Fire Alarm	1441 New Sales: Fire Alarm
1432 Installation: Security	1442 New Sales: Security
1433 Installation: Suppression	1443 New Sales: Suppression
1434 Installation: Clock	1444 New Sales: Clock
1435 Installation: Fire Station	1445 New Sales: Fire Station
1450 Training: Overtime	1460 Sales Taxes
1451 Training: Fire Alarm	1465 Use Taxes
1452 Training: Security	1470 Sales Returns and Allowance
1453 Training: Suppression	1480 Other Income
1454 Training: Clock	1490 Interest Income
1455 Training: Fire Station	
<u>1500 Series – Purchases</u>	<u>1700 Series – Sales Promotion</u>
1531 Service Truck Expense – Gas: Inspections	1771 Sales Promotion – Time
1532 Service Truck Expense – Gas: Service	1772 Sales Promotion – Travel
1533 Service Truck Expense – Gas: Installation	1773 Sales Promotion – Entertainment
1534 Service Truck Expense – Gas: New Sales	1774 Sales Promotion – Other
1535 Service Truck Expense – Gas: Training	

The last two digits of the Proposed Chart of Account numbers for sales and service are the same as the Work Code numbers currently being used. Mileage, however, is an expense item that should be coded separately as indicated. A procedure should also be developed to determine the general and administrative (G & A) overhead for the company. The following is a description of how to complete the general and administrative personnel overhead. Basically it is all non-chargeable expenses and non-chargeable salaries, including the payroll overhead for non-chargeable salaries, all divided by chargeable salaries. This

assumes that the rate the company charges for their technical personnel carries the full cost of general and administrative overhead.

The company could decide to include a percentage, say 50%, of the general and administrative expense in the mark-up on purchased and installed equipment. In this case, one-half of the G & A expense would be divided by chargeable salaries and one-half of the G & A expense would be divided by the cost of chargeable installed equipment. The decision on what the percentage split should be should be based upon approximately what percent of income is from chargeable salaries and what percent is from installed equipment.

$$\text{General \& Admin Overhead} = \frac{\text{General and Admin Expense}}{\text{Chargeable Salaries}}$$

and / or

$$\text{General \& Admin Overhead} = \frac{\text{General and Admin Expense}}{\text{Chargeable Installed Equipment}}$$

Since the code numbers indicate the type of work being done, the column for "Work Description" on the present Time Sheet can probably be eliminated, An additional recommended change to the Time Sheet is the addition of Overhead and Sales Promotion. Figure No. 1 is an example of the Time Sheet with the proposed modifications.

The hours reported on the Time Sheets can be summarized weekly on a simple form similar to Figure No. 2. This summary information can then be utilized on a monthly or quarterly basis to obtain the following information for Protex management:

$$\text{Total Cost of Fringe Benefits} = \text{Benefit Salaries} + \text{Benefit Costs}$$

$$\text{Overhead Salaries} = \text{Total Payroll} / (\text{Chargeable Salaries} + \text{Sales Promotion Salaries} + \text{Benefit Salaries})$$

Benefit Salaries includes Vacation, Sick Leave, Holiday, coffee breaks
Benefit Costs includes FICA, Group Insurance, Unemployment, Workmen's Compensation.

$$\text{Total Payroll Overhead (\%)} = \frac{\text{Total Cost of Fringe Benefits}}{\text{Total Payroll}} \times 100$$

ii. Project Financial Reporting

a) Observations. Button Lainson, a service bureau located in currently

furnishes Protex Systems, Inc. with several types of financial reports, including:

- Credit Management Report (which includes a record of Accounts Receivable).
- Past Due Summary (Accounts Receivable over 30 days).
- Billing Statements (summary only, plus previous billing).

The billing statement sent out to the client is usually preceded by

General & Admin Expense=General Business Expenses+All non-chargeable salaries+payroll overhead on non-chargeable salaries
an invoice mailed immediately after completion of the work. Since most contracts and/or agreements are lump sum amounts, neither the statement or the billing are broken down as to labor, equipment, or expenses. However, on larger bid projects, progress billings are sent, usually for equipment ordered and received, but not yet installed.

- b) Recommendations. Apparently the fact that a client receives first an invoice, then later in the month a billing statement which does not necessarily include the same amount as the previous invoice, has caused some confusion to the client. The practice of sending two types of billings should be thoroughly reviewed, with the aim of possibly reducing the procedure to one monthly invoice. This will reduce not only the chance for confusion, but clerical time and postage as well.

In addition, it may be possible to combine the Credit Management Report with the Past Due Summary. There appears to be a substantial amount of duplicated information, with some data possibly extraneous. The determination of exactly what is needed and in what form should be made prior to incorporating this type of report into any in-house computer system.

iii. Files

- a) Observations. Currently five separate types of files are maintained:
- Quotations for bid sales
 - Jobs in progress
 - Completed (record) files
 - Invoices
 - Purchase Orders

A typical job-in-progress project file consists of a manila envelope containing the signed proposal or contract, all correspondence or memos related to that project, and copies of work orders. Project files are filed alphabetically by town, with no visual identification

available by index tabs. These project files also include contract, ordering and correspondence related to fire inspection clients, although the inspection reports themselves are kept in the Operations Manager's office, where they are also filed alphabetically by town.

There is no existing project numbering system, and multiple projects for the same client are not identified or filed separately.

The invoice files contain completed work orders, billings for inspection, and invoices, but do not contain a copy of the contract or agreement.

Purchase orders are compiled by month in a separate file, with no cross-reference to client name or location.

b) Recommendations

- The practice of filing alphabetically by town and client name apparently works quite well. However, in order to permit easy-cross reference between files and to allow differentiation between multiple projects for the same client, a project numbering system should be instituted and used as identification on all types of files. An example of a suggested system is as follows:

8205-10 School District 34, Berwyn, Nebraska

The first two digits refer to the year (1982) and the second two digits to the month (May) in which the new project is initiated, while the number following the hyphen represents the sequence for that month in which that new project was entered on the job list. If a differentiation is desired between jobs for the various offices, monthly sequence numbers 1-199 could be reserved for the Hastings office, while Scottsbluff jobs for May of 1982, for example, would be 8205-200, 8205-201, etc. and similar categories of numbers set aside for other offices.

Such a numbering system also permits a quick way to determine when a project began, and facilitates checking on past records.

- Secondly, it is recommended that the invoice files and purchase order files be combined in a single file which will also contain the contract or agreement, with the client and copies of all work orders. In this way, a complete record of all information pertinent to billing

would be in a single central location. As mentioned previously, the practice of filing alphabetically by town and then by client appears to work very satisfactorily; however, all contents of each newly-created Contract File should also be identified by job number.

- Separate files (or at least subfiles) should be kept for each project, regardless of whether they are for the same client. This differentiation will be made possible by the incorporation of the recommended job numbering system.
- The manila envelopes currently used as file holders should be replaced with file folders placed in hanging files with identifying index tabs. Contents of the files should be punched and top secured with two-pronged metal fasteners. This will facilitate quick identification and removal of individual project files.
- Conclusions. Protex, Inc. has grown to a size where effective manual reporting and control of the various administrative functions is no longer practical. The need for quick access to current as well as historical cost, payroll and billing data is very real if the company is to maintain close financial and operational control.

In order to achieve this control, it is recommended that Protex Systems, Inc. purchase a computer suitable for the scope of operations involved. The company from which this equipment is purchased should have a proven experience record with both its hardware and all software packages which are relevant to Protex's data and work processing requirements, as well as having a nearby service center. Included in such software will be programs replacing those provided by Work Incorporated and Dutton Lainson, with a total cost accounting and financial reporting system. Other functions recommended to be computerized are discussed in following sections of the report.

B. Purchasing and Inventory

i. Warehouse Operations

- a) Observations. An extensive inventory of component parts for all systems marketed by the company is maintained in the warehouse. The value of this inventory is in the \$85,000 - \$100,000 range, including parts that cost only a few dollars on up to Cincinnati Clock components which cost over a thousand dollars. Parts are organized by designation of specific shelf areas for those components related to a certain type of system, such as security, range hood, miscellaneous

fire protection, etc. Parts also are coded by number, with some numbers incorporating manufacturer's order numbers and other numbers selected by Protex Systems, Inc. There is no master list of these codes to permit identification of parts by number, with personnel depending mainly on familiarity acquired by working on the various systems.

Inventory control is maintained through a system of manually compiled cards, one for each part, which describes the part, lists the purchase price of that part at the time it was ordered, the date and amount of the last order, and the quantity currently in stock. The decision to reorder is made by the warehouse manager, based on his experience.

Quantities shown on the inventory cards are updated manually on a daily basis by the warehouse manager, as the first task of the morning. Prices are changed only when more parts are ordered, so the price shown on the inventory card does not necessarily reflect current prices of equipment.

No inventory is maintained on tools, since all hand tools are the technicians and replaced by Protex Systems, Inc if damaged on the job.

Except for large projects, parts for specific projects are usually assembled and packaged the day before the job run is scheduled, and are either picked up by the technicians or sent by UPS to the field offices.

b) Recommendations . Although the manual inventory card system has been carefully developed and maintained, its efficiency and suitability has decreased as the company has grown. Much of its current workability is dependent on the detailed knowledge and experience of the current warehouse manager. An additional problem is the difficulty in maintaining current and/or accurate prices on the cards, since changes in the costs of parts occur irregularly in timing and in amount.

It is strongly recommended that Protex Systems, Inc. computerize their inventory control system, using one of the many proven software packages available. It will then be possible to update prices immediately upon receipt of notification from the supplier or manufacturer. In addition, information regarding quantity or time-

related discounts or special purchasing arrangements can be entered into the data bank and will be part of the pricing information brought forward on the screen for use in purchasing or bidding. A possible further extension of this aspect of data processing is the development of an optimum reorder point system for the company's inventory.

In anticipation of this changeover to computerized inventory and pricing control, it is recommended that a master list of all current parts be compiled, utilizing the existing coding system. Depending upon whose computer equipment is ultimately purchased, the coding system may possibly need to be modified to fit the software package.

C. New Sales

- i. Observations . There are two types of new sales activities at Protex Systems, Inc : (1) bid new sales; and (2) negotiated new sales. Each involves an extensive series of procedures and activities, involving staff from all departments, and usually involving installation of flow charts showing the process involved in each of the two major categories of sales are shown in Figure Nos. 3 and 4.

As Protex Systems, Inc. has grown and expanded its operation to include more diversified and complex services, the problem of maintaining project control f.-r new in1ep has become a ma lot concern. Although management ner-sonnel has a depth of experience and project f arniliaritv , the sheer magnitude of the number of projects concurrently in progress makes it impossible for an/ .jH-.j J n.'iv id ',-' 1 in the company to know the overall status of th^ work loaa or r.i.fr nrosr^ss status of the individual projects.

- ii. Recommendations. There are a number of reasons why timely project status information would be valuable to Protex Systems, Inc.
 - a)Availability to management of project status reports will permit necessary adjustments to be made in advance of problems rather than as reactions to a crisis situation.
 - b)Knowledge of existing work load will allow better informed bidding on potential new projects.
 - c)This same knowledge also will provide planning tools for scheduling of work already under contract, but not yet executed.
 - d)Project status reports, particularly reviewed in sequence, will permit a rapid overview by the General Manager of not only the overall current

level of activity, but of the ongoing trend of company operations and performance.

e)Current Project Costs

A number of manual techniques can be developed to permit more efficient project management. In fact, some steps have already been taken at Protex Systems, Inc. to monitor the status of certain critical project activities such as obtaining shop drawing approvals and meeting equipment delivery dates.

It is recommended that Protex Systems, Inc. incorporate a formal project status reporting system, involving input from the Financial Manager, the Assistant Sales Manager, and the Operations Manager, and utilizing a report form of the type shown in Figure No. 5. The report should be prepared at least monthly and should report the status, by date, of activities related to major new sales projects in progress.

It is also recommended that a special project status reporting form be developed for use with all individual bid projects and larger negotiated sales/installation projects. This form should be used by the Sales Department to facilitate preparation of the project status management reports, with a separate record maintained for each job and all individual files combined in a single file or notebook. A suggested format for this type of reporting form is shown in Figure No. 6.

It is also recommended that Protex Systems, Inc. investigate the feasibility of a computerized project status management report, or at least line item status reports for work in progress and manpower requirements. Care must be taken to insure that such a system requires uncomplicated and readily available input and furthermore is convenient to use. Software packages available with the various makes and models of computers should be examined carefully to see if they have the versatility and range of scale necessary for effective use by Protex Systems, Inc. management.

D. Inspection and Installation Operations

- i. Observations The Operations Manager is responsible for scheduling all fire alarm and range hood inspections and installations as well as for assigning personnel. All scheduling is done on a large planning calendar, and is usually done for the period of the current week. Out-state managers call in their scheduled activities on a daily basis. Work

orders for the outstate offices are sent to them by mail as assignments, and they are returned when the work is completed.

a)Inspections . Inspection schedules for fire alarm systems are organized on a Quarterly basis to meet the State of Nebraska requirements. Many change because of state. Dutton Lainson furnishes the inspection reports to be scheduled each month, with all basic information and run numbers provided on the forms through their word processing equipment. The customers are organized into geographic "runs" for each office with a certain number of runs scheduled for each of the three months in a quarter. An attempt is made to send the same inspector back each quarter. If the inspection reveals the need for service, the technician is generally able to perform minor repairs from his inventory of small standard parts on the truck. If additional work is needed, but is not critical to the functioning of the system, they are usually noted and deferred until the next inspection run.

Range hood inspections are performed every six months and are all handled by one person in the Hastings office. Outstate offices perform their own inspections. The forms for range hood inspections are prepared manually each month.

Remote connections at fire and police stations are also inspected on a regular basis, and scheduled by the Operations Manager. These forms are prepared manually prior to each inspection.

b)Work Orders. Installation of equipment and service calls are scheduled when the Operations Manager receives a work order and a packing slip, if equipment is to be installed. Upon receiving the work order, he assigns the proper identification code and logs the project by town.

Personnel are assigned to work orders on the basis of daily assignments if the projects are in the Hastings area, and on a weekly basis for a series of projects within a specific geographical area. parts are packed and packaged the previous day, so they are ready to be nicked up by the technician before he begins his run in the morning. Technicians working out of town call in each morning to obtain additional or modified assignments. Completed work orders are turned in weekly and noted on the project log. No completion dates are specified on the work orders, which are taken in sequence and processed as soon as a technician is available.

Range hood installations are handled by one particular technician and frequently must be done at night to minimize interruption of the restaurant activities.

ii. Recommendations

- a) Inspections. The fire alarm inspection procedure is well organized and appears to be functioning quite efficiently. The use of computer-prepared inspection forms is an effective practice and should be extended to include the other types of inspection reports when in-house computer capability is acquired. Since the inspections are organized by geographical run and by month, time and mileage is apparently being expended very efficiently. However, the interface with service or installations in the same geographical area is not as well organized. The use of the monthly planning calendar could be expanded as the first step in this process.
- b) Work Orders. Although work orders are noted on the weekly calendar as they are assigned, there is no summary of scheduled work that is readily available to anyone other than the Operations Manager. Since the schedule for inspections is essentially set week by week on a quarterly basis, and since work orders normally are received well in advance of personnel being available, the opportunity does exist to do some extended manpower planning on a bi-weekly or monthly basis. The planning should be performed in such a way that the information can be readily copied for the General Manager and the Warehouse Manager. In addition, there may be advantages to making the proposed assignments available to the technicians, so they can comment on the planning. Development of a long-range schedule will permit a better picture of the impact of larger projects on the availability of personnel for work on more routine, short-duration jobs. The development of historical data showing the actual hours expended on the various types of projects, made possible through the use of time sheets and job cost accounting, will provide the Operations Manager with more complete information for planning.

It also is recommended that a weekly report be prepared by the Operations Manager, showing both scheduled work and work actually completed. A suggested form for this weekly report is shown in Figure No, 7, This completed form would be routed monthly to the General Manager, together with a recap of types of projects completed, by work code, including revenue generated.

IV. TRAINING PROGRAM

Training for new technicians currently is on-the-job instruction, where the new employee accompanies an experienced man on his rounds, gradually being allowed to perform more and more of the tasks related to the job. After a six-month training period, the apprentice-level technician takes the State of Nebraska licensing examination for the installation and inspection of fire alarm systems. The newly licensed technician is then sent out on his own, first as an inspector, and as his skill develops, as an installer.

Protex Systems, Inc. is currently considering a more formal training program, to include basic theory on how the electronic equipment functions, along with step by step instruction in installation and repair. Companies who supply major items of equipment handled by Protex Systems, Inc. would participate in the sessions to transmit technical information on their products. Participation in various levels of the program would permit technicians to be qualified as follows:

	<i>Grade</i>	<i>Duties</i>
Inspector I		Make normal inspections, make minor repairs, handle report forms.
Inspector II		Handle advanced trouble shooting and do inspection of complex systems or special equipment
Installer I		Install standard equipment and handle routine service calls.
Installer II		Install complex system and specialty items, do advanced trouble shooting.

The concept of a formal training program is excellent, and could easily be expanded to include the kind of special training suggested by Communications Engineering. Once again, however, the importance of long-range planning must be stressed, so that training sessions can be scheduled well in advance, permitting outstate people to attend and not interfere with critical dates for work in progress. The individual assigned to develop the program should be given the proper guidance and assistance, since technical competence is only one of the considerations of such an undertaking. In addition, it should be remembered that training programs must be a continuous activity, as products and technology changes. Participation in the ongoing program should be a prerequisite to advancement in salary and responsibility,

to promote self-improvement.

V. SUMMARY

Protex Systems, Inc. is a company which has experienced excellent growth both in size and in diversification of services. As the company has grown, however, the ability to maintain effective control of costs and operation has become increasingly difficult.

A. As mentioned throughout the report, it is recommended that Protex Systems, Inc. should purchase a computer to facilitate both administrative and job-related functions. First priority should be given to the following two areas:

- i. Job cost accounting
- ii. Inventory control

Future consideration can then be given to adding the following program capabilities in this order:

- i. Inspection reports
- ii. Accounts receivable
- iii. Accounts payable
- iv. Payroll (Job Cost Accounting)
- v. Project management reports

In selecting the appropriate type of equipment, the following items should be considered:

- i. Proven performance
- ii. Availability of local service
- iii. Capability for expanded capacity, at no penalty
- iv. Simplicity of operation
- v. Quality training for purchaser's personnel
- vi. Appropriate and proven software packages
- vii. Affordable cost

Several companies have service representatives in Orand Island, including IBP, Burroughs, and Data General. All three of these companies have a record of experience in both hardware and software performance.

Marketing for computer companies is very regionalized, and sales representatives in Omaha are reluctant to make calls concerning potential

sales not in their territory. Consequently, Wells Engineers, Inc. personnel need to spend time in Grand Island with those particularly marketing people in order to obtain proposals for Protex Systems, Inc. The IBM systems analysts, however, did provide consultation with regard to the type of equipment which appears to be appropriate for the applications considered. The data processing equipment which they recommend is the IBM System/34, a system which supports both multiple work stations and different applications. It is a very flexible system which can be started with a minimum amount of equipment and added to as the need and confidence level develops.

Other companies have similar systems, each with their own special features. The proposals from the various companies will be carefully evaluated to assure the best choice for Protex Systems, Inc.

The preliminary cost figures obtained from IBM for the System/34 hardware, assuming 32k field, four terminals and no remote connections to the out-state offices is approximately \$55,000. A contract for service and preventative maintenance for this system costs approximately \$375 per month, while software (programs) are approximately \$80/month/application. The capacity of the computer can be doubled for less than 15% of the original hardware cost and requires no external modification to the existing unit. A remote printer in an outstate office would cost approximately \$7,000, depending on the line distance. These could be added at a later date.

The costs furnished by IBM are order-of-magnitude only, and are only for planning purposes. More detailed requirements will need to be furnished to the companies from whom Protex Central Inc. requests proposals to obtain final cost proposals. Response time for a request for proposals is very good, and delivery time of the computer equipment is apparently not a problem.

It is therefore recommended that the required information be compiled and specifications be provided to the three following companies: IBM, Burroughs, and Data General, to obtain proposals for a data processing system, including software and service agreements.

- E. It is further recommended that additional effort be spent working with the staff at Protex Central Inc. particularly with the Operations Manager, to develop specific techniques related to extended advance scheduling for field personnel and to regular, organized reporting of work accomplished. The effort will include further study of the number and types of project typically scheduled, as well as the standard times spent on routine tasks. The outstate office work load will be included in the study. In addition, the

impact of providing installation and hookups for Communication Engineering equipment will be reviewed.

Appropriate planning and reporting will be developed, incorporating input from Protex Central Inc. management. The purpose of this effort will be to provide the Operations Manager with the guidance and tools required to increase his management skills and to permit him to furnish to the General Manager, on a regular basis, both status and planning information.